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#### Summer Quarter 1977

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<thead>
<tr>
<th>Date</th>
<th>Day</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 20</td>
<td>Monday</td>
<td>Beginning of university year</td>
</tr>
<tr>
<td>June 21</td>
<td>Tuesday</td>
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<tr>
<td>June 28</td>
<td>Tuesday</td>
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<tr>
<td>July 4</td>
<td>Monday</td>
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</tr>
<tr>
<td>July 12</td>
<td>Tuesday</td>
<td>Last day to enroll for summer quarter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Last day to add courses</td>
</tr>
<tr>
<td>August 9</td>
<td>Tuesday</td>
<td>Academic holiday—Independence Day</td>
</tr>
<tr>
<td>August 26</td>
<td>Friday</td>
<td>Last day to withdraw from classes without petition</td>
</tr>
<tr>
<td>August 29–</td>
<td>Monday–</td>
<td>End of seventh week</td>
</tr>
<tr>
<td>September 1</td>
<td>Thursday</td>
<td>First session classes begin</td>
</tr>
<tr>
<td>September 1</td>
<td>Thursday</td>
<td>Last day to enroll—two week term</td>
</tr>
<tr>
<td>September 2–</td>
<td>Friday–</td>
<td>Last day to enroll—four week term</td>
</tr>
<tr>
<td>September 18</td>
<td>Sunday</td>
<td>Final examination period</td>
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<tr>
<td></td>
<td></td>
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#### Fee-Supported Summer Sessions, 1977

<table>
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<tbody>
<tr>
<td>June 20 to</td>
<td>June 24</td>
<td>Pre-session</td>
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<tr>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>FIRST SESSION</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>June 27</td>
<td>Monday</td>
<td>Registration for first session</td>
</tr>
<tr>
<td>June 28</td>
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<tr>
<td>June 29</td>
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<td>June 30</td>
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<td>Last day to enroll—four week term</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Last day to add or drop courses without penalty</td>
</tr>
<tr>
<td>July 4</td>
<td>Monday</td>
<td>Academic holiday—Independence Day</td>
</tr>
<tr>
<td>July 9</td>
<td>Saturday</td>
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</tr>
<tr>
<td>July 23</td>
<td>Saturday</td>
<td>End of four-week term</td>
</tr>
<tr>
<td><strong>SECOND SESSION</strong></td>
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<td></td>
</tr>
<tr>
<td>July 25</td>
<td>Monday</td>
<td>Registration for second session</td>
</tr>
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<td>July 26</td>
<td>Tuesday</td>
<td>Second session classes begin</td>
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<tr>
<td>July 27</td>
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<td>July 28</td>
<td>Thursday</td>
<td>Last day to enroll—four week term</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Last day to add or drop courses without penalty</td>
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<tr>
<td>August 5</td>
<td>Friday</td>
<td>End of two-week term</td>
</tr>
<tr>
<td>August 19</td>
<td>Friday</td>
<td>End of four-week term</td>
</tr>
<tr>
<td>August 22 to</td>
<td>August 26</td>
<td>Post-session</td>
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Final Examinations to be held during the last day of classes.
### Fall Quarter 1977

<table>
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<th>Date</th>
<th>Day</th>
<th>Event</th>
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<tbody>
<tr>
<td>September 19</td>
<td>Monday</td>
<td>Beginning of fall quarter (faculty only)</td>
</tr>
<tr>
<td>September 22</td>
<td>Thursday</td>
<td>Registration for new students</td>
</tr>
<tr>
<td>September 23</td>
<td>Friday</td>
<td>Registration for continuing and returning students</td>
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<tr>
<td>September 26</td>
<td>Monday</td>
<td>Fall quarter classes begin</td>
</tr>
<tr>
<td>October 3</td>
<td>Monday</td>
<td>Last day to enroll for fall quarter</td>
</tr>
<tr>
<td>October 14</td>
<td>Friday</td>
<td>Last day to withdraw from classes without petition</td>
</tr>
<tr>
<td>November 11</td>
<td>Friday</td>
<td>Academic holiday—Veteran’s Day</td>
</tr>
<tr>
<td>November 14</td>
<td>Monday</td>
<td>End of seventh week</td>
</tr>
<tr>
<td>November 23–27</td>
<td>Wednesday–Sunday</td>
<td>Academic holiday—Thanksgiving</td>
</tr>
<tr>
<td>December 7</td>
<td>Wednesday</td>
<td>Last day of classes</td>
</tr>
<tr>
<td>December 8–9</td>
<td>Thursday–Friday</td>
<td>Final examination period</td>
</tr>
<tr>
<td>12–13</td>
<td>Monday–Tuesday</td>
<td>Final examination period</td>
</tr>
<tr>
<td>December 13</td>
<td>Tuesday</td>
<td>End of fall quarter</td>
</tr>
<tr>
<td>December 14–</td>
<td>Wednesday–Monday</td>
<td>Academic holiday</td>
</tr>
<tr>
<td>January 2</td>
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### Winter Quarter 1978

<table>
<thead>
<tr>
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<th>Day</th>
<th>Event</th>
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<tbody>
<tr>
<td>January 3–</td>
<td>Tuesday</td>
<td>Beginning of winter quarter</td>
</tr>
<tr>
<td>January 3–4</td>
<td>Tuesday–Wednesday</td>
<td>Registration for winter quarter</td>
</tr>
<tr>
<td>January 5</td>
<td>Thursday</td>
<td>Winter quarter classes begin</td>
</tr>
<tr>
<td>January 12</td>
<td>Thursday</td>
<td>Last day to enroll for winter quarter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Last day to add courses</td>
</tr>
<tr>
<td>January 25</td>
<td>Wednesday</td>
<td>Last day to withdraw from classes without petition</td>
</tr>
<tr>
<td>February 20</td>
<td>Monday</td>
<td>Academic holiday—Washington’s Day</td>
</tr>
<tr>
<td>February 24</td>
<td>Friday</td>
<td>End of seventh week</td>
</tr>
<tr>
<td>March 14</td>
<td>Tuesday</td>
<td>Last day of classes</td>
</tr>
<tr>
<td>March 15–18</td>
<td>Wednesday–Saturday</td>
<td>Final examination period</td>
</tr>
<tr>
<td>March 18</td>
<td>Saturday</td>
<td>End of winter quarter</td>
</tr>
<tr>
<td>March 19–22</td>
<td>Sunday–Wednesday</td>
<td>Academic holiday</td>
</tr>
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</table>

### Spring Quarter 1978

<table>
<thead>
<tr>
<th>Date</th>
<th>Day</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>March 23</td>
<td>Thursday</td>
<td>Beginning of spring quarter</td>
</tr>
<tr>
<td>March 23–24</td>
<td>Thursday–Friday</td>
<td>Registration for spring quarter</td>
</tr>
<tr>
<td>March 27</td>
<td>Monday</td>
<td>Spring quarter classes begin</td>
</tr>
<tr>
<td>April 3</td>
<td>Monday</td>
<td>Last day to enroll for spring quarter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Last day to add courses</td>
</tr>
<tr>
<td>April 14</td>
<td>Friday</td>
<td>Last day to withdraw from classes without petition</td>
</tr>
<tr>
<td>April 19</td>
<td>Wednesday</td>
<td>Last day to apply for June commencement</td>
</tr>
<tr>
<td>May 12</td>
<td>Friday</td>
<td>End of seventh week</td>
</tr>
<tr>
<td>May 29</td>
<td>Monday</td>
<td>Academic holiday—Memorial Day</td>
</tr>
<tr>
<td>June 5</td>
<td>Monday</td>
<td>Last day of classes</td>
</tr>
<tr>
<td>June 6–9</td>
<td>Tuesday–Friday</td>
<td>Final examination period</td>
</tr>
<tr>
<td>June 10</td>
<td>Saturday</td>
<td>Commencement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>End of spring quarter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>End of university year (faculty only)</td>
</tr>
<tr>
<td>June 11–18</td>
<td>Sunday–Sunday</td>
<td>Academic holiday</td>
</tr>
</tbody>
</table>
# ACADEMIC CALENDAR—1978–79

## Summer Quarter 1978

<table>
<thead>
<tr>
<th>Date</th>
<th>Day</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 19</td>
<td>Monday</td>
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<td>Registration for summer quarter</td>
</tr>
<tr>
<td>July 4</td>
<td>Tuesday</td>
<td>Summer quarter classes begin</td>
</tr>
<tr>
<td>July 11</td>
<td>Tuesday</td>
<td>Last day to enroll for summer quarter</td>
</tr>
<tr>
<td>August 8</td>
<td>Tuesday</td>
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<td>August 25</td>
<td>Friday</td>
<td>Academic holiday—Independence Day</td>
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<td>August 28–31</td>
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<tr>
<td>August 31</td>
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<tr>
<td>September 1–17</td>
<td>Friday–Sunday</td>
<td>Academic holiday</td>
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</tbody>
</table>

## Fall Quarter 1978

<table>
<thead>
<tr>
<th>Date</th>
<th>Day</th>
<th>Event</th>
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</thead>
<tbody>
<tr>
<td>September 18</td>
<td>Monday</td>
<td>Beginning of fall quarter (faculty only)</td>
</tr>
<tr>
<td>September 21</td>
<td>Thursday</td>
<td>Registration for new students</td>
</tr>
<tr>
<td>September 22</td>
<td>Friday</td>
<td>Registration for continuing and returning students</td>
</tr>
<tr>
<td>September 25</td>
<td>Monday</td>
<td>Fall quarter classes begin</td>
</tr>
<tr>
<td>October 2</td>
<td>Monday</td>
<td>Last day to enroll for fall quarter</td>
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<tr>
<td>October 13</td>
<td>Friday</td>
<td>Last day to add courses</td>
</tr>
<tr>
<td>November 10</td>
<td>Friday</td>
<td>Last day to withdraw from classes without petition</td>
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<tr>
<td>November 13</td>
<td>Monday</td>
<td>Academic holiday—Veteran’s Day</td>
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<tr>
<td>November 22–26</td>
<td>Wednesday–Sunday</td>
<td>Academic holiday—Thanksgiving</td>
</tr>
<tr>
<td>December 6</td>
<td>Wednesday</td>
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<tr>
<td>December 7–8</td>
<td>Thursday–Friday</td>
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<tr>
<td>11–12</td>
<td>Monday–Tuesday</td>
<td>End of fall quarter</td>
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<tr>
<td>December 12</td>
<td>Tuesday</td>
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</tr>
<tr>
<td>December 14– January 1</td>
<td>Thursday–Monday</td>
<td>Academic holiday</td>
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## Winter Quarter 1979

<table>
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<th>Date</th>
<th>Day</th>
<th>Event</th>
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<tbody>
<tr>
<td>January 2</td>
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<tr>
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<td>Tuesday (Noon)–Wednesday</td>
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<tr>
<td>January 4</td>
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<tr>
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<tr>
<td>February 23</td>
<td>Friday</td>
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<tr>
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<td>March 18–21</td>
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### Spring Quarter 1979

<table>
<thead>
<tr>
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<th>Day</th>
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<tbody>
<tr>
<td>March 22</td>
<td>Thursday</td>
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<tr>
<td>March 22-23</td>
<td>Thursday-Friday</td>
<td>Registration for spring quarter</td>
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<tr>
<td>March 26</td>
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<td>April 2</td>
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<td></td>
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<tr>
<td>April 16</td>
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<tr>
<td>April 18</td>
<td>Wednesday</td>
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<tr>
<td>May 11</td>
<td>Friday</td>
<td>End of seventh week</td>
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<tr>
<td>May 28</td>
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<td>Monday</td>
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<tr>
<td>June 5-8</td>
<td>Tuesday-Friday</td>
<td>Final examination period</td>
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<tr>
<td>June 9</td>
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<td>Commencement</td>
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<td></td>
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<tr>
<td>June 10-17</td>
<td>Sunday-Sunday</td>
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### Summer Quarter 1979 (Tentative)

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<td>June 19</td>
<td>Tuesday</td>
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<tr>
<td>June 26</td>
<td>Tuesday</td>
<td>Last day to enroll for summer quarter</td>
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<td>Last day to add courses</td>
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<tr>
<td>July 10</td>
<td>Tuesday</td>
<td>Last day to withdraw from classes without petition</td>
</tr>
<tr>
<td>August 7</td>
<td>Tuesday</td>
<td>End of seventh week</td>
</tr>
<tr>
<td>August 24</td>
<td>Friday</td>
<td>Last day of classes</td>
</tr>
<tr>
<td>August 27-30</td>
<td>Monday-Thursday</td>
<td>Final examination period</td>
</tr>
<tr>
<td>August 30</td>
<td>Thursday</td>
<td>End of summer quarter</td>
</tr>
<tr>
<td>August 31-</td>
<td>Friday-Sunday</td>
<td>Academic holiday</td>
</tr>
<tr>
<td>September 16</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
THE CALIFORNIA STATE UNIVERSITY AND COLLEGES

Humboldt State University
California State University, Chico
Sonoma State College
California State University, Sacramento
San Francisco State University
California State University, Hayward
San Jose State University
California State College, Stanislaus
California State University, Fresno

California State College, Bakersfield
California State Polytechnic University, Pomona
California State University, Northridge
California State University, Los Angeles
Office of the Chancellor, Long Beach
California State College, Dominguez Hills
California State University, Long Beach
California State University, Fullerton
California State College, San Bernardino
San Diego State University
Imperial Valley Campus, Calexico
THE CALIFORNIA STATE UNIVERSITY AND COLLEGES

The individual California State Colleges were brought together as a system by the Donahoe Higher Education Act of 1960. In 1972 the system became The California State University and Colleges and fourteen of the nineteen campuses received the title University.

The oldest campus—California State University, San Jose—was founded in 1857 and became the first institution of public higher education in California. The newest campus—California State College, Bakersfield—began instruction in 1970.

Responsibility for The California State University and Colleges is vested in the Board of Trustees, whose members are appointed by the Governor. The Trustees appoint the Chancellor, who is the chief executive officer of the system, and the Presidents, who are the chief executive officers on the respective campuses.

The Trustees, the Chancellor and the Presidents develop systemwide policy, with actual implementation at the campus level taking place through broadly based consultative procedures. The Academic Senate of The California State University and Colleges, made up of elected representatives of the faculty from each campus, recommends academic policy to the Board of Trustees through the Chancellor.

Academic excellence has been achieved by The California State University and Colleges through a distinguished faculty, whose primary responsibility is superior teaching. While each campus in the system has its own unique geographic and curricular character, all campuses, as multipurpose institutions, offer undergraduate and graduate instruction for professional and occupational goals as well as broad liberal education. All of the campuses require for graduation a basic program of "General Education—Breadth Requirements" regardless of the type of bachelor's degree or major field selected by the student. A limited number of doctoral degrees is offered jointly with the University of California.

Presently, under the system's "New Approach to Higher Education," the campuses are implementing a wide variety of innovative programs to meet the changing needs of students and society. Among pilot programs under way are instructional television projects, self-paced learning plans, minicourses, and credit-by-examination alternatives. The Consortium of The California State University and Colleges fosters and sponsors local, regional, and statewide external degree and certificate programs to meet the needs of individuals who find it difficult or impossible to attend classes on a campus.

Enrollments in fall 1976 totaled approximately 300,000 students, who were taught by a faculty of 17,000. Last year the system awarded over 53 percent of the bachelor's degrees and 34 percent of the master's degrees granted in California. Almost 600,000 persons have been graduated from the nineteen campuses since 1960.
Average Annual Costs and Sources of Funds Per Full-Time Equivalent * Student in The California State University and Colleges

The 19 campuses of The California State University and Colleges are financed primarily through funding provided by the taxpayers of California. For the 1976–77 year, the total cost of operation is $740 million, which provides continuing support for 239,410 full-time equivalent (FTE*) students. This results in an average cost per FTE student of $3,091 per year. Of this amount, the average student pays $285. Included in this average student payment is the amount paid by nonresident students. The remaining $2,806 in costs are funded by state and federal taxes.

Averages do not fit all students alike or even any specific student. To arrive at an average figure that is meaningful, the costs outlined above exclude “user fees” for living expenses, housing, and parking, as well as costs for extension and summer session work. Computations are based on full-time equivalent students, not individuals, and costs are prorated by system totals, not by campus. The average costs for a full-time equivalent student in the system are depicted in the following chart:

1976–77 Projection of Total Costs of Campus Operation (Including Building Amortization)

<table>
<thead>
<tr>
<th>Enrollment: 239,410 FTE</th>
<th>Amount</th>
<th>Cost per FTE *</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>State Approp. (Support)</td>
<td>$613,824,941</td>
<td>$2,564</td>
<td>82.9%</td>
</tr>
<tr>
<td>State Funding (Capital Outlay) **</td>
<td>30,029,210</td>
<td>125</td>
<td>4.1</td>
</tr>
<tr>
<td>Student Charges</td>
<td>68,260,575</td>
<td>285 **</td>
<td>9.2</td>
</tr>
<tr>
<td>Federal (Fin. Aids)</td>
<td>27,881,227</td>
<td>117</td>
<td>3.8</td>
</tr>
<tr>
<td>Total</td>
<td>$739,995,953</td>
<td>$3,091</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

* For budgetary purposes, full-time equivalent (FTE) translates total head count into total academic student load. The term assumes that a full-time student in The California State University and Colleges is enrolled for 15 units of academic credit. Some students enroll for more than 15 units; some students enroll for fewer than 15 units.

** The system's more than 14,000 acres of land and the wide range of facilities and equipment on the 19 campuses are currently valued at approximately $1.2 billion. Amortized over a 40-year period, they are valued at $125 per FTE student.

*** The average costs paid by a student include the student services fee (formerly called the materials and service fee), health facilities fee, college union fee, student body fee, and the nonresident tuition. This amount is derived by taking the total of all student fees and dividing by the total full-time equivalent student enrollment. Individual students may pay more or less than $285 depending on whether they are part-time, full-time, resident or nonresident students.
ADMINISTRATION, CALIFORNIA STATE UNIVERSITY
AND COLLEGES

EX-OFFICIO TRUSTEES
The Honorable Edmund G. Brown Jr. .................................. State Capitol, Sacramento 95814
Governor of California
The Honorable Mervyn Dymally .................................... State Capitol, Sacramento 95814
Lieutenant Governor of California
The Honorable Leo McCarthy ....................................... State Capitol, Sacramento 95814
Speaker of the Assembly
The Honorable Wilson C. Riles ................................ 721 Capitol Mall, Sacramento 95814
State Superintendent of Public Instruction
Dr. Glenn S. Dumke .............................................. 400 Golden Shore, Long Beach 90802
Chancellor of The California State University and Colleges

APPOINTED TRUSTEES
Appointments are for a term of eight years except for a student trustee and alumni trustee
whose terms are for two years, expiring March 1 of the years in parentheses. Names are listed
in order of appointment to the Board.
Charles Luckman (1982) ........................................ 9200 Sunset Blvd., Los Angeles 90069
William O. Weissich (1977) ........................ 55 Professional Center Pkwy., San Rafael 94903
Robert A. Hornby (1978) ..................................... 810 South Flower St., Los Angeles 90017
Wendell W. Witter (1979) .................................... 45 Montgomery St., San Francisco 94106
Mrs. Winifred H. Lancaster (1977) ...................... P.O. Drawer JJ, Santa Barbara 93102
Gene M. Benedetti (1978) ...................................... 8990 Poplar Ave., Cotati 94952
Robert F. Beaver (1976) ........................................ 254 East 27th St., Los Angeles 90011
Mrs. C. Stewart Ritchie (1980) .......................... 1064 Creek Dr., Menlo Park 94025
Frank P. Adams (1981) ........................................ 235 Montgomery St., San Francisco 94104
Richard A. Garcia (1979) ........................................ P.O. Box 2073, Glendale 91209
Dean S. Lesher (1981) .......................................... P.O. Box 5166, Walnut Creek 94598
Dr. Claudia H. Hampton (1982) ......................... 450 N. Grand, Room G 353, Los Angeles 90012
Dr. Mary Jean Pew (1983) ..................................... 2021 N. Western Ave., Los Angeles 90027
Willie J. Stennis (1983) ...................................... 3947 Landmark, Culver City 90230
Kathleen A. Carlson (1978) .................................... 185A Parnassus Ave., San Francisco 94117
Juan Gomez-Quinones (1984) .......................... Chicano Studies Center,
John F. O'Connell (1978) ........................................ P.O. Box 3965, San Francisco 94119

OFFICERS OF THE TRUSTEES
Governor Edmund G. Brown Jr.
President
Roy T. Brophy
Chairman
Frank P. Adams
Vice Chairman
Chancellor Glenn S. Dumke
Secretary-Treasurer
OFFICE OF THE CHANCELLOR

The California State University and Colleges

400 Golden Shore
Long Beach, California 90802

Glenn S. Dumke .................................................... Chancellor
Mayer Chapman .................................................. General Counsel
D. Dale Hanner .................................................... Vice Chancellor, Business Affairs
Harry Harmon .................................................... Executive Vice Chancellor
Lee R. Kerschner .............................................. Vice Chancellor, Administrative Affairs
Alex C. Sherriffs .................................................... Vice Chancellor, Academic Affairs
Marjorie Downing Wagner .................................... Vice Chancellor, Faculty and Staff Affairs

THE CALIFORNIA STATE UNIVERSITY AND COLLEGES

San Jose State University (1857) ........................................ John H. Bunzel, President
125 South Seventh Street, San Jose, California 95192
(408) 277-2000

California State University, Chico (1887) ....................... Stanford Cazier, President
First and Normal Streets, Chico, California 95929
(916) 893-5011

San Diego State University (1897) .................................. Brage Golding, President
5300 Campanile Drive, San Diego, California 92182
(714) 286-5000

San Francisco State University (1899) .......................... Paul F. Romberg, President
1600 Holloway Avenue, San Francisco, California 94132
(415) 469-2141

California Polytechnic State University (1901) .................... Robert E. Kennedy, President
San Luis Obispo, California 93407
(805) 546-0111

California State University, Fresno (1910) ...................... Norman A. Baxter, President
Shaw and Cedar Avenues, Fresno, California 93740
(209) 487-9011

Humboldt State University (1913) .................................. Alistair W. McCrone, President
Arcata, California 95521
(707) 826-3011

California State Polytechnic University (1938)
Kellogg-Voorhis, Pomona ........................................ Hugh O. LaBounty, Jr., Acting President
3801 West Temple Avenue, Pomona, California 91768
(714) 598-4592

California State University, Los Angeles (1947) .................. John A. Greenlee, President
5151 State University Drive, Los Angeles, California 90032
(213) 224-0111

California State University, Sacramento (1947) ............... James G. Bond, President
6000 Jay Street, Sacramento, California 95819
(916) 454-6011

California State University, Long Beach (1949) ............... Stephen Horn, President
1250 Bellflower Boulevard, Long Beach, California 90840
(213) 498-4111

California State University, Fullerton (1957) .................... L. Donald Shields, President
Fullerton, California 92634
(714) 870-2011

California State University, Hayward (1957) ..................... Ellis E. McCune, President
Hayward, California 94542
(415) 881-3000

California State University, Northridge (1958) ............... James W. Cleary, President
18111 Nordhoff Street, Northridge, California 91330
(213) 885-1200

California State College, Stanislaus (1959) ...................... A. Walter Olson, President
800 Monte Vista Avenue, Turlock, California 95380
(209) 633-2122

California State College, Sonoma (1960) ....................... Peter Diambandopoulos, President
1801 East Cotati Avenue, Rohnert Park, California 94928
(707) 795-2880

California State College, Dominguez Hills (1960) ............. Donald R. Gerth, President
1000 E. Victoria Street, Dominguez Hills, California 90747
(213) 532-4300

California State College, San Bernardino (1960) ............... John M. Pfau, President
5500 State College Parkway, San Bernardino, California 92407
(714) 887-7301

California State College, Bakersfield (1967) ................... Jacob P. Frankel, President
9001 Stockdale Highway, Bakersfield, California 93309
(805) 833-2011
General Information
EDUCATION AT CAL POLY

Cal Poly is different. The difference is apparent to visitors who first see the large, diversified campus with well-tended farmlands stretching away from the academic core. But the difference goes beyond its size, appearance, and unique setting.

The California State Legislature has established special goals for California Polytechnic State University, San Luis Obispo. The administration and faculty are dedicated to achieving these goals, and students are attracted to Cal Poly because they want to benefit from the special educational opportunities offered. These opportunities have led to significant, meaningful jobs for thousands of graduates. Historically, Cal Poly's methods of education and dedication to occupationally-centered curricula have created for the University a distinctive role in higher education. Its statewide and national reputation has made it one of the most popular campuses in California. Cal Poly is particularly noted for its special emphasis and excellence in such applied fields as agriculture, architecture, business, engineering, home economics, and science and mathematics, which are integrated with closely-related career-oriented or supporting fields of communicative arts, education, humanities, and social sciences.

Each applicant is required to select an academic major at the time of application, whether seeking to enter directly from high school or to transfer from another college. A concurrent sequence of general education and elective courses assists the student in relating the chosen area of study to other fields of knowledge. Faculty members, who are selected on the basis of academic qualifications, professional experience, and teaching ability, are encouraged to give the highest priority to effective teaching. At Cal Poly a constant interplay between general principles and practical applications characterizes instruction, whether in the laboratory, the classroom, or field study. Departments assist students in obtaining actual experience through individual and group projects, work-study programs, cooperative education, and internships. Such practical educational experiences in the major field prepare the student for specific occupations and professions or for advanced study.

In addition to preparing the student to meet the requirements of specific occupations, Cal Poly is also dedicated to helping each individual to achieve his or her maximum personal development. An extensive cocurricular program helps the student to develop citizenship, leadership, and the skills necessary for constructive and productive life in the community. Student and faculty participation in the development and improvement of both curricular and cocurricular programs characterize Cal Poly's mode of learning.

HISTORICAL DEVELOPMENT

California Polytechnic State University began with the establishment in 1901 by the State Legislature of a vocational high school at San Luis Obispo. The institution served as a forerunner in vocational education for agriculture and industry in California. In 1921 its Board of Trustees was dissolved and the State Board of Education administered the school until July 1, 1961 when administration passed to the Trustees of The California State University and Colleges.

Cal Poly began offering junior college courses in 1927, and became a two- and three-year institution in 1933. In 1936 a degree transfer program was added, and in 1940 the first bachelor of science degrees were authorized.

The first baccalaureate exercises were held in 1942. Approval to grant the master of arts degree in education was received in 1949, and to grant the master of science degree in 1967.

From 1933 until his retirement in 1966, the late Dr. Julian A. McPhee was chief administrator of Cal Poly. On May 1, 1967 the Trustees of The California State University and Colleges named Dr. Robert E. Kennedy as president of Cal Poly.

Students are enrolled at Cal Poly in over 50 academic programs. Included are men and women students from all California counties.
THE CAMPUS

The Cal Poly campus consists of over 5,000 acres adjacent to San Luis Obispo, a community of 35,000 located on U.S. Highway 101, midway between San Francisco and Los Angeles, and 12 miles from the beaches and marine facilities of California's Central Coast.

Due to the varied nature of Cal Poly's curricula, instructional facilities are diverse and suited to the up-to-date demands of modern technology. In addition to faculty offices, classrooms, and laboratories for instructional use, the campus is served by several specialized facilities, particularly in agriculture, architecture, engineering, and the sciences.

Cal Poly has long been known as a friendly campus which welcomes visitors to its campus. Maps suitable for a self-conducted tour are available from the information desk of the Administration Building for interested prospective students and parents and others. Arrangements for group visits to the campus may be made by contacting the Office of Relations with Schools and/or the office of the dean of the respective academic school or division.

FACILITIES

The outstanding agricultural programs of the University utilize such facilities as the Alan A. Erhart Agriculture building (which includes modern laboratories for animal husbandry, accounting, crops, dairy, farm management, and ornamental horticulture); several Agricultural Engineering shops (including farm mechanics, farm machinery, farm power, hydrology, rural electricity); the Food Processing building (which includes a creamery, meat laboratory, canning and freezing laboratories, and an instructional retail facility); soil science and veterinary science laboratories in the Science building; and an unexcelled complex of agricultural production units which are utilized instructionally in Cal Poly's student enterprise projects.

These agricultural units include a beef unit with feeding barns; 3800 acres of cattle range and pasture; a judging pavilion; a complete feed mill with storage facilities; a crops unit which includes washing, crating, and packing areas; and 750 acres of vegetable and field crops plus 30 acres of fruit and vine crops. Dairy unit includes a milking barn, feed barns, judging pavilion, and a complete creamery. In addition, a student project unit provides for 80 head of student owned dairy project cattle. The horse unit includes barns, paddocks, and pasture for thoroughbred and quarter horses. A recently completed ornamental horticulture unit provides the most modern propagation and instructional facilities of their kind in the nation. Additional agricultural units are utilized instructionally for sheep, swine, and poultry production. A new beef cattle evaluation center built through support of private industry and individuals offers operating programs for the improvement of beef cattle quality.

The instructional philosophy of the University as reflected in the extensive and modern agricultural facilities has also been incorporated in programs of engineering and technology, science, mathematics, graphic communications, physical education, home economics, and other areas in which Cal Poly has developed a reputation for excellence. These include laboratories for all phases of engineering such as aeronautical, electronic, environmental and industrial, mechanical, welding technology, and engineering technology.

The computer science building provides computer capabilities for all instructional programs, particularly those in engineering, science, and mathematics. Two large science buildings provide fully equipped laboratories devoted to instruction in bacteriology, botany, chemistry, entomology, marine biology, microbiology, physics, plant pathology, and zoology. The Clyde P. Fisher Science Hall, to include additional laboratories and classrooms, is anticipated for completion in Summer, 1978.

Individual drafting and study cubicles in architectural laboratories give a distinctive appearance to new drafting classrooms as well as to some of the campus historical buildings which have been remodeled by the students themselves to provide design facilities in the School of Architecture and Environmental Design. The new 70,000 square foot Architecture and Environmental Design building was occupied winter, 1976. The building provides for classrooms, architectural laboratories, offices, and specialized facilities related to architecture.

Campus facilities include, in addition to a 500-seat theater, a language laboratory, and home economics and child development laboratories. The graphic arts building, which houses the journalism program, student newspaper, and radio station, includes the graphic communications department which ranges from the unique Shakespeare Press Museum to the most modern computer typesetting equipment for printing instruction.
The physical education facilities of the campus are extensive. The physical education building provides wrestling, and gymnastic rooms in addition to the main floor which contains three full-length cross-court basketball courts and seats 4,000 persons for athletic contests. Handball and tennis courts are adjacent to the gymnasium, along with a large playing field area for intramural sports and physical education classes. Two heated swimming pools are used both for physical education classes and for varsity water polo and swimming. The football stadium has a grandstand and bleachers seating 7,000 persons. There is also a spacious baseball field with permanent seating, and a 9-lane all-weather quarter-mile track. Crandall Gymnasium is utilized for minor sports as well as for special women’s physical education requirements.

The four-story Administration building and Julian A. McPhee University Union serve all campus personnel. The University Union includes Chumash Auditorium, which accommodates over 1300 persons, lounges, meeting rooms, and offices for the Cal Poly Foundation and the Associated Students, Inc.

The program of the Walter F. Dexter Memorial Library is designed to meet the curricular resource needs of students and the instructional and research needs of the faculty. The collections in excess of 1,180,680 cataloged and uncataloged items include 480,000 cataloged volumes, approximately 44,000 bound periodicals, 305,000 microforms, and 400,000 unbound documents, pamphlets, and miscellaneous materials. The Library receives regularly 3,600 periodical and 3,060 other serial titles, and it is an official depository for United States Government and California State publications. Bookstacks located throughout the Library are open to all readers, and professionally trained librarians assist students and faculty in the use of the Library's resources.

Cal Poly has the largest on-campus residence hall complex of any of the campuses of The California State University and Colleges. A variety of living arrangements is offered for over 2,750 single students. There are several food service dining facilities including Vista Grande, which offers both cafeteria and table service restaurant modes of dining. Campus housing, intramural facilities, a modern health services center, the convenience of the University Union, and access to the library and laboratories all combine to provide a well-rounded home on campus for a large proportion of Cal Poly students.

ACCREDITATION

The University is fully approved as a four-year degree-granting institution by the Western Association of Schools and Colleges. In addition the University holds associate membership in the Northwest Association of Schools and Colleges.

The Chemistry Department is fully approved and accredited by the American Chemical Society and students completing the appropriate curriculum are eligible for certification by the Society. The curriculum leading to the Master of Architecture degree in the School of Architecture and Environmental Design is fully accredited by the National Architectural Accrediting Board. Also accredited are the curricula in Landscape Architecture and Architectural Engineering.

Eight degree curricula in the School of Engineering and Technology are accredited by the Engineers Council for Professional Development. They are: Aeronautical Engineering, Electrical Engineering, Electronic Engineering, Environmental Engineering, Industrial Engineering, Mechanical Engineering, Metallurgical Engineering, and Transportation Engineering.

Also accredited are Engineering Technology course options in air conditioning and refrigeration technology, electronic technology, manufacturing processes technology, and mechanical technology.

The program in Industrial Technology is accredited by the National Association of Industrial Technology, and the program in Agricultural Engineering by the Engineers Council for Professional Development.

In addition the California Commission for Teacher Preparation and Licensing has authorized the University to recommend for a number of teaching credentials, described in the catalog section on “Teacher Preparation Programs.”
THE FOUNDATION

Established in 1940, the California Polytechnic State University Foundation is a separate non-profit corporation functionally organized to promote and enhance the educational mission of the University. With faculty and administrative personnel of the University as Board directors, the Foundation operates the campus food service system, the El Corral Bookstore, and provides other support services, including the fiscal management of many applied research grants and contracts and the student enterprise projects. As a legal entity qualifying as a charitable organization, the Foundation also has an important role in receiving gifts, as well as acting as trustee or beneficiary of deferred gifts for the benefit of the University.

The Foundation operates under lease agreements made with the Trustees of The California State University and Colleges and approved by the State Department of Finance. The provisions of these leases define the activities of the Foundation and the use of its funds. The accounts are subject to audit by the Department of Finance and other control agencies.

Through the Foundation there is available a revolving fund from which students may borrow to finance their projects. No cosigner is required for a student to borrow from the Foundation, but each must present a working plan, a budget, and a signed contract with the Foundation before starting a project. Each student contributes a share from earnings towards the project fund. Any losses in student projects are covered by the Foundation from this fund.

Typical agricultural projects include: Fattening steers, lambs, or swine; raising and breeding cattle, both beef and dairy, for a start towards future herds; growing crop projects, such as tomatoes, sweet corn, hay, and sugar beets; raising poultry, both meat birds and laying hens, and operating the hatchery; growing and marketing ornamental horticultural projects. Group and individual projects are also conducted by students in engineering, technology, and science. Projects have become increasingly interdisciplinary.

THE ALUMNI ASSOCIATION

The Cal Poly Alumni Association serves all of the more than 90,000 students who have attended California Polytechnic State University, San Luis Obispo, since 1901.

The Association endeavors to maintain communication with former students and coordinates alumni gatherings for educational purposes, reunions and other functions at the campus and in areas throughout California and the United States, and the world.

An international president and two vice-presidents, elected for two-year terms, aided by the secretary-treasurer and the campus coordinator, alumni services, provide leadership for the organization which functions in California through directors in 17 sections of the State.

The Association membership includes 6,000 life members and 1,500 annual members.

The Association currently assists in the production of the quarterly University alumni-oriented publication, CAL POLY TODAY, organizes off-campus seminars, supports alumni activities at Homecoming and Poly Royal, and assists in the sponsorship of several special events for students on campus including Week of Welcome (for freshmen and transfer students) and Senior Week. Through contributions to loan and scholarship funds, it provides assistance to current students.

Memberships in several categories for alumni, students, faculty and staff and friends of the University are available through the Alumni Services Office on campus.

UNIVERSITY ADVANCEMENT

The advancement program at Cal Poly is a unified approach to development of sources of non-State funding from individual donors, corporations, foundations, and other sources. The overall objective of the advancement program is most effectively to present the total needs of the university to its multiple audiences. Advancement program goals include development of a strong alumni association, coordination of non-State funding for research and development, and the raising of non-State funds in support of the university. Planned giving programs include estate planning and deferred giving. The annual giving program of the university includes solicitation of former students, friends of the university, corporations, and foundations. Membership in special gift groups is based on the donor’s annual contributions.
Admissions and Registration
ADMISSION REQUIREMENTS

Admission to California Polytechnic State University is open to qualified graduates of any high school and to other applicants who, in the judgment of the appropriate campus authorities, possess equivalent preparation. Admission is limited to those applicants for whom adequate staff and facilities are available.

Applicants must include their social security number in designated places on applications for admission as required by Title 5, California Administrative Code. The social security number is to identify records pertaining to the student as well as to identifying the student for purposes of financial aid eligibility, disbursement and repayment of financial aid or other debts payable to the University.

Transcripts and records presented for admission or evaluation will become a part of the students’ permanent records upon completion of matriculation.

Currently enrolled students may elect to be absent from the University for any one quarter, including the summer quarter, without having to reapply for admission.

Applications for readmission must be filed after absences of two or more quarters. The $20 application fee is not required if the absence has not been for more than two quarters and no other college was attended. Applications for readmission must be filed during the appropriate filing period in order to receive equal consideration for available space.

Transfer Credit and Residence Requirements

Persons who have attended community colleges or four-year colleges will be given full credit for such college level courses as may be applicable to the pattern of course work in the California Polytechnic State University curriculum followed, and in general elective credit for those not so applicable. Credit earned in non-accredited colleges and universities will be accepted toward graduation requirements only after the student has completed 36 quarter units in residence with a C average.

Not more than 70 semester units (105 quarter units) may be allowed for credit taken in a community college. No credit may be allowed for professional courses in education taken in a community college.

No limit is placed upon the number of transferable credits from a four-year college or university, except that no student will be granted a bachelor’s degree in any of the various curricula with less than 30 quarter units in residence at least 30 of which must be among the last 40 units counted toward the degree.

Individuals transferring from colleges or universities will be considered for admission only on a conditional basis at California Polytechnic State University if they have been on probation at the college or university last attended.

Evaluation of in-service military training will be made on the basis of American Council on Education recommendations.

English Proficiency Test

The Board of Trustees has approved a resolution requiring a writing proficiency/diagnostic examination for all entering lower division students, to be initiated no sooner than September 1977. Applicants are advised to obtain further information from the Admissions Office on current methods of meeting this requirement. The results of the writing examination will not affect admission eligibility.

Declaration of Major and Matriculation

The complete process of being admitted to Cal Poly as a candidate for a certificate, degree or credential requires that the applicant complete a matriculation process. This process at Cal Poly requires filing of complete application forms including the Residence Questionnaire, payment of the application fee, submission of college aptitude test results, and transcripts of previous academic training.

All students applying for admission to undergraduate lower division or upper division programs, or to graduate studies, are required to declare a major or graduate degree objective. Postbaccalaureate applicants for admission to graduate programs and candidates for teaching credentials must also meet additional requirements specified in the Graduate Studies An-
Admissions

nouncement or the “Teaching Credential Requirements” bulletin.

Career Placement Information

Information is available concerning the subsequent employment of students who have graduated from Cal Poly programs or courses of study. Data concerning average starting salary and the percentage of previously enrolled students who obtained employment may be obtained from the Coordinator of Relations with Schools.

Undergraduate Application Procedures

Prospective undergraduates, whether applying for part-time or full-time programs of study, in day or evening classes, must file a complete application including all the required forms and fees as described in the application booklet. The $20.00 nonrefundable application fee should be in the form of a check or money order payable to The California State University and Colleges. Undergraduate applicants may file only at their first choice campus. Alternate choice campuses and majors may be indicated on the application, but an applicant should list as alternate campuses only those campuses of The California State University and Colleges that he will attend if his first choice campus cannot accommodate him. Generally, alternate degree majors will be considered at the first choice campus before an application is redirected to an alternate choice campus. Applicants will be considered automatically at the alternate choice campus if the first choice campus cannot accommodate them. Transcripts and other supporting documents should not be submitted until requested by the campus.

Quotas and Systemwide Impacted Programs

Because the campus regularly receives more applications than can be accepted, quotas are established for each major and for each level, i.e., new freshmen, lower division transfers, upper division transfers, and graduates. Where there are more applications received in the initial filing period than can be accommodated in any major quota in any level, supplementary selection criteria may be used. A small number of undergraduate programs are impacted throughout the 19-campus system, and applicants to such programs are expected to meet supplementary admission criteria for admission to these programs. These programs are identified and announced each fall. Applicants will receive from the campuses further information about the supplementary admission criteria to be used and how and when applicants can meet them. Applicants to impacted programs must apply during the initial filing period.

Post-Baccalaureate Application Procedures

All applicants for any type of post-baccalaureate status (e.g., master’s degree applicants, those seeking credentials, and those interested in taking courses for professional growth, etc.) must file a complete application within the appropriate filing period. Second baccalaureate degree aspirants should apply as undergraduate degree applicants. A complete application for post-baccalaureate status includes all of the materials required for undergraduate applicants plus the supplementary graduate admissions application. Post-baccalaureate applicants who completed undergraduate degree requirements and graduated the preceding term are also required to complete and submit an application and the $20.00 non-refundable application fee. Since applicants for post-baccalaureate programs may be limited to the choice of a single campus on each application, redirection to alternative campuses or later changes of campus choice will be minimal. In the event that a post-baccalaureate applicant wishes to be assured of initial consideration by more than one campus, it will be necessary to submit a separate application (including fee) to each. Applications may be obtained from the Graduate Studies Office of any California State University or College campus in addition to the sources noted for undergraduate applicants.

Application Filing Periods

<table>
<thead>
<tr>
<th>Term</th>
<th>Initial Filing Period</th>
<th>Extended Filing Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer</td>
<td>the previous February</td>
<td>March until filled</td>
</tr>
<tr>
<td>Fall</td>
<td>the previous November</td>
<td>December until filled</td>
</tr>
<tr>
<td>Winter</td>
<td>the previous June</td>
<td>July until filled</td>
</tr>
<tr>
<td>Spring</td>
<td>the previous August</td>
<td>September until filled</td>
</tr>
</tbody>
</table>
Admissions

All applications postmarked or received during the initial filing period will be given equal consideration within established categories, quotas, priorities, and selection process. There is no advantage in filing before the initial filing period. Applications received before the initial filing period may be returned, causing a delay in processing. Cal Poly will continue to accept applications during the extended filing period until quotas are filled. Application priority within the extended period is granted in chronological order in which applications are received.

Space Reservations

Applicants who apply during the initial filing period and who can be accommodated will receive a space reservation notice. A space reservation notice is not a notice of admission but is a commitment by the University to admit the student once eligibility has been established. The space reservation directs the applicant to arrange to have appropriate records forwarded promptly to the Admissions Office. Applicants should not request that any records be forwarded until they have received a space reservation notice. Cal Poly has established procedures to consider qualified applicants who would be faced with an extreme hardship if not admitted. The Admissions Office should be contacted regarding hardship admission.

DETERMINATION OF RESIDENCE FOR NONRESIDENT TUITION PURPOSES

New and returning students of The California State University and Colleges are classified for the purpose of determining the residence of each student for nonresident tuition purposes. The Residence Questionnaire and, if necessary, other evidence furnished by the student is used in making these determinations. A student may not register and enroll in classes until his Residence Questionnaire has been received by the Admissions Office. The Residence Questionnaire is a part of the application for admission.

The following statement of the rules regarding residence determination for nonresident tuition purposes is not a complete discussion of the law, but a summary of the principal rules and their exceptions. The law governing residence determination for tuition purposes by the California State University and Colleges is found in Education Code Sections 68000–68090, 90403, 89705–89707.5, and 68121, 68122 and 68124, and in Title 5 of the California Administrative Code, Article 4 (commencing with Section 41901) of Subchapter 5 of Chapter 1, Part V. A copy of the statutes and regulations is available for inspection at the campus Admissions Office.

Legal residence may be established by an adult who is physically present in the state while, at the same time, intending to make California his permanent home. Steps must be taken at least one year prior to residence determination date to evidence the intent to make California the permanent home with concurrent relinquishment of the prior legal residence. Some of the relevant indexes of an intention to establish and maintain California residence are registering to vote and voting in elections in California; satisfying resident California state income tax obligations on total income; ownership of residential property or continuous occupancy or letting of an apartment on a lease basis where one's permanent belongings are kept; maintaining active resident memberships in California professional or social organizations; maintaining California vehicle plates and operator's license; maintaining active savings and checking accounts in California banks; maintaining permanent military address and home of record in California if one is in the military service, etc.

The student who is within the state for educational purposes only does not gain the status of resident regardless of the length of his stay in California.

In general, the unmarried minor (a person under 18 years of age) derives legal residence from his parents, or, in the case of permanent separation of the parents, from the parent with whom the minor maintains his or her place of abode. The residence of a minor cannot be changed by act of the minor or that of the minor's guardian, so long as the minor's parents are living.

A man or a woman may establish his or her residence; marriage is not a governing factor.

The general rule is that a student must have been a California resident for at least one year immediately preceding the residence determination date in order to qualify as a "resident student" for tuition purposes. A residence determination date is set for each academic term and is the date from which residence is determined for that term. The residence determination
Admissions

dates are: Summer—July 1, Fall—Sept. 20, Winter—Jan. 5, Spring—April 1. Questions respecting the applicable date should be referred to the Campus Admissions Office.

There are several exceptions for nonresident tuition. Some of the exceptions provide for:

1. Persons below the age of 19 whose parents were residents of California but who left the state while the student who remained was still a minor. When the minor reaches age 18, the exception continues for one year to enable the student to qualify as a resident student.

2. Persons below the age of 19 who have been present in California for more than a year before the residence determination date, and entirely self-supporting for that period of time.

3. Persons below the age of 19 who have lived with and been under the continuous direct care and control of an adult, not a parent, for the two years immediately preceding the residence determination date. Such adult must have been a California resident for the most recent year.

4. Dependent children and spouses of persons in active military service stationed in California on the residence determination date. This exception applies only for the minimum time required for the student to obtain California residence and maintain that residence for a year. The exception, once attained, is not affected by transfer of the military person directly to a post outside the 50 states and District of Columbia.

5. Military personnel in active service stationed in California on the residence determination date for purposes other than education at state-supported institutions of higher education. This exception applies only for the minimum time required for the student to obtain California residence and maintain that residence for a year.

6. A student who is an adult alien is entitled to residence classification if the student has been lawfully admitted to the United States for permanent residence in accordance with all applicable provisions of the laws of the United States; provided, however, that the student has had residence in California for more than one year after such admission prior to the residence determination date. A student who is a minor alien shall be entitled to residence classification if both the student and the parent from whom residence is derived have been lawfully admitted to the United States for permanent residence in accordance with all applicable laws of the United States, provided that the parent has had residence in California for more than one year after acquiring such permanent residence prior to the residence determination date of the term for which the student proposes to attend the University.


8. Certain credentialed, full-time employees of school districts.

9. Full-time State University and Colleges employees and their children and spouses. This exception applies only for the minimum time required for the student to obtain California residence and maintain that residence for a year.

10. Certain exchange students.

11. Children of deceased public law enforcement or fire suppression employees, who were California residents, and who were killed in the course of law enforcement or fire suppression duties.

12. A person in continuous full-time attendance at an institution who had resident classification on May 1, 1973, shall not lose such classification as a result of adoption of the uniform student residency law on which this statement is based, until the attainment of the degree for which currently enrolled.

Any student, following a final decision on campus on his residence classification, may make written appeal to:

The California State University and Colleges
Office of General Counsel
400 Golden Shore
Long Beach, Calif. 90802

within 120 calendar days of notification of the final decision on campus of his classification. The Office of General Counsel may make a decision on the issue, or it may send the matter back to the institution with instructions for a further review on campus. Students classified incorrectly as residents or incorrectly granted an exception from nonresident tuition are subject to reclassification as nonresidents and payment of nonresident tuition in arrears. If incorrect classification results from false or concealed facts, the student is subject to discipline.
Admissions

pursuant to Section 41301 of Title 5 of the California Administrative Code. Resident students who become nonresidents, and nonresident students qualifying for exceptions whose basis for so qualifying changes, must immediately notify the Admissions Office. Applications for a change in classification with respect to a previous term are not accepted.

The student is cautioned that this summation of rules regarding residency determination is by no means a complete explanation of their meaning. The student should also note that changes may have been made in the rate of nonresident tuition, in the statutes, and in the regulations between the time this catalog is published and the relevant residence determination date.

**REQUIREMENTS FOR ADMISSION AS AN UNDERGRADUATE STUDENT**

Requirements for admission to California Polytechnic State University are in accordance with Title 5, Part 5, Subchapter 3 of the California Administrative Code. A prospective applicant who is unsure of his status under these requirements is encouraged to consult with a school or college counselor or contact the University admissions office. Students who will be registered for less than a full load (12 units) are subject to the same admission requirements as full time students.

It is not always possible for the University to accommodate all qualified applicants. When there is lack of facilities or qualified faculty to accommodate all prospective students applying for admission to a specified curriculum, those applicants not accommodated will be notified of that fact and will be informed of alternatives open to them at that time.

**First-time Freshmen**

First-time freshman eligibility is governed by an eligibility index. The index is computed using the high school grade point average on all course work completed in the last three years of high school, exclusive of physical education and military science; and the ACT composite, or the SAT total score. Test results of either the CEEB Scholarship Aptitude Test (SAT) or the American College Testing Program examination (ACT) are used in establishing eligibility.

Exceptions: College credit earned concurrent with high school enrollment; college credit earned in summer session after high school and prior to regular matriculation in college; college credit granted for the CLEP or ADVANCED PLACEMENT programs, or military or USAFI courses; or college credit granted for some non-traditional learning experience, will not affect the applicant's status as a first-time freshman for application quota purposes as well as admission. Further, the accelerated student, who completes his high school program in mid-year, who has applied to the California State University and Colleges for the following Fall term, but chooses to attend a local community college in the spring term will be considered a first-time freshman for application quota purposes as well as admission. All such college or advanced standing credit, if fully acceptable as transfer credit, will be granted the student after admission.

**California High School Graduates and Residents**

California high school graduates and legal residents for tuition purposes must have an eligibility index placing them in the upper one-third of California high school graduates.

**ELIGIBILITY INDEX**

An eligibility index is used in determining the eligibility of graduates of California high schools (or California legal residents) for freshmen admission to the California State University or Colleges. Grade point averages (G.P.A.) are based on work completed in the last three years of high school, exclusive of physical education and military science. Scores shown are the SAT Total and the ACT score. Conversely, applicants with a given ACT or SAT score must present the corresponding G.P.A. in order to be eligible.

The minimum eligibility index is: $SAT = 3147$ and $ACT = 762$. The index is computed either by multiplying the grade point average by 800 and adding it to the total SAT score, or multiplying the grade point average by 200 and adding it to 10 times the composite ACT score.
Admissions

Grade Point Minimum Minimum
Average ACT Score SAT Score
3.21 and above ................................... Eligible with any score
2.80 ......................................... 19 832
2.40 ......................................... 27 1,152
2.00 ......................................... 35 1,472
1.99 and below ................................... Not eligible

Non-Residents Graduated from High Schools in Other States or Possessions

The admissions requirements for non-resident applicants are more restrictive than those for California residents. An applicant who is a non-resident for tuition purposes and is a graduate of a high school outside California must have an eligibility index which places him among the upper one-sixth of California high school graduates. The minimum acceptable index for non-resident applicants using the SAT score is 3678; using the ACT score, 892.

Graduates of High Schools in a Foreign Country

An applicant who is a graduate of a foreign secondary high school must have preparation equivalent to that required of eligible California high school graduates. The University will carefully review the previous record of all such applicants and only those with promise of academic success equivalent to that of eligible California high school graduates will be admitted. Such applicants are not required to take the SAT or ACT test, but are required to submit TOEFL results.

Non-High-School Graduates

An applicant who is over 18 years of age, but has not graduated from high school will be considered for admission only when his preparation in all other ways is such that the college believes his promise of academic success is equivalent to that of eligible California high school graduates.

Admission to Two-Year Technical Curricula in Agriculture

Admission to two-year technical curricula in agriculture is available to high school graduates whose preparation and educational objectives are appropriate to the programs offered as determined by appropriate college authorities.

Other Applicants

An applicant not admissible under one of the above provisions should enroll in a community college or other appropriate institution. Only under the most unusual circumstances will such applicants be permitted to enroll in the college. Permission is granted only by special action.

Recommended Preparation

Overall excellence of performance in high school subjects and evidence of academic potential provide the basis for admission to California Polytechnic State University. While no course pattern is required, the applicant to be properly prepared to undertake a full program of studies and to pursue the required program in general education is strongly encouraged to include the following subjects as minimally adequate background for college work:

1. College preparatory English.
2. College preparatory mathematics.
3. College preparatory laboratory science.
4. College preparatory history and/or social science.
5. Study in speech, music, art, and other subjects contributing to general academic background.

ADMISSION AS AN UNDERGRADUATE TRANSFER

Transfer admission eligibility is based on transferable college units attempted, rather than on all college units attempted. The California Community College transfers should consult their college counselor for information on transferability of courses. Applicants in good stand-
Admissions

ing at the last college attended may be admitted as undergraduate transfers if they meet either of the following requirements:

1. They were eligible for admission in freshmen standing (see First-Time Freshman requirements) and have earned an average grade of "C" (2.0 on a give-point scale) or better in all transferable college units attempted.

2. They have completed at least 56 transferable semester units or 84 transferable quarter units with an average grade of "C" (2.0 on a five-point scale) or better if a California resident. Non-residents must have a grade point average of 2.40 or better.

Applicants with Particular Majors

Applicants who do not meet either of the above provisions may be admitted to the University if they satisfy the requirements of each of the following subdivisions:

1. The degree objective is such that at least 56 transferable semester units or the equivalent of appropriate course work are not offered at the college from which transfer is sought;

2. They have completed that portion of the curricular program required by the campus for the degree objective, as is offered at the college from which transfer is sought;

3. They have attained a grade point average of 2.0 (grade of C on a five-point scale) or better in all transferable college work attempted;

4. They were in good standing at the last college attended.

Other Applicants

Only under the most unusual circumstances will an applicant not meeting either of the above provisions be considered for admission. Permission is granted by special university action.

ADMISSION FROM SCHOOLS AND COLLEGES IN FOREIGN COUNTRIES

The admission of international (foreign) students is governed by separate requirements. The official transcript of record and other credentials of an applicant for admission from a foreign country must be submitted in official English language translation. All application papers must be submitted to the Admissions Office in accordance with the published filing periods. Inquiries concerning admission should be made early enough to allow sufficient time for the necessary correspondence relative to admission. This will aid the applicant in obtaining the necessary travel documents.

An applicant from a foreign country whose education has not been conducted in the English language may be admitted only after demonstrating a command of the language that will enable the student to profit from instruction in the University. An applicant must take the Test of English as a Foreign Language (TOEFL).

REQUIREMENTS FOR ADMISSION AS A POST-BACCALAUREATE OR GRADUATE STUDENT

All students desiring to do graduate work must file for admission at the Admissions Office. This applies not only to graduates of other colleges and universities, but to Cal Poly graduates, who must also apply for admission as graduate students.

Post-Baccalaureate Standing, Unclassified.

For admission to unclassified post-baccalaureate standing, a student must: a) hold an acceptable baccalaureate degree from an institution accredited by a regional accrediting association or have completed equivalent academic preparation as determined by an appropriate campus authority; b) have attained a grade point of at least 2.5 (on a five-point scale) in the last 60 semester (90 quarter) units attempted; and, c) have been in good standing at the last college attended. Admission to a State University or College with post-baccalaureate unclassified standing does not constitute admission to graduate degree curricula.
Post-Baccalaurate Standing. Classified.

A student who is eligible for admission to a State University or College in Unclassified standing may be admitted to Classified post-baccalaurate standing for the purpose of enrolling in a particular post-baccalaurate credential or certificate program; provided, that such additional professional, personal, scholastic, and other standards, including qualifying examinations, as may be prescribed for the particular program by the appropriate campus authority are satisfied.

Graduate Standing. Conditionally Classified.

A student who is eligible for admission to a State University or College under Unclassified post-baccalaureate standard above, but who has deficiencies in prerequisite preparation which in the opinion of the appropriate campus authority can be met by specified additional preparation, including qualifying examinations, may be admitted to an authorized graduate degree curriculum with Conditionally Classified Graduate Standing.

Graduate Standing. Classified.

A student who is eligible for admission to a State University or College in Unclassified or Conditionally Classified Standing may be admitted to an authorized graduate degree curriculum of the campus as a classified graduate student if the professional, personal, scholastic, or other standards for admission to the graduate degree curriculum, including qualifying examinations, as prescribed by the appropriate campus authority are satisfied. Only those applicants who show promise of success and fitness will be admitted to graduate degree curricula, and only those who continue to demonstrate a satisfactory level of scholastic competence and fitness shall be eligible to proceed in such curricula.

See the Graduate Studies issue of Cal Poly Announcements for further details.

GRADUATE COURSES TAKEN BY UNDERGRADUATES

Undergraduates are not permitted to take courses in the 300, 400, or 500 series for graduate credit until they are within 12 quarter units of graduation. Such students may petition for up to 9 units of graduate credit when the courses are not required for the baccalaureate and must petition for the credit prior to completion of the course work. Students should verify the applicability of such credit toward their graduate objective.

REGISTRATION

All students are required to enroll in courses which meet the requirements of their major course of study insofar as these courses are available.

The schedule for registration and payment of fees is published in the “Class Schedule” which is on sale prior to the start of each quarter. Students should consult this booklet for detailed registration procedures.

Credit for coursework completed is given only when the student is properly registered. A student is not properly registered until fees have been paid and quarterly registration materials have been filed with the Registrar’s Office. Individuals are not permitted to attend courses unless they are officially registered as regular students as approved extension students, or as an enrolled auditor. See “Academic Policies, Audit.”

FEES AND EXPENSES

The Student Services Fee

A Student Services Fee was established in January 1975 by the Trustees of The California State University and Colleges. Previously this fee was known as the Materials and Services fee. The fee provides financing for the following student services programs not covered by state funding:

1. Social and Cultural Development Activities: provides for the coordination of various student activities, student organizations, student government and cultural programs.
2. Counseling: includes the cost of counselor’s salaries and clerical support plus operating
expenses and equipment.
3. Testing: covers the cost of test officers, psychometrists, clerical support, operating expenses and equipment.
4. Placement: provides career information to students and faculty for academic program planning and employment information to graduates and students.
5. Financial Aids Administration: includes the cost of the counseling and business services provided in connection with the financial aid programs.
6. Health Services: provides health services to students and covers the cost of salaries of medical officers and nurses plus related clerical and technical personnel as well as operating expenses and equipment.
7. Housing: includes the cost of personnel providing housing information and monitoring housing services.
8. Student Services Administration: covers 50% of the cost of the Dean of Students Office which has responsibility for the overall administration of student services.

Required State Fees for Regularly-Enrolled Resident Students

<table>
<thead>
<tr>
<th>Description</th>
<th>Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application fee (non-refundable)</td>
<td>$20.00</td>
</tr>
<tr>
<td>Campus services card fee (each student, per card)</td>
<td>1.50</td>
</tr>
<tr>
<td>Facilities fee (non-State funded, per quarter)</td>
<td>2.00</td>
</tr>
<tr>
<td>Student services fee (per quarter):</td>
<td></td>
</tr>
<tr>
<td>0–6.0 units</td>
<td>38.00</td>
</tr>
<tr>
<td>more than 6 units</td>
<td>48.00</td>
</tr>
</tbody>
</table>

Additional State Fees

<table>
<thead>
<tr>
<th>Description</th>
<th>Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transcript of record</td>
<td>1.00</td>
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<tr>
<td>Late registration fee</td>
<td>5.00</td>
</tr>
<tr>
<td>Credit by examination fee (per unit)</td>
<td>1.00</td>
</tr>
<tr>
<td>Failure to meet administratively required appointment or time limit</td>
<td>2.00</td>
</tr>
<tr>
<td>Library fees</td>
<td>See Schedule in library</td>
</tr>
<tr>
<td>Thesis binding fee</td>
<td>7.50</td>
</tr>
<tr>
<td>Check returned for any cause</td>
<td>5.00</td>
</tr>
<tr>
<td>Housing (annual license, double occupancy)</td>
<td></td>
</tr>
<tr>
<td>Academic year</td>
<td>777.00</td>
</tr>
<tr>
<td>Summer quarter</td>
<td>259.00</td>
</tr>
</tbody>
</table>

*Parking fees:

- Quarterly, non-reserved spaces: 10.00
- Quarterly pool (2 or more vehicles), each pool: 12.00
- Daily permits: 0.25
- Each alternate vehicle, additional fee: 2.00

Conference, short course or institute, per person: Estimated cost

Extension course fees (per quarter unit):

- Lecture and discussion: 23.50
- Activity: 28.50
- Laboratory: 44.00

Summer session fee (per quarter unit): 22.00

Non-resident tuition—($2,100 annual maximum):

- For 15 units or more (per quarter): 525.00
- For less than 15 units (per quarter per unit or fraction of unit): 35.00

Auxiliary organization fees (subject to change)

Associated students fee (required):

- Summer: 5.00
- Fall: 10.00
- Winter and spring quarters, each: 5.00

* Proportionate fees apply during summer session. Less than four-wheel, self-propelled vehicles 25 percent of published fee, exclusive of alternate vehicle fee.
Fees/Expenses

University union fee (required):
- Summer, 1977: $8.00
- Academic year 1977-78, each quarter: $11.00
- Summer, 1978: $9.00
- Academic year 1978-79, each quarter: $12.00

Meals (subject to change):
- 19 meals per week, academic year: $900.00
- 14 meals per week, academic year: $789.00

Health fee (for optional services):
- Academic year: $45.00
- Quarterly: $18.00

Sponsored program fee: $10.00

State fees are subject to change upon approval by the Board of Trustees of the California State University and Colleges.

REFUND OF FEES

Fees may be refunded only as authorized by Sections 41802, 41803, and 41913 of Title 5, California Administrative Code. Whether a fee may be refunded and the circumstances under which a fee or any part of a fee may be refunded, vary depending on the particular fee involved. Requirements governing refund may include such matters as the reason for seeking a refund (for example, death, disability, compulsory military service), the number of days of instruction which have elapsed before application for refund is made (for example, requests for refund of student services fees, student body organization fees, and University union fees must be made no later than 14 days following the commencement of instruction and requests for refund of extension course tuition fees must be made prior to the fourth meeting of the class), and the degree to which the campus has provided the services for which the fee has been charged. Details concerning the fees which may be refunded, the circumstances under which fees may be refunded, and the appropriate procedure to be followed in seeking a refund may be obtained from the Records Office or the University Cashier.

Debts Owed to the University

From time to time the student may become indebted to the institution. This could occur, for example, when the student fails to repay money borrowed from the institution. Similarly, debts occur when the student fails to pay institution, dormitory, or library fees, or when the student fails to pay for other services provided by the institution at the request of the student. Should this occur, Sections 42380 and 42381 of Title 5 of the California Administrative Code authorize the institution to withhold “permission to register, to use facilities for which a fee is authorized to be charged, to receive services, materials, food or merchandise or any combination of the above from any person owing a debt” until the debt is paid. For example, under these provisions the institution may withhold permission to register, and may withhold other services, such as grades and transcripts. If a student believes that he or she does not owe all or part of a particular fee or charge, the student should contact the accounts receivable office at the Administration Building. The office will review the pertinent information, including information the student may wish to present, and will advise the student of its conclusions with respect to the debt.
Academic Programs
and Policies
# ACADEMIC PROGRAMS

Curricula with Schools and Departments Options/Concentrations

## School of Agriculture and Natural Resources

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<thead>
<tr>
<th>Department</th>
<th>Options/Concentrations</th>
<th>Degrees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural Education Department</td>
<td>Agriculture, General Agricultural Sciences, International Agriculture, Mechanized Agriculture, Soil Conservation</td>
<td>M.S.</td>
</tr>
<tr>
<td></td>
<td>Agricultural Science, Animal Production, Mechanics, Ornamental Horticulture, Plant Production, Products and Processing, Resources Management, Supplies and Services</td>
<td>B.S.</td>
</tr>
<tr>
<td>Agricultural Engineering Department</td>
<td>Agricultural Engineering, Mechanized Agriculture</td>
<td>B.S.</td>
</tr>
<tr>
<td>Agricultural Management Department</td>
<td>Agricultural Management, Farm Management, Agricultural Business Management</td>
<td>B.S.</td>
</tr>
<tr>
<td>Animal Science Department</td>
<td>Animal Science</td>
<td>B.S.</td>
</tr>
<tr>
<td>Crop Science Department</td>
<td>Crop Science, Fruit Science</td>
<td>B.S.</td>
</tr>
<tr>
<td>Dairy and Poultry Science Department</td>
<td>Dairy Science, Husbandry, Manufacturing</td>
<td>B.S.</td>
</tr>
<tr>
<td>Food Industries Department</td>
<td>Food Industries</td>
<td>B.S.</td>
</tr>
<tr>
<td>Natural Resources Management Department</td>
<td>Natural Resources Management, Environmental Services, Fishery and Wildlife, Forest Resources, Parks and Recreation</td>
<td>B.S.</td>
</tr>
<tr>
<td>Ornamental Horticulture Department</td>
<td>Ornamental Horticulture, Nursery Management, Floriculture and Design, Landscape Industry</td>
<td>B.S.</td>
</tr>
<tr>
<td>Soil Science Department</td>
<td>Soil Science</td>
<td>B.S.</td>
</tr>
</tbody>
</table>

## School of Architecture and Environmental Design

<table>
<thead>
<tr>
<th>Department</th>
<th>Options/Concentrations</th>
<th>Degrees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architecture</td>
<td></td>
<td>B.S., M.Arch.</td>
</tr>
<tr>
<td>Architectural Engineering</td>
<td></td>
<td>B.S.</td>
</tr>
<tr>
<td>City and Regional Planning</td>
<td></td>
<td>B.S., M.C.R.P.</td>
</tr>
<tr>
<td>Construction</td>
<td></td>
<td>B.S.</td>
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<tr>
<td>Landscape Architecture</td>
<td></td>
<td>B.S.</td>
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</tbody>
</table>
### Schools and Departments

<table>
<thead>
<tr>
<th>School of Business</th>
<th>Curricula with Options/Concentrations</th>
<th>Degrees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accounting Department</td>
<td>Business Administration</td>
<td>M.B.A.</td>
</tr>
<tr>
<td></td>
<td>Business Administration</td>
<td>B.S.</td>
</tr>
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### School of Communicative Arts and Humanities

| Art Department                     | Applied Art and Design                                                                             | B.S.        |
|                                   | Crafts Design, Graphic Design                                                                       |             |
| English Department                 | English                                                                                             | B.A., M.A.  |
| Foreign Languages Department       |                                                                                                    |             |
| Graphic Communications Department  | Graphic Communications                                                                               | B.S.        |
|                                   | Computer Graphic Communications                                                                    |             |
|                                   | Design Reproduction                                                                                 |             |
|                                   | Packaging                                                                                            |             |
|                                   | Printing Management                                                                                 |             |
| History Department                 | History                                                                                             | B.A.        |
| Journalism Department              | Journalism                                                                                          | B.S.        |
|                                   | Agricultural, Broadcast Journalism, News-Editorial                                                  |             |
|                                   | Public Relations-Advertising, Photojournalism                                                        |             |
| Music Department                   |                                                                                                    |             |
| Philosophy Department              |                                                                                                    |             |
| Speech Communication               | Speech Communication                                                                                | B.A.        |

### School of Engineering and Technology

| Aeronautical Engineering Department | Engineering                                                                 | M.Engr.     |
|                                   | Engineering Science                                                                | B.S.        |
| Civil Engineering Department       | Civil Engineering                                                                  | B.S.        |
|                                   | Public Works, Transportation                                                         |             |
| Electronic and Electrical Engineering Department | Electrical Engineering                                                | B.S.        |
|                                   | Electronic Engineering                                                              | B.S.        |

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<th>Schools and Departments</th>
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ENROLLMENT OF MEN AND WOMEN STUDENTS, BY SCHOOL AND
MAJOR, FALL 1976

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ACADEMIC REQUIREMENTS

Curricula leading to graduation with the degree of bachelor of science or bachelor of arts are offered in agriculture, architecture, engineering, business, and in the applied arts and applied sciences. Occupational majors in these fields are described under the appropriate school or division heading in this catalog. In addition Cal Poly offers the following degrees: master of science, master of arts, master of architecture, master of business administration, master of city and regional planning, master of engineering. It also offers the bachelor of vocational education degree and a technical certificate in selected agricultural fields. Programs leading to teaching credentials authorizing service in the public schools are described under the heading “Teacher Preparation Programs”.

APPLICATION FOR GRADUATION

Students shall file application for graduation in the Records Office prior to the last date for filing such applications, as shown in the academic calendar. Application forms and evaluations for graduation are available in the Evaluations Office. The effective date of graduation will be the end of the quarter when all requirements have been met.

DOUBLE MAJORS

The student will normally meet graduation requirements for a degree in one of the major curricula.

It is permissible for a student to be granted a bachelor's degree with two majors if the complete requirements of both major curricula have been met at the time the application for graduation is filed.

No more than one diploma or degree will be granted to the same student at one commencement. As a BA and a BS, the student will be required to declare one major as the degree major in order to determine which degree will be awarded.

A student who desires to submit only one senior project covering two graduation majors must file a petition for special consideration prior to the date of commencing the senior project.

SECOND BACHELOR’S DEGREE

A qualified student who holds a bachelor's degree from Cal Poly or from another accredited institution may be awarded a second bachelor’s degree in a different major when all requirements have been met and providing a minimum of 36 units of course work have been completed in residence after the requirements for the first degree have been fulfilled. A joint senior project is precluded.

BACHELOR’S DEGREES

GENERAL REQUIREMENTS FOR GRADUATION

All candidates for a bachelor's degree shall have completed the requirements in one of the listed curricula with a minimum “C” grade average for all units in the major, and shall have earned a total number of grade points at least equal to twice the number of units attempted. For this purpose courses comprising the major are identified on curriculum evaluation sheets available from the Evaluations Office. Transfer students, in their work taken at this University, must earn a number of grade points at least equal to twice the number of units attempted. All candidates for these degrees shall have earned not less than 50 quarter units in residence, and shall have earned at least 30 of these units among the last 40 units counted toward the degree. (Extension credit or credit from another university by examination may not be used to fulfill the residence requirement.)

Candidates for the bachelor of science degree (except in engineering) must present from 186 to 198 units for graduation according to the approved curriculum for each major. Candidates in engineering must present at least 200 units (210 units in Architectural Engineering). Candidates for the bachelor of arts degree must present 186 units for graduation according to the approved curriculum for each major. Exemption from required courses by waiver, substitu-
tion, or examination does not reduce the total required units for each degree.

The Board of Trustees has approved a resolution requiring a demonstration of writing skills competency as a requirement for graduation. Students will be advised when further information is available on methods for meeting this requirement.

GENERAL EDUCATION BREADTH REQUIREMENT

All candidates for the bachelor's degree must complete a minimum of 60 quarter units of general education as specified below. The curriculum for each major published in this catalog is designed to satisfy the general education breadth requirement. The requirement is met in different ways depending on the particular major. The student planning to transfer from another college should therefore consult the published curriculum for the major and plan course work accordingly.

No course shall be used for this purpose if it has a prerequisite unless such prerequisite is also counted as general education. Only degree credit courses in the 100, 200, and 300 series may be counted as general education. No more than six units in the major academic discipline of the student may be counted as fulfilling the general education requirement.

Natural Sciences

At least 15 units chosen from courses in the natural sciences, with at least one course in life science (Bact, Bio, Bot, Cons, Ent, Zoo), and at least one course in physical science (Astr, Chem, Geol, PSc, Phys). Up to six units of "broadly-based" course work in the Schools of Agricultural and Natural Resources, Architecture and Environmental Design, or Engineering and Technology may be counted in this category, provided that these units are taken outside the School in which the student is enrolled. No more than three courses having the same prefix may be counted to satisfy the natural science requirement. Maximum 24 units.

Social Sciences

At least 9 units chosen from courses in Ant, Econ, Geog, PolS, Psy, Soc Sc, Soc. All students must take PolS 201.1 No more than two courses having the same prefix may be counted in this category. Maximum 16 units.

Humanities

At least 15 units chosen from courses in Art, Dr, Hist, Hum, literature (in English or in a foreign language), Mu, Phil. All students must include two courses in literature or two courses in philosophy or one of each. All students must take Hist 204 and 205,1 or equivalent. No more than 4 units each in Art, Dr, Mu, nor 6 units in Hist, may be counted in this category. Maximum 21 units.

Basic Subjects

Mathematical Sciences (CSc, Math, Stat) (at least a 3-unit course), written communication (Engl) (one course), oral (Sp) or written communication (at least one course). Minimum 12 units, maximum 16 units.

Other Subjects

Physical Education Activity or Health Education (3 to 5 units, at the option of individual Schools).2 Any 6 to 4 units (depending upon P.E. requirements of individual Schools), provided that these additional units are taken outside the department in which the student is enrolled. Minimum 3 units, maximum 9 units.

1 These courses are required to satisfy Section 40404 of the Administrative Code, but the units may also be counted as general education (Section 40405). Transfer students, certified as having completed the general education requirement, will have to complete this requirement separately if they have not already done so. (Social sciences and history majors will take an equivalent sequence.)

2 Exemption from the course in Health Education may be granted by the Director of Admissions, Evaluations, and Records upon receipt of a statement of contrary religious belief. Exemption from required Physical Education Activity may be authorized by the Director of Admissions, Evaluations, and Records based on recommendation of medical authority, or attainment of age 18 at the time of initial enrollment. Any veteran may claim appropriate military service as a substitute for the physical education requirements.
MASTER’S DEGREES

Cal Poly offers graduate programs leading to the master’s degree in several areas. Curricula for the master’s degrees are briefly outlined in the appropriate departmental sections of this catalog. For complete requirements for graduate study and for the master’s degrees consult the Graduate Studies Announcement.

TEACHER PREPARATION PROGRAMS

California Polytechnic State University is authorized by the California Commission for Teacher Preparation and Licensing to prepare candidates and recommend for the following credentials:

- Multiple Subject Instruction (as commonly practiced in California elementary schools)
- Single Subject Instruction (as commonly practiced in California high schools and most junior high schools)
- Administrative Services
- Pupil Personnel Services
- Reading Specialist
- Special Education (Learning handicapped) Specialist

Further information, requirements, and procedures for entering a particular credential program may be obtained from Education Department Credentials Office and the appropriate credential program coordinator. A bulletin, Teaching Credential Requirements for Single Subject and Multiple Subject Instruction, is available upon request from the Education Department.

Approved University degree majors which have received examination waiver status for a teaching credential are for Multiple Subject Instruction: Liberal Studies; and for Single Subject Instruction: Agriculture (12 majors), Agriculture Science, Biological Sciences, English, History, Home Economics, Industrial Arts, Mathematics, Physical Education (Men), Physical Education (Women), Physical Sciences, Political Science, Social Sciences.

TWO-YEAR TECHNICAL CURRICULA IN AGRICULTURE

All candidates for a technical certificate shall have completed 98 quarter units of courses approved by the department granting the certificate, shall have been in residence at least two quarters immediately preceding graduation, shall have earned not less than 32 quarter units in residence, and shall have earned a total number of grade points at least equal to twice the number of units attempted.

SPECIAL INSTRUCTIONAL SERVICES

INSERVICE TRAINING IN AGRICULTURE

Cal Poly plays an active role in the inservice training of teachers of vocational agriculture by providing instructional staff and facilities for workshops and training programs co-operatively sponsored by the University and the State Bureau of Agricultural Education.

The campus provides an annual one-week summer skills program. The content varies, depending upon the needs and desires of the teachers as these are expressed through the Bureau of Agricultural Education. University faculty members provide up-to-date training in the technical phases of agriculture and also contribute to the professional improvement of teachers by offering instruction in teaching methods.

The annual summer conference of the California Agricultural Teachers Association is held at the campus with an attendance of 400-500 persons. Facilities, special speakers, exhibits, and other services are provided.

SERVICES TO VOCATIONAL AGRICULTURE

Services to vocational agriculture departments in the secondary schools of California are provided by the campus staff through such activities as: visiting vocational agriculture depart-
Instructional Services

ments to discuss with teachers and students dairy, animal husbandry, deciduous and citrus fruits, field and truck crops, poultry, farm mechanics, farm management, and other problems; writing for agricultural magazines; assisting high school vocational agriculture departments to solve educational and agricultural problems through correspondence; judging of livestock, poultry, crops and other products at fairs; furnishing of breeding stock and hatching eggs to improve herds and flocks owned by Future Farmers throughout the State; and preparing a variety of teaching aids. These services are provided through a cooperative arrangement with the Bureau of Agricultural Education.

Other services to vocational agriculture are rendered by the Instructional Materials Program sponsored by the University to create a variety of visual aids for educational use.

SUMMER SESSIONS

The summer sessions are designed to meet the needs of regularly enrolled and visiting students and of teachers and others who wish to improve their professional competence. Cal Poly offers summer sessions on campus ranging from one week to six weeks long. The course offerings are broad, leading to various degrees and credentials, as well as providing for continuing professional development in many fields.

Admission to the summer sessions does not require completion of the matriculation process. Registration in the summer session does not insure the privilege of enrollment in one of the regular quarters. Post-baccalaureate students should consult the Graduate Studies Announcement regarding requirements for classification and applicability of credit toward their degree objectives. Credit earned as a non-matriculated summer session student may not necessarily be applicable to graduate degree objectives.

The summer sessions are supported by fees collected from the students who enroll in the courses. There is no application fee for summer sessions. Requests for application forms, information on course offerings and regulations should be addressed to the Associate Dean, Continuing Education.

EXTENSION PROGRAM

A variety of extension courses is offered to assist in meeting the educational needs of the residents of (San Luis Obispo, Santa Barbara, and southern Monterey Counties). Courses are arranged in an area when student demand is adequate to finance the instruction. Extension program offerings may be full quarter classes or special interest seminars or workshops of shorter duration.
Prospective extension students need not apply for admission to the University. Enrollment in an extension course does not imply admission as a matriculated student for any quarter. A listing of Extension programs and courses is published quarterly and is available from the Associate Dean, Continuing Education. Extension students may also enroll in regular course offerings. Extension students who desire to enroll in the University's on-campus courses should obtain a “Petition to Take Regular Course by Concurrent Enrollment Through Extension Program” from the Continuing Education office.

The maximum extension credit which may be accepted towards the bachelor's degree is 36 quarter units. No more than 9 quarter units of extension work may be counted towards the master's degree.

**CONFERENCES, SEMINARS, SHORT COURSES, WORKSHOPS**

The University provides facilities, faculty and staff for programs of special design appropriate to its education objectives. These professional short courses, workshops and conferences have included such titles as: Agricultural Leadership Training Program; Alternate Energy Systems Workshop; American Institute of Floral Design Symposium; California Agricultural Teachers’ Association Skills Week and Annual Conference; California Association of Refrigeration Engineers Society Conference; California Measurement Science Conference; California Nurserymen’s Refresher Course; Future Farmers of America State Convention; Newspaper Circulation Workshop; Physical Education Workshop; Plant Engineering Workshop; Pressure Vessel Inspectors’ Short Course; and the Puppeteers of America National Festival.

**EDUCATIONAL OPPORTUNITY PROGRAM**

The campus participates in the Educational Opportunity Program which is supported by the State government for residents of California. Designed to help minority and low income groups obtain a college education, it provides financial assistance, tutoring, curriculum advisement, counseling, and vocational guidance services. Cal Poly's curricula are especially attractive to students interested in its programs with emphasis on technological careers. California State University and College entrance requirements may be waived for a limited number of high school graduates and college transfers. Agencies authorized to nominate students for the program include high schools, community colleges, the Veterans Administration, and certain State agencies. For more information contact the Educational Opportunity Program Office.
STUDY ABROAD

Cal Poly students are active in a study abroad program offered by The California State University and Colleges International Programs, under which students enroll for a full academic year simultaneously at their home campus, where they earn academic credit and maintain campus residency, and at a distinguished foreign university or a special program center.

Cooperating universities abroad include the University of Provence, France; the Universities of Heidelberg and Tubingen, Germany; the University of Tel Aviv and Hebrew University of Jerusalem in Israel; the University of Florence, Italy; the Universidad Ibero-Americana, Mexico; the Universities of Granada and Madrid, Spain; the University of Uppsala, Sweden; Lincoln University College of Agriculture and Massey University, New Zealand; and Waseda University of Japan. In the United Kingdom, cooperating universities (which may vary from year to year) include, among others, Aberdeen, Dundee, Edinburgh, Bangor, Heriot-Watt, Leicester, London, Manchester, Nottingham, Oxford, Liverpool, Lampeter, Sheffield, and Strathclyde. In addition, CSUC students may attend a special program in Taiwan, Republic of China, or an architecture program in Copenhagen, Denmark.

Eligibility for application is limited to those students who will have, during their year of participation, upper division or graduate standing at the CSUC campus; who have demonstrated the ability to adapt to a new cultural environment; and, who, in the cases of France, Germany, Mexico, and Spain, will have completed at least two years of college-level study in the language of instruction at the host university, or possess equivalent knowledge of the language. At the time of application, students must have a minimum cumulative grade point average (g.p.a.) for all college-level work of 2.5, except for the programs in Israel, New Zealand, and the United Kingdom where a minimum g.p.a. of 3.0 is required. Selection is competitive and is based on home campus recommendations and the applicant's academic record. Final selection decisions are made by a statewide committee of faculty members, except for the programs in New Zealand and the United Kingdom where final selections are made by the respective host universities.

Residence credit taken at the cooperating university abroad which is not directly equivalent to Cal Poly course listings will be reported in terms of the following:

IP 299, 499 Study Abroad (1-4)

Course subtitle as designated by the Resident Director, International Programs. Open only to students in the California State University and Colleges International Programs. May be repeated for credit when different subjects are covered.

The International Programs supports all tuition and other academic and administrative costs overseas for each of its participants to the same extent that such funds would be expended to support similar costs in California. Students assume costs for pre-departure orientation, insurance, transportation, housing, and meals. Home campus registration and other fees and personal incidental expenses or vacation travel costs while abroad are also paid by the student. Non-resident students are subject to non-resident fees. The Office of International Programs collects and administers funds for those items which the program must arrange or can negotiate more effectively, such as home campus fees, orientation costs, insurance, outbound transportation, and, in some centers, housing. International Programs participants may apply for any financial aid available at their home campuses, except for campus work-study.


Detailed information and application materials may be obtained from the Cal Poly International Programs Office, Adm. #317. Further information may also be obtained by writing to The California State University and Colleges International Programs, 400 Golden Shore, Long Beach, California 90802.

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ACADEMIC POLICIES

Academic Obligations
All students are expected to be diligent in the pursuit of their courses of study in order that both they and the State will receive maximum benefit from the educational opportunities provided.

Students are expected to satisfy the academic demands required by their instructors in such ways as they may set forth, in order to satisfy the instructor that they are performing their assignments in a proper manner.

Instructors are expected to give first priority to meeting their scheduled classes and other assigned responsibilities, including keeping regular office hours for student conferences.

An instructor, with the President's approval, may at any time exclude from a course any student guilty of unbecoming or disorderly conduct toward the instructor or the class. The instructor may refer the case of misconduct to the Dean of Students for disciplinary action.

Class Attendance
Students are expected to be regular in attendance to keep the quality and quantity of work high. Absence from classes is regarded as serious, and work missed is not excused.

An excused absence can be allowed only by the instructor in charge of the class upon consideration of the evidence justifying the absence presented by the student. An excused absence merely gives the individual who missed the class an opportunity to make up the work and is not an excuse from the work required.

Maximum Loads
The maximum load for regular students is 20 quarter units of work including audited courses and concurrent work at other colleges; the only exceptions are made with the advance approval of the student's major department head and completion of a petition to carry excess load which is available at the Records Office. Maximum load requirements may be waived only on presentation of evidence of ability to carry successfully such a group of courses. Maximum load for graduate students is 16 units per quarter.

SCHOLARSHIP REQUIREMENTS
Uniform standards for academic probation or disqualification, and for administrative-academic probation or disqualification, are in effect at all campuses of the California State University and Colleges. Undergraduate students may be placed on academic probation and later be disqualified, or be placed on administrative-academic probation and later be disqualified, when they do not meet these standards.

Students who have been placed on academic probation, administrative-academic probation, or who have been notified of their disqualification may request review of such action by the dean of the school taking the action. Students who have been disqualified for inadequate progress or performance will not be readmitted until presentation of satisfactory evidence that they have improved their chances of academic success. The request for readmission will be referred to the dean of the school in which the student wishes to enroll.

Students on academic probation may not participate on intercollegiate teams nor may they hold positions of leadership in student organizations or student government groups. This includes, but is not limited to, such groups as: athletic teams, debate teams, drama casts, judging teams, ASI councils, boards and committees. Such students may not hold an office in a student organization, nor may they be editors, managers, or hold similar positions on student publications. However, students on academic probation may participate in such activities as club membership, intramurals, and music which do not include travel and the official representation of the University.

Certain groups may have set higher standards than the minimum for specific positions or areas of responsibility that require considerable commitments of time and energy.
Academic Probation or Disqualification

Both academic progress toward degree objective and quality of academic performance are considered in the determination of a student's eligibility to remain enrolled. An undergraduate student becomes subject to academic probation or disqualification under the conditions shown below. For minimum scholarship standards applicable to graduate and post-baccalaureate students see the GRADUATE STUDIES ANNOUNCEMENT.

I. Academic Probation: An undergraduate student is subject to academic probation if at any time his or her cumulative grade point average in all college work attempted or the student's Cal Poly cumulative grade point average falls below 2.0 or if during any term while enrolled he or she fails to earn at least two times as many progress points as all units attempted. The student will be advised of probation status promptly. An undergraduate student will be removed from academic probation when the student's cumulative grade point average in all college work attempted and the student's Cal Poly cumulative grade point average is 2.0 or higher and when he or she earns at least twice as many progress points as all units attempted in a term.

II. Academic Disqualification: An undergraduate student on academic probation may be disqualified when his or her cumulative grade point average for all college work attempted or his or her Cal Poly cumulative grade point average is 7 or more grade points below 2.0 (C), or, regardless of class level or cumulative grade point average, when in any term he or she fails to earn at least twice as many progress points as units attempted. Such a student on academic probation shall be subject to disqualification:

A. As a freshman or sophomore student (less than 90 quarter units of college credit completed) whose average falls 22⅔% or more grade points below a 2.0 (C) average on all units attempted or in all units attempted at Cal Poly.

B. As a junior student (90 to 134 quarter units of college credit completed) whose average falls 13⅔% or more grade points below a 2.0 (C) average on all units attempted or in all units attempted at Cal Poly.

C. As a senior student (135 or more quarter units of college credit completed) whose average falls 9 or more grade points below a 2.0 (C) average on all units attempted or in all units attempted at Cal Poly.

A student who is placed on probation or who is subject to disqualification at the end of an enrollment period will be notified by the dean of the school in which the student is enrolled as soon as possible following the end of the quarter in which the student's performance fails to meet the prescribed conditions. In cases where a student ordinarily would be disqualified at the end of a term save for the impossibility of making timely notification, the student may be advised that the disqualification is to be effective at the end of the next term.

Administrative-Academic Probation or Disqualification

An undergraduate or graduate student may be placed on administrative-academic probation by action of the dean of the school in which the student is enrolled for any of the following reasons:

A. Withdrawal from all or a substantial portion of a program of studies in two successive terms or in any three terms.

B. Repeated failure to progress toward the stated degree or program objective when such failure appears to be due to circumstances within the control of the student.

C. Failure to comply, after due notice, with an academic requirement or regulation which is routine for all students or a defined group of students.

When such action is taken, written notice will be provided including a statement of the conditions for removal from probation and the circumstances which would lead to disqualification, should probation not be removed. If disqualified, the student will receive written notification from the dean of the school in which the student is enrolled including an explanation of the basis for the action.
Grading System

Eligibility for Intercollegiate Athletics

Eligibility for competition in intercollegiate athletics is regulated in general by the rules of the National Collegiate Athletic Association (NCAA), the Association of Intercollegiate Athletics for Women (AIAW), and specifically by current Conference and University regulations. The Director of Athletics is responsible for maintaining up-to-date intercollegiate athletics eligibility rules applicable to the University. The Faculty Athletic Representative has the responsibility for the interpretation of the NCAA, AIAW, Conference, and University rules for determining student eligibility to represent the University in intercollegiate athletic events.

GRADING SYSTEM

The following marking and grading system is in effect:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Points Earned Per Unit</th>
<th>Progress Points Earned per Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Superior Attainment of Course Objectives</td>
<td>4</td>
</tr>
<tr>
<td>B</td>
<td>Good Attainment of Course Objectives</td>
<td>3</td>
</tr>
<tr>
<td>C</td>
<td>Acceptable Attainment of Course Objectives</td>
<td>2</td>
</tr>
<tr>
<td>D</td>
<td>Poor Attainment of Course Objectives</td>
<td>1</td>
</tr>
<tr>
<td>F</td>
<td>Non-Attainment of Course Objectives</td>
<td>0</td>
</tr>
<tr>
<td>CR</td>
<td>Credit</td>
<td>-</td>
</tr>
<tr>
<td>NC</td>
<td>No Credit</td>
<td>-</td>
</tr>
<tr>
<td>AU</td>
<td>Audit</td>
<td>-</td>
</tr>
<tr>
<td>I</td>
<td>Incomplete (authorized)</td>
<td>-</td>
</tr>
<tr>
<td>U</td>
<td>Incomplete (unauthorized)</td>
<td>0</td>
</tr>
<tr>
<td>SP</td>
<td>Satisfactory Progress</td>
<td>-</td>
</tr>
<tr>
<td>W</td>
<td>Withdrew</td>
<td>-</td>
</tr>
</tbody>
</table>

Final grades signifying student accomplishment are assigned for each course by the instructor. These grades are A, B, C, D, F, U, CR, and NC. A grade point average for each student is computed by dividing the total grade points earned by the total units in which the student received a grade of A, B, C, D, U, or F. Courses for which CR, NC, AU, I, SP, or W were assigned are not included in the grade point computation.

Students are required to earn twice as many progress points as total units attempted each term in order to avoid being subject to probation. For this purpose courses with grades of CR and NC are included in addition to those with A, B, C, D, U, and F.

Audit

Enrollment as an auditor is subject to the permission of the instructor; provided that enrollment in any course as an auditor shall be permitted only after students otherwise eligible to enroll in the course on a credit basis have had an opportunity to do so. Auditors are subject to the same fee structure as credit students and regular class attendance is expected. Once enrolled as an auditor, a student may not change to credit status unless such a change is requested prior to the last day to add classes. A student enrolled in a course for credit may not change to audit after the third week of instruction. See "Credit Policy."

Procedures for auditing courses are published in the quarterly Class Schedule.

Incomplete (authorized)

An incomplete signifies that a portion of required course work has not been completed and evaluated in the prescribed time period due to unforeseen, but fully justified, reasons and that there is still a possibility of earning credit. It is the responsibility of the student to bring pertinent information to the instructor who will determine the means by which the remaining course requirements will be satisfied. A final grade is assigned when the work agreed upon has been completed and evaluated. The student is not permitted to re-enroll in the course as a means to complete course requirements.
Grading System

An "I" must be made up within one calendar year immediately following the end of the term on which it was assigned. This limitation prevails whether or not the student maintains continuous enrollment. Failure to complete the assigned work will result in an "I" being counted as equivalent to an 'F' (or an 'NC') for grade point average and progress point computation.

Incomplete (Unauthorized)

The symbol "U" indicates that an enrolled student did not withdraw from the course but failed to complete course requirements. It is used when, in the opinion of the instructor, completed assignments or course activities or both were insufficient to make normal evaluation of academic performance possible. For purposes of grade point average and progress point computation this symbol is equivalent to an "F".

Satisfactory Progress

The "SP" symbol is used in connection with courses that extend beyond one academic term. It indicates that work is in progress and has been evaluated and found to be satisfactory to date, but that assignment of a grade must await completion of additional work. Re-enrollment is permitted prior to the assignment of the final grade provided that the total permissible number of units for the course or courses is not exceeded. Work is to be completed within a stipulated time period. This may not exceed one year except for graduate degree theses for which the time may be up to two years, but may not exceed the overall time limit for completion of all Master's degree requirements. Any extension of time limit must receive prior authorization by the dean of the school in which the student is a degree candidate.

Credit-No Credit Grading

Some courses, as indicated in their descriptions, are offered only on a Credit-No Credit grading basis. Exclusive of these courses, all students may elect additional courses for Credit-No Credit grading subject to the following:

a. Up to 2 courses (not to exceed 8 units) may be taken per student per quarter on a Credit-No Credit grading basis; a maximum total of 15 courses (not to exceed 45 units) may be elected per student for Credit-No Credit grading.

b. The course may not be repeated for Credit-No Credit if the student has previously received a grade of "U" or "F" in that course. The course may be repeated for Credit-No Credit if the student has previously received a grade of "D" or "NC" in that course.

c. Students desiring to elect a course on a Credit-No Credit grading basis must be currently enrolled in the course and must complete the appropriate form available from the Records Office. Such declaration for Credit-No Credit grading must be filed not later than the end of the third week of instruction of the quarter. Students may not change from one grading system to the other after the end of the third week of instruction of the quarter.

d. Students will be given a grade of "Credit" for accomplishment equivalent to a grade of "C" or better. "No Credit" will be given for accomplishment equivalent to "D" or "F" grades. Instructors will submit conventional letter grades to the Registrar's Office where they will be converted to Credit-No Credit Grades.

e. Courses in the student's major (designated with the "M" on student's major curriculum sheet) may not be taken for Credit-No Credit grading.

f. The applicant for a Credit-No Credit grade must have at least a 2.0 grade point average in cumulative Cal Poly work.

g. Units earned in courses for which the grade was "Credit" will count toward satisfaction of degree requirements for undergraduate students only. No courses taken on a Credit-No Credit grading basis may be used to satisfy graduate program degree requirements.

h. Grades of "Credit" or "No Credit" are not included in determining the student's grade point average.

i. Nonmatriculated students in the Extension Program, Summer Session and Workshops must meet the same requirements as matriculated students to elect courses on a Credit-No Credit grading basis. (The 2.0 GPA requirement is waived in the case of nonmatriculated students having no previous course work recorded at Cal Poly.)
Grading System

Repeating a Course

Students may enroll in a course for credit more than once only if the catalog course description states that the course may be repeated for credit or under one of the following policies:

1. A course taken at this or at another university or college in which a grade of "D" or "F" or "NC" was received may be repeated here with the new grade recorded along with the prior grade. The grade earned by repeating the course will be awarded the appropriate progress points, grade points and units attempted and completed.

2. Up to 20 units of "D" or "F" may be repeated and the original grade points and units will not be counted in the calculation of the grade point average. However, under the terms of this rule, a notice of intent to repeat a course must be filed in the records office prior to the end of the seventh week of instruction during the quarter in which the course is repeated.

3. Except where noted in the specific course description that the course may be repeated for credit, a student may not enroll in (except as an auditor) or receive credit by examination for any course in which a grade of "C" or higher, including "CR" has been received. A course may not be challenged by examination during the same quarter that the student is enrolled in the course.

Invalidation of Previous Records

Under certain circumstances a student may petition the University to remove from consideration associated with requirements for the baccalaureate degree up to two semesters or three quarters of undergraduate work taken at least five years previously at any college. Further information and petition forms are available from the Director of Admissions and Records.

Withdrawals from Courses

The "W" symbol indicates that the student was permitted to drop the course after the 15th day of instruction with the approval of the instructor and appropriate campus officials. It carries no adverse connotation of quality of student performance and is not used in calculating grade point average or progress points.

A student may withdraw from a course without academic penalty during the initial 15 instructional days of the quarter provided the instructor is formally notified. Between the 15th instructional day and the end of the 7th week of instruction a student must request permission to withdraw from a course by processing a petition which is available at the Records Office. The petition will be approved and withdrawal authorized only if there are serious and compelling reasons for withdrawal in the judgment of the instructor and department head.

After the end of the 7th week of instruction withdrawals are permitted only if the withdrawal is based on an emergency situation clearly beyond the control of the student. In some such cases a final or incomplete grade may be assigned for courses in which sufficient work has been completed to permit an evaluation to be made. The student must request permission to withdraw as specified above, or request grade assignment, both of which are subject to approval by designated campus officials. Any student who fails to provide notification or who fails to obtain formal approval to withdraw will be subject to failing grades. (U or F).

Withdrawal from the University

A student is permitted to withdraw from the University upon request and without restriction or penalty until the end of the 7th week of the quarter. After the 7th week, withdrawals from the university must be approved by campus officials. Disapproved, unauthorized, or unofficial withdrawal from the University will subject the student to failing grades in each course. (U or F).

The student or duly authorized representative of the student is required to submit the request and reason for withdrawal in writing to the Registrar. The date of withdrawal will be established as the circumstances indicate or as determined by the Registrar.

The student may be eligible for a full or partial refund of registration fees depending upon the time and circumstances of withdrawal from the University. A written application for refund is required. Specific limiting dates and application procedures are published in the quarterly class schedules.
PROGRAM CHANGES

An official program card is prepared for each student who completes the formal registration process. All program cards are distributed by the student's major department and all changes to the official program become the responsibility of the student. Time periods have been established following registration during which students may attempt to add new courses or withdraw from existing courses. These periods are defined as the last day to add courses or 6th academic day, and the last day to withdraw from classes without petition, 15th academic day, or third week census date. Specific dates for completing these transactions are published in the annual academic calendar and in each quarterly class schedule. The student must ensure that each instructor is properly notified before the expiration of the time limits and that the instructor formally acknowledges the change to the student's official program. A revised official program card will be prepared for each student which will list the courses in which a final grade will be awarded.

The student has approximately one week in which to add a course, complete the late-registration process, increase units in a course, and to change from audit to credit. Each change requires that the student initiate contact with the instructor and present a valid Campus Services Card which verifies enrollment for the quarter in progress. Exceptions are made for late registrants and for selected extension students who are required to have all enrollment transactions completed at the end of the first week and all fees paid by the third week census date.

The student has until the third week to withdraw from a course without penalty or entry on the academic record, and to change from credit to audit status in a course. In either instance, it is the student's responsibility to notify the instructor. At the first class meeting only, the instructor may delete a student's name from the official class list if the student is not present or has not been excused. The student must not assume that voluntary absence from class means automatic withdrawal. At the third week census date, the instructor must assume that any student who has not provided notification of withdrawal will remain officially enrolled in the course. For program changes after the third week see under WITHDRAWALS.

A special provision, applicable only to students in their first quarter at the University, permits the substitution, without prejudice, of a prerequisite course in a sequence of courses for a later course in the sequence through the end of the fourth week. Only the substituted course appears on the transcript and the grade is based on performance after the change.

CHANGES IN CURRICULUM

Students who find that they are preparing for a profession which does not provide the type of education for which they have the greatest aptitude should contact their adviser and the University Counseling Center for advice and assistance in making curriculum changes. Students will be permitted to apply for a change of major curriculum after six weeks in residence during which they follow the prescribed curriculum for their current major as far as possible. Admission to a new curriculum will depend on the availability of space within the limitations imposed by budget, faculty, and facilities.

Transfer from one curriculum to another does not in any way change a student's scholastic standing.

Transfer from a technical to a degree curriculum may be permitted subject to scholarship requirements and completion of the specified number of units in residence.

Upon transfer from a degree to a technical curriculum, at the campus, a student's record is evaluated in terms of the technical curriculum. Courses completed prior to transfer which are applicable to the required courses in the technical curriculum will be transferred intact. The remaining courses completed prior to transfer must apply as electives up to, but not in excess of, the number of elective units specified in the technical curriculum. In the case of an excess of elective units, the student may choose which units shall apply. For purposes of computing the grade point average for graduation, only those courses transferred as outlined above and those taken subsequent to transfer will be used.
Revision of Curricular Requirements

A student remaining on continuous attendance in regular sessions and continuing in the same curriculum in any state university or college, in any of the California community colleges or in any combination of California community colleges and state university and colleges, may, for purposes of meeting graduation requirements, elect to meet the graduation requirements in effect either at the time of entering the curriculum or at the time of graduation therefrom, except that substitutions for discontinued courses may be authorized or required by the student’s school dean.

Curriculum Deviation

Although a curriculum is specified for each major, under certain conditions a student may be permitted some deviation from the established curriculum. Detailed instructions for applying for a curriculum deviation may be obtained from the Records Office.

RECORDS PROCEDURES

Holding of Records

Student records may be placed in a “Hold” status because of financial or other obligations to the University. The “Hold” status authorizes the University to withhold the “permit to register”, release of transcripts, and other services normally provided to the student. The student’s records will be held until the obligation is cleared to the satisfaction of the office or department placing the “Hold.”

Transfer to Other Colleges

Students who plan to transfer from the California Polytechnic State University to another college or university should, at the earliest possible date, request that their transcript of academic record be forwarded by the Records Office. Any evaluation of transcripts presented to another college or university will be made by the new institution in terms of its established policies.

PRIVACY RIGHTS OF STUDENTS IN EDUCATION RECORDS

The federal Family Education Rights and Privacy Act of 1974 and regulations adopted thereunder and California Education Code Section 22509 et seq, set out requirements designed to protect the privacy of students concerning their records maintained by the campus. Specifically, the statute and regulations govern 1) access to student records maintained by the campus, and 2) the release of such records. In brief, the law provides that the campus must provide students access to official records directly related to the student and an opportunity for a hearing to challenge such records on the grounds that they are inaccurate, misleading or otherwise inappropriate; the right to a hearing under the law does not include any right to challenge the appropriateness of a grade as determined by the instructor. The law generally requires that written consent of the student be received before releasing personally identifiable data about the student from records to other than a specified list of exceptions. The institution has adopted a set of policies and procedures concerning implementation of the statutes and the regulations on the campus. Copies of these policies and procedures may be obtained from the Director, Judicial Affairs. Among the types of information included in the campus statement of policies and procedures is: 1) the types of student records and the information contained therein; 2) the official responsible for the maintenance of each type of record; 3) the location of access lists which indicate persons requesting or receiving information from the record; 4) policies for reviewing and expunging records; 5) the access rights of students; 6) the procedures for challenging the content of student records; 7) the cost which will be charged for reproducing copies of records, and 8) the right of the student to file a complaint with the Department of Health, Education and Welfare. An office and review board have been established by the Department to investigate and adjudicate violations and complaints. The office designated for this purpose is: The Family Educational Rights and Privacy Act Office, Department of Health, Education and Welfare, 330 Independence Avenue, SW, Washington, D.C. 20201.
The campus is authorized under the Act to release public directory information concerning students. Directory information includes the student’s name, address, telephone listing, name(s) and address(es) of parent(s), date and place of birth, marital status, major field of study and current schedule of classes, participation in officially recognized activities and sports, weight and height of members of athletic teams, dates of attendance, degrees and awards received, any previous educational agency or institution attended by the student, and any other information authorized in writing by the student. The above designated information is subject to release by the campus at any time unless the campus has received prior written objection from the student specifying information which the student requests not be released. Written objections must be filed with the Director, Judicial Affairs, within three working days of completing registration, on a form provided by that office.

The campus is authorized to provide access to student records to campus officials and employees who have legitimate educational interests in such access. These persons are those who have responsibilities in connection with the campus’ academic, administrative or service functions and who have reason for using student records connected with their campus or other related academic responsibilities.

CREDIT POLICY

Advanced Placement

The University offers credit and advanced placement for those students who achieve scores of 3, 4 or 5, on the College Entrance Board advanced placement examinations. Nine quarter units of lower division credit will be granted for such achievement in each subject examination taken upon request and submission of the examination results to the Director, Admissions, Records and Evaluations.

Credit by Examination

A regularly enrolled student may be permitted to obtain credit by examination for courses in subject matter fields in which he is especially qualified through previous education or experience and for which credit has not otherwise been given. A credit by examination request will not be considered for a course in which the student is enrolled, or for which a student has received a failing or NC at Cal Poly, or for which a student has previously unsuccessfully attempted credit by examination. A fee of $1 per unit is charged for such an examination. It may include written, oral, or skills tests, or a combination of all three types, and will be sufficiently comprehensive to determine that the student has essentially the same knowledge and skills as those students who successfully complete the course. The grade received is entered on the student's permanent record. The grade may not be Credit-No Credit. The length of the examination will be consistent with the unit value of the course.

Credit toward partial completion of the general education-breadth requirements will be granted for the completion of specified tests of the general examinations in the College Level Examination Program with an appropriate score, and up to 4 units of elective or course equivalent credit for each subject examination completed with an appropriate score. The maximum number of units of credit the University will grant for the successful completion of any combination of general and subject examinations of the College Level Examination Program will be 45 quarter units.

Credit for CLEP and other externally developed examinations will not be awarded if any of the following apply: (1) Examination previously taken within the past year; (2) Equivalent degree credit or duplicate credit has already been granted; (3) Credit has been granted for previous course work or for a previously completed more advanced or higher level examination; (4) Total amount of credit awarded for externally developed tests exceeds 45 quarter units (Advanced Placement Examination credit excluded from this limit).

Arrangements to obtain course credit by examination may be made with the head of the department in which the course is taught. Units of credit received through this procedure may not apply toward the residence requirements for any of the degrees or credentials offered by the University.

Detailed instructions for applying for credit by examination may be obtained from the Records Office.
Credit for Military Service

Nine quarter units of elective credit will be allowed toward graduation to any student with honorable discharge submitting evidence of satisfactory completion of one year of training in the military service of the United States. Additional credit may be allowed in accordance with the recommendations of the American Council on Education.

Credit is not given for completion of the six-month Reserve Training Programs or for college level General Educational Development Tests. No grade points are assigned in connection with units of credit allowed for military service. The units allowed are not included in scholarship computations.

Auditing of Courses

An auditor is a student who is attending courses for no credit. The student must be registered with fees paid for the quarter in which the course is to be audited. A student may enroll to audit a course during the first week of instruction and no later than the 1st day to add a course. The deadline to change from audit to credit is the same as the last day to add a course. A student may change from credit to audit no later than the last day to drop a course without penalty.

In cases where class sections must be limited in enrollment, preference will be given to students enrolling for credit. Students may not enroll for audit classes at registration.

The student services fee and non-resident tuition fee are determined on the basis of the total units for which the student is enrolled including courses audited.

HONORS

Candidates for bachelor's degrees are eligible for "Graduation with Honors" if at the end of winter quarter preceding commencement they have earned a 3.2 or better cumulative grade point average, including all college level work attempted at Cal Poly and all college level work accepted from other institutions.

Similarly, those with a corresponding average of 3.6 or better are eligible for "Graduation with Highest Honors".

The "President's Honors List" is compiled at the end of each college year to honor those undergraduate students who have demonstrated consistent achievement, as represented by being named to the "Dean's Honors List" for any three of the four quarters of the college year.

The "Dean's Honors List" is compiled at the end of each quarter to honor undergraduate students who have completed 12 or more units during the quarter with a grade point average which places them in the top 15 percent of the students in their school.

Entering freshmen who rank in the top five percent of high school graduates are granted "Honors at Entrance."

STUDENT CONDUCT

It is expected that all California Polytechnic State University students are enrolled for serious educational pursuits and that they will conduct themselves so as to preserve an appropriate atmosphere of learning. It is also expected that all students who enroll at Cal Poly are willing to assume the responsibilities of citizenship in the campus community. Association in such a community is voluntary, and students may withdraw from it at any time that they consider the obligations of membership disproportionate to the benefits. While enrolled, students are subject to campus authority which includes the prerogative of dismissing those whose conduct is inimical to the aims of an institution of higher education.

While enrolled, students are subject to the regulations governing discipline stated in Education Code Section 22505 and in Title 5 of the California Administrative Code, Sections 41301-41304, and to such rules and regulations as have been approved and promulgated by authority of the President. Copies of 5 Cal Adm Code 41301 and 41302, which deal specifically with student disciplinary regulations, are distributed to all new students during each registration period and are posted officially in the Administration Building. Other applicable regulations are contained in this Catalog, in the Campus Administrative Manual, and in other official University publications.
Student Conduct

Student Disciplinary Procedures
The Chancellor of the California State University and Colleges has established procedures for student disciplinary matters which are included in the Campus Administrative Manual, the official campus publication of policies and procedures which is available in the library for easy reference.

Educating students to their responsibilities as good citizens of the University and of the community is a campus-wide responsibility requiring the cooperation and understanding of the entire campus. Title 5 of the California Administrative Code assigns to the President responsibility for enforcement of student disciplinary regulations. The President has delegated to the Director of Judicial Affairs the responsibility and commensurate authority to administer student disciplinary regulations but has retained decision-making authority on cases which proceed to a hearing at the local campus level.

When the conduct or behavior of a student is such that he or she is alleged to be in violation of applicable provisions of the Education Code, regulations of the Board of Trustees, and campus rules and orders issued thereunder, the case is referred to the Director of Judicial Affairs for investigation of the facts leading to the allegation. If the investigation reveals that there is reason to believe that an infraction has been committed by a student, disciplinary procedures as described in the Campus Administrative Manual will be initiated.

Eligibility for Student Activities
Students on either academic or disciplinary probation may not participate on intercollegiate teams nor may they hold positions of leadership in chartered student organizations or coded student government groups. Students on probation may participate in such student organizations and groups as members but they may not hold an office or represent the University or the Associated Students, Incorporated, in any official capacity.

Student Involvement in Disciplinary Procedures
Student Hearing Boards conduct hearings in the residence halls and make recommendations to the Director of Judicial Affairs. In addition, students have majority representation on the Student Appeals and Advisory Commission which also includes members of the faculty and of the administrative staff; this group makes recommendations to the President in appropriate cases.

Procedural Due Process
In all matters of student discipline, each person charged with a violation is given every courtesy, privilege, and right under the law and within the context of the uniqueness of a public institution of higher learning.

Causes for Disciplinary Action
Causes for disciplinary action are cited in Title 5 of the California Administrative Code, Section 41301, which reads:

41301. Following procedures consonant with due process established for the campus of which he is a student, any student of a campus may be expelled, suspended, placed on probation or given a lesser sanction for one or more of the following causes which must be campus related:

(a) Cheating or plagiarism in connection with an academic program at a campus.
(b) Forgery, alteration or misuse of campus documents, records, or identification or knowingly furnishing false information to a campus.
(c) Misrepresentation of oneself or of an organization to be an agent of a campus.
(d) Obstruction or disruption, on or off campus property, of the campus educational process, administrative process, or other campus function.
(e) Physical abuse on or off campus property of the person or property of any member of the campus community or of member's family or the threat of such physical abuse.
(f) Theft of, or non-accidental damage to, campus property, or property in the possession of, or owned by, a member of the campus community.
(g) Unauthorized entry into, unauthorized use of, or misuse of campus property.
Student Conduct

(h) On campus property, the sale or knowing possession of dangerous drugs, restricted dangerous drugs, or narcotics as those terms are used in California statutes, except when lawfully prescribed pursuant to medical or dental care, or when lawfully permitted for the purpose of research, instruction or analysis.

(i) Knowing possession or use of explosives, dangerous chemicals or deadly weapons on campus property or at a college campus function without prior authorization of the campus president.

(j) Engaging in lewd, indecent, or obscene behavior on campus property or at a campus function.

(k) Abusive behavior directed toward, or hazing of, a member of the campus community.

(l) Violation of any order of a campus president, notice of which had been given prior to such violation and during the academic term in which the violation occurs, either by publication in the campus newspaper, or by posting on an official bulletin board designated for this purpose, and which order is not inconsistent with any of the other provisions of this Section.

(m) Soliciting or assisting another to do any act which would subject a student to expulsion, suspension or probation pursuant to this Section.

(n) For purposes of this Article, the following terms are defined:

1. The term "member of the campus community" is defined as meaning California State University and Colleges Trustees, academic, non-academic and administrative personnel, students, and other persons while such other persons are on campus property or at a campus function.

2. The term "campus property" includes:
   - Real or personal property in the possession of, or under the control of, the Board of Trustees of the California State University and Colleges, and
   - All campus feeding, retail, or residence facilities whether operated by a campus or by a campus auxiliary organization.

3. The term "deadly weapons" includes any instrument or weapon of the kind commonly known as a blackjack, slug shot, billy, sandclub, sandbag, metal knuckles, any dirk, dagger, switchblade knife, pistol, revolver, or any other firearm, any knife having a blade longer than five inches, any razor with an unguarded blade, and any metal pipe or bar used or intended to be used as a club.

4. The term "behavior" includes conduct and expression.

5. The term "hazing" means any method of initiation into a student organization or any pastime or amusement engaged in with regard to such an organization which causes, or is likely to cause, bodily danger or physical harm to any member or the campus community; but the term 'hazing' does not include customary athletic events or other similar contests or competitions.

(o) This Section is not adopted pursuant to Education Code Section 23604.1.

(p) The provisions of this Section as hereinabove set forth shall only apply to acts and omissions occurring subsequent to its effective date. Notwithstanding any amendment or repeal pursuant to the resolution by which any provision of this Article is amended, all acts and omissions occurring prior to that effective date shall be subject to the provisions of this Article as in effect immediately prior to such effective date.

Among the specific causes for which the University will take such disciplinary action are: the bringing or drinking of alcoholic beverages on campus; being intoxicated on campus; being convicted by a public law enforcement agency of a misdemeanor involving moral turpitude, or of a felony, resulting from behavior which indicates that the student's presence on campus would constitute a threat to the safety or welfare of the campus community; repeated violations of campus rules and regulations, including those pertaining to driving and parking of vehicles.

In accordance with provisions of Section 41301 above, the President has issued and posted officially an order which prohibits the consumption, possession, or use of alcoholic beverages on campus. Students who violate this order are subject to the penalties provided for in Sections 41301 and 41302, Title 5 of the California Administrative Code.

Disciplinary action varies with the severity of the violation. If the unacceptable behavior involves use of motor vehicles, the student may be restricted from driving or parking on campus. If the unacceptable behavior involves matters pertaining to on-campus housing or dining, the student may be restricted from living or dining on campus.
Student Activities and Services
STUDENT ACTIVITIES

The campus provides an integrated program of classroom and laboratory instruction, and co-curricular activities. A professional staff in the Activities Planning Center is responsible for providing a wide spectrum of meaningful activities for all students. Leadership development groups, conferences, and classes are offered to increase the effectiveness and efficiency of student officers in student organizations and government. Many of the programs are located in the University Union, a student financed facility.

STUDENT GOVERNMENT

All students are members of the student association known as the Associated Students, Inc., of California Polytechnic State University, San Luis Obispo. The government of student affairs is vested in the Student Affairs Council, the members of which are selected according to regulations established in the student body bylaws. In addition, there are boards established to oversee publications, athletics, music, University Union programming, Week of Welcome, ethnic programs, and Poly Royal. All interested students have an opportunity to participate in student government.

ATHLETICS

Intercollegiate competition is held under the rules and auspices of the National Collegiate Athletic Association and the Association of Intercollegiate Athletics for Women. Conference competition is maintained in most sports as a member of the California Collegiate Athletic Association and Southern California Athletic Association. Intercollegiate competition is offered for men in the sports of football, basketball, wrestling, baseball, track, swimming, water polo, golf, cross country, soccer, tennis and volleyball. Women's sports are conducted in volleyball, track, basketball, tennis, and softball. Junior varsity competition is offered in sports where competition is available and sufficient interest warrants it. For eligibility rules see ELIGIBILITY FOR INTERCOLLEGIATE ATHLETICS.

INTRAMURALS

The Physical Education Department offers an intramural program which provides opportunities for all students to participate in a variety of individual, dual, and team sports, many of which are coeducational. The objectives of the intramural program are to provide education in physical skills, recreation, social contact, carry-over activities, and physical fitness through the give-and-take of competition.

CAMPUS ORGANIZATIONS

Clubs and organizations cover all departments and activities, and the opportunity exists for every student to take an active part in club life. There are departmental and professional organizations, hobby-interest clubs and many others serving the areas of honor societies, service clubs, residence groups, ethnic groups, and religious faith groups.

MEDIA

Publications of the student body at California Polytechnic State University, San Luis Obispo, are not only written and edited by students, but are also printed on campus as laboratory work for students majoring in Graphic Communications. Editorial and photographic work for publications is handled primarily by students of the journalism classes. Mustang Daily is the official newspaper of the associated students. In addition, the Journalism Department operates KCPR-FM, a student station heard on campus and in the surrounding community.

STUDENT COMMUNITY SERVICES

A comprehensive program of student volunteer assistance to people who need help, both on and off campus, is coordinated in the Activities Planning Center. Services include such things as tutoring, recreation, and helping the handicapped of all ages.
POLY ROYAL

Each year during the last weekend in April Cal Poly holds an open house exhibition and show conducted primarily by the Associated Students. This event is known as Poly Royal. Its purpose is to display work accomplished during the year by students. Each department on the campus prepares displays that reflect the curriculum within that department and its relation to employment, as well as the activities and success of the graduates. Besides the shows and exhibits there are many entertainment features such as intercollegiate baseball, swimming, and rodeo. Other special events include music department concerts, dramatic presentations, aqua-cade, carnival, various judging contests, and a mathematics contest featuring students from high schools throughout the State.

STUDENT SERVICES

Cal Poly provides a number of services designed to help the student in his college work. Some of the services are directed toward group activities and experiences, others toward helping students overcome individual problems.

COUNSELING SERVICES

Advising

Each new student is assigned an adviser in his major department when he enrolls at Cal Poly. This adviser helps the new student solve problems involved in becoming oriented to college life and helps to arrange a sound course of study for him. Returning students and college transfers are also assigned an adviser who helps the student arrange his instructional program.

Counseling Center

The Counseling Center, under the direction of the Director, Counseling and Testing offers service in vocational, educational, and personal counseling in accordance with the needs of the student. A well-equipped test center, under the direction of the Test Officer, is available to assist the students, faculty, and counselors.

FOOD SERVICES

Dining Facilities

The food services on campus are operated by the Cal Poly Foundation and offer a variety of menus, dining atmospheres and prices to meet student needs and interests. Two campus dining halls provide cafeteria food service for meal plans or cash purchases. Vista Grande, which includes a full-service restaurant and an a la carte cafeteria, offers greater service for more formal occasions, visits with parents, and special celebrations. For quick nutritious snacks the Food Service also operates a snack bar, burger bar, old-fashioned ice cream parlour sandwich shop and vending areas. The variety offered ranges from fast foods and complete meals to formal catered banquets.

Meals Program

In addition to a la carte and vending services, meal ticket plans are available from the Foundation Business Office. See page 58 for meal plan requirement for resident students.

HEALTH SERVICES

Health Center

The staff and facilities of the Student Health Center are dedicated to the ideals of preventive, diagnostic and therapeutic medicine. These services are offered with an emphasis on health education. In general, the same approach as that of the student's own family physician is provided. The Health Center staff has several full-time physicians, registered nurses, and medical technologists. The Health Center is comprised of two units: an inpatient infirmary and an outpatient department. It provides a well-equipped clinic and infirmary with facilities for pharmacy, laboratory, physical therapy, medical records, and diagnostic X-ray.
Health Program

The health program is financed by the student in three plans; for complete coverage, each regular student should participate in all three:

1. The student service fee allows basic outpatient care from 8 a.m. to 5 p.m., Monday through Friday.

2. An optional, local, augmented health fee entitles the student carrying more than 6 units to service in the campus infirmary and 24-hour emergency care by a campus physician. Additional services under this program are physical therapy, La Femme clinic, preventive oral health program, and discounted prescription service at the campus pharmacy. These students, even without this prepaid campus health plan, may still avail themselves of these benefits by paying a fee-for-service.

3. Supplementary major medical and hospital insurance is offered to cover major surgery and emergency expenses.

A Health Status Report on a form provided by Cal Poly is required of each student.

HOUSING SERVICES

On-Campus Housing

On-campus residence hall facilities are available for 2,750 students, both men and women. A stimulating intellectual and social living environment is an important part of the student's education. Study is encouraged through the observance of regular quiet hours. The professional housing personnel work with residents in planning and facilitating student programs which contribute positively to the learning experiences offered through the regular university educational programs. Complementary programs such as intramural activities, discussion groups on current national issues and well-planned social events with fellow residents overcome feelings of isolation and loneliness, thus creating a residence hall environment conducive to strong personal development.

The residence hall environment is one in which "the individual counts as a person."

New students who wish to live in the residence halls should request on-campus housing by returning their housing application to the Admission Office. This is found in the "Notice of Space Reservation" booklet. Housing licenses are mailed to students according to a priority system which generally provides first priority to returning students with hardship situations and high priority to new students.

Students who are 30 years of age and above may be granted special permission by the Dean of Students to live in campus housing. Signed licenses, accompanied by the required payment, must be returned by the deadline stated in the license. Failure to comply with the license stipulations may result in loss of housing assignment.

LIVING EXPENSES FOR STUDENTS LIVING IN CAMPUS RESIDENCE HALLS

(Subject to Change)

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room and Board</td>
<td></td>
</tr>
<tr>
<td>Room per quarter, annual license required (double occupancy)</td>
<td>777.00</td>
</tr>
<tr>
<td>Board, annual (mandatory) (academic year)</td>
<td>789.00 to 900.00</td>
</tr>
<tr>
<td>Housing security deposit (payable prior to occupancy)</td>
<td>20.00</td>
</tr>
<tr>
<td>Room payable in advance. Arrangements to pay in installments may be made upon application for campus housing. A service fee of $4.00 per quarter shall be charged for the right to make installment payments.</td>
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</tr>
<tr>
<td>Students furnish their own bed spreads and study lamps.</td>
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<tr>
<td>Two meal ticket plans are available. On-campus residence hall students must choose one of these two plans. The 19-meal plan provides for a maximum of 19 meals per week at a cost of $900 prepaid for the academic year or three installments of $305 each (includes a $15 installment service charge). The 14-meal plan provides for a maximum of 14 meals per week at a cost of $789 prepaid for the academic year or three installments of $268 each. Students may change</td>
<td></td>
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</tbody>
</table>
from one meal plan to the other only during a quarter break.

Off-Campus Housing
The Off-campus Housing Office maintains a listing service of available houses, apartments, rooms in private homes and mobile homes for rent. These listings are for San Luis Obispo and the north and south county areas. Included in the listings is information on rental rates, number of bedrooms, utilities included, location, person to contact, phone number, and any other special features. New listings are posted, rented ones removed, and others modified as soon as the information is made available to our office. The university does not inspect, approve, or disapprove any units offered for rent. The staff assists students with information about where and how to look for housing, things they should know about contracts, deposits, and general information about the community and university.

Family Housing
The Housing Office maintains a card file of apartments and rooms available to married students. It does not inspect or approve the facilities listed. Inquiries about the file should be made in person at the Housing Office.

PLACEMENT SERVICES
A centralized placement service is available to all students and alumni of the University. The Placement Center and instructional departments work together in assisting students to obtain the most suitable employment consistent with their preparation and experience.

A followup program conducted by the Placement Center includes contacting both the graduate and employer to appraise the effectiveness of the instructional programs in light of employer needs, and the satisfaction of employer and employee.

Teacher Placement
Every candidate for a credential should register with the Placement Center one quarter prior to initial student teaching. Registration includes the preparation of personal data, and the listing of references for the teacher placement folder which is sent by the Placement Center to school administrators who are considering the candidate for a teaching position. This folder is maintained permanently by the Placement Center for use whenever the teacher wishes to seek a new position. Cooperation of the candidate in keeping information in the folder up to date is necessary for most effective service.

Summer Employment
Students are encouraged to take summer employment in fields related to their major.
The Placement Center receives many summer job listings. Ranchers and businessmen visit the campus in person and large business concerns send recruiters to interview undergraduates for summer employment.

Part-time Employment
In addition to off-campus employment and opportunities for students to earn money through project activities, the University has established a policy of giving a maximum number of students experience by employing them to assist in the operations of the entire campus and farm. The number of campus jobs is greater than in the typical college where regular full-time employees do much more of the work.

FINANCIAL
The University has a variety of loan funds, scholarships, awards, and part-time employment opportunities designed to assist students financially. Students who must have assistance in order to complete their college work should read this section carefully. Additional current information may be obtained by writing to the Financial Aid Office for a copy of Financial Aids Announcement.
The application for financial aid is included in the common application for admission to the University. Scholarship applications may be requested directly from the Financial Aid Office.
Scholarship application deadline is March 15; the deadline for Financial Aid applications for Summer Quarter is April 1; academic year Financial Aid applications are due by May 1. A Financial Aid Form is required and must be filed with the College Scholarship Service, P.O. Box 380, Berkeley, California 94701.

**TYPICAL STUDENT EXPENSES**

Following is an estimate of typical expenses per quarter for the average California resident student living in campus residence halls. Non-resident students should be prepared to pay additional tuition fees. Of the total amount, the student should be prepared to pay from $130 to $180, depending upon his major, at the time of fall quarter registration and approximately the same amount at the time of registration for other quarters.* Charges for room and board are payable in advance or in installments.

(All State fees are subject to change upon approval by the Board of Trustees of the California State University and Colleges.)

<table>
<thead>
<tr>
<th>Expense</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Associated Student fee</td>
<td>$10.00</td>
</tr>
<tr>
<td>University Union fee</td>
<td>$12.00</td>
</tr>
<tr>
<td>Health fee—optional (per quarter)</td>
<td>$17.00</td>
</tr>
<tr>
<td>Student services fee (per quarter)</td>
<td>$48.00</td>
</tr>
<tr>
<td>Facilities fee</td>
<td>$2.00</td>
</tr>
<tr>
<td>Room and board with mandatory annual 19-meal ticket</td>
<td>$559.00</td>
</tr>
<tr>
<td>Books and supplies (estimated)</td>
<td>$70.00</td>
</tr>
<tr>
<td>Personal expenses and transportation</td>
<td>$300.00</td>
</tr>
<tr>
<td><strong>Estimated total per quarter (approximately 3 months)</strong></td>
<td><strong>$1,018.00</strong></td>
</tr>
</tbody>
</table>

**SCHOLARSHIPS AND AWARDS**

**General Information**

Scholarships awarded by the University are available to both entering and enrolled students who meet the scholastic and financial need requirements of the University scholarship funds. These scholarships are made available from various sources, usually corporations, individuals, or interested groups outside the campus. Approximately 350 scholarships are awarded yearly.

**How to Apply**

To be considered for a scholarship, a student or prospective student must complete a scholarship application. Students may secure an application from the Financial Aid Office. A confidential statement is required.

**Selection Criteria**

Applicants are judged upon their need, scholastic ability, character and participation in school and community affairs. In addition, certain scholarships require special conditions concerning field of study, residence, and other similar factors.

Generally, students must have at least a "B" average to place high enough in the scholarship ratings to be granted an award. However, there are scholarships which are granted to students with a lesser grade average. In some cases need, special qualification, or a specific field of study will compensate for a lower grade average. It is recommended that a student apply if in doubt.

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* Students enrolling under the auspices of an agency supplying educational assistance should check in advance with the appropriate agency representative regarding payment of fees and/or costs.

† Beginning engineering and architecture students should be prepared to pay up to $150 in their first quarter.
JULIAN A. McPHEE AWARD, ($200), to an outstanding undergraduate student who has attended the University for at least six quarters as a full-time student. This award was established in memory of Julian A. McPhee, President of Cal Poly from 1933 to 1966. Students are nominated by each School of the University and will be requested to complete a scholarship application.

ALAN PATTEE SCHOLARSHIPS. Children of deceased public law enforcement or fire suppression employees, who were California residents and who were killed in the course of law enforcement or fire suppression duties, are not charged fees or tuition of any kind at any California State University or College, according to the Alan Pattee Scholarship Act. Students qualifying for these benefits are known as Alan Pattee scholars. For further information contact the Financial Aid Office, which determines eligibility.
AGRICULTURE AND NATURAL RESOURCES

Freshman or Advanced Student Scholarships
- American Fuchsia Society, Main Branch Scholarship $300
- California Cowbelles Scholarship $200
- Agnese Davey Scholarship $300

Freshman Scholarships
- Mercedes Berry Memorial Scholarship $500
- California State Grange Scholarship $250
- E.C. Loomis and Sons Scholarship $100
- San Luis Obispo County Cowbelles Scholarship $100 & $200

Advanced Student Scholarships
- L. L. Bennion Scholarship $250
- California Association of Nurserymen, Central Chapter, Scholarship
- California Association of Nurserymen, Peninsula Chapter, Scholarship
- California Dairy Industries Association Scholarship $600
- California Fertilizer Association Soil Improvement Committee Scholarship $200
- Earl J. Cecil Educational Foundation Scholarships $450 (2)
- CIBA-GEIGY Awards $500 (2)
- Continental Grain Company Scholarships $200–$500
- Wellington Davey Scholarship $300
- Dorothy Bancroft Drasel Scholarship $100
- Paul Ecke Ranch Scholarship $100

ARCHITECTURE AND ENVIRONMENTAL DESIGN

Advanced Student Scholarships
- Wallace W. Arendt Scholarship $500
- Bechtel Corporation Scholarship $500
- Richard Dorman and Associates Scholarship $1,000
- D. Stewart Kerr Architectural Scholarship Fund $1,000 (10)

BUSINESS

Advanced Student Scholarships
- Continental Grain Company Scholarship $200–$500

COMMUNICATIVE ARTS AND HUMANITIES

Freshman Scholarship
- Speak Easy Club Scholarship $150

ENGINEERING AND TECHNOLOGY

Freshman or Advanced Scholarships
- Walter Wells, Sr., Memorial Scholarships $500 (10)
- Alcoa Foundation Scholarship $750
- Alpac Scholarship $330

Advanced Student Scholarships
- American Institute of Aeronautics and Astronautics, Vandenberg Section Scholarship $300
- American Society of Heating, Refrigerating, and Air-Conditioning Engineers Scholarships
- Bechtel Corporation Scholarship $500
Boeing Aerospace Company Scholarship $500
Burroughs Corporation Scholarship $500
Food Machinery Corporation Scholarship
Harold R. Frank—Applied Magnetics Corporation Scholarship $500.
Getty Oil Company Scholarship $750
Industrial Technology Scholarship and Development Fund Scholarships
Institute of Electrical & Electronics Engineers Santa Barbara Section, Scholarship
Institute of Traffic Engineers, Central California Section Scholarship $100

**HUMAN DEVELOPMENT AND EDUCATION**

Freshman Scholarship
San Luis Obispo County Cowbelles Scholarship $100 & $200
Advanced Student Scholarships
Altrusa Club of San Luis Obispo Scholarship $50

**SCIENCE AND MATHEMATICS**

Applegarth Biology Scholarship $100
Beta Beta Beta Biological Society Scholarship
Burroughs Corporation Scholarship $500

**ATHLETICS**

Robert A. Mott Scholarship $100
Jon R. Dana Memorial Scholarship

**OTHER SCHOLARSHIPS**

In addition to the scholarships awarded by the University, many awards from various private donors and organizations are available to assist students in meeting University expenses. Interested students should make inquiries for such awards directly to the sponsoring organization or to the Financial Aid Office.

**LOANS**

Loans are generally for education purposes only, with definite provisions for repayment. These loans are of four types, the National Direct Education Act loans, United Student Aid Fund, Guaranteed Loan and the University long-term education loan. Also available are emergency loans of small amount, interest free for short-term period.

**NATIONAL EDUCATION ACT LOAN**

The National Direct Student Loan can provide up to $2,500 per year with a maximum of $5,000 to an eligible undergraduate. Loans are also available to eligible graduate students. Repayment of principal and interest (3% on unpaid balance) begins one year after the student leaves the University. There are cancellation provisions for teaching in designated areas, teaching the handicapped, or teaching in a Head Start Program. Applications for this program are due by May 1 of each year for the following college year. A Financial Aid Form is required.
STUDENT LOAN FUNDS

Student loan funds are available to provide temporary assistance to eligible students. Loans from these funds are made for varying periods of time, according to regulations determined by a faculty committee and in conformance with conditions prescribed in the establishment of the particular loan fund. Applications may be obtained from the Financial Aid Office, Administration 128.

Institutional Long-Term Loans

Educational long-term loans are granted to students who need them and are considered good risks. They are approved by a standing committee on the basis of written applications, recommendations, and interviews. Promissory notes signed by the borrower and a co-signer are required. Amounts of up to $500 may be borrowed per academic year. Interest is charged on the unpaid balance beginning six months after the date of graduation or withdrawal from the university. Repayment of the loan begins one year after graduation or withdrawal. Contributions to the long-term loan fund are:

- Jed S. Blake Memorial Loan Fund
- Herbert E. Collins Student Loan Fund
- Bing Crosby Youth Fund Student Loan Fund
- 1960 Football Memorial Loan Fund
- Fred Kimball Loan Fund
- Norma Sullivan Memorial Loan Fund
- Marie Van Asperen Memorial Loan Fund—Cal Poly Women’s Club
- Leopold Edward Wrasse Loan Fund

One Year Loans

The university has additional funds for emergency loans. Up to $200 can be borrowed from these funds during a school year. Repayment is required by the following September 1 with 6% interest charged on the unpaid balance. Contributors to this fund include:

- Agricultural Engineering Society Loan Fund
- Alpha Zeta Loan Fund
- Alumni Association Loan Fund
- American Society of Heating, Refrigeration and Air Conditioning Engineers Loan Fund
- American Welding Society Loan Fund
- Lamar Anderson Memorial Student Loan Fund
- Peter Bachino Memorial Loan Fund
- Baer-Beck Fund
- Edgar E. Bilodeau Loan Fund
- California Association of Refrigeration Service Engineers Loan Fund
- California Association of Soil Conservation Districts Loan Fund
- California Polytechnic Memorial Loan Fund
- California Retired Teacher’s Loan Fund
- California Polytechnic State University Women’s Club Fund
- W.B. Camp Educational Loan Fund
- Logan S. Carter Loan Fund
- Margaret Chase Memorial Loan Fund
- Thomas Comer Memorial Loan Fund
- Harlan Diedrichsen Memorial Loan Fund
- Court Evergreen, Independent Order of Foresters Loan Fund
- Barbara Hammonds, Memorial Loan Fund
- John Holley Memorial Loan Fund
- Ralph Hoover Loan Fund
- Horsehoeing and Animal Husbandry Loan Fund
- Industrial Technology Scholarship and Development Fund
- International Students Emergency Loan Fund
- Chris Jespersen Fund
- Anita Hathaway/KEMA Fund
- William Kirkpatrick Memorial Loan Fund
- Alfred M. Kretzmann, Jr. Memorial Loan Fund
- Lee Gird Levering Memorial Loan Fund
- Lynn T. Lobaugh Memorial Loan Fund
- William Mercer Memorial Loan Fund
- Roy E. Metz Memorial Loan Fund
- Ornamental Horticulture Emergency Loan Fund
- Rotary Club Fund
- San Fernando Valley Club, Printing House Craftsmen Loan Fund
- Sears Roebuck Foundation Loan Fund for Foreign Students
- George Sehlmeyer Fund
- Student Architect Wives Club Loan Fund
- Telegram-Tribute Loan Fund
- Todd Farm Bureau Emergency Loan Fund
- Wilder Memorial Loan Fund
University Emergency Loans

Short-term loans in amounts up to $30 can be borrowed quarterly with payment due by the end of the quarter.

FEDERALLY INSURED LOAN PROGRAM

This program enables students to borrow funds from banks and other lending institutions. Loans are processed by the University and approved by a cooperating lending agency. The FISL is a 7% interest loan and students that qualify may have the interest paid by the federal government while they are still in school. Deadlines vary according to the lending agency as do maximum amounts loaned.

SUPPLEMENTAL EDUCATIONAL OPPORTUNITY GRANT PROGRAM

A grant-in-aid program intended to assist undergraduate students who, without substantial aid such as this, could not attend college. The aid must be matched by a National Direct Loan or similar aid.

Educational Opportunity Grant applicants must submit a Financial Aid Form.

BASIC EDUCATIONAL OPPORTUNITY GRANT PROGRAM

This is a Federal aid program designed to provide financial assistance to those who need it to attend post-high school education institutions. The maximum award that may be received is $1,400 minus the amount the student and his family are expected to contribute toward the cost of his education.

LAW ENFORCEMENT EDUCATIONAL GRANT PROGRAM

Grants for the mandatory fees required by the University are made available to in-service law enforcement officers through a Federal program. Applicants may enroll on a full or part-time basis and must agree to serve in the employing agency for a period of at least two years following completion of their studies.

MERLE HAMBLY FUND PROGRAM

A fund established by the California Polytechnic State University Student Wives Club provides for grants to assist the married student whose child has met with an accident or otherwise requires immediate medical care of an emergency nature.

STATE AID TO THE PHYSICALLY HANDICAPPED

The State of California, through its Bureau of Vocational Rehabilitation, provides financial assistance to students who have physical disabilities. This assistance equals the necessary school expense and may include an additional amount to help cover the cost of living. Students who may be entitled to the assistance should apply to the State Bureau of Vocational Rehabilitation.

COLLEGE WORK STUDY PROGRAM

The University is participating in the College Work Study Program which provides students who are eligible the opportunity of employment as set forth under the Economic Opportunity Act. Employment provisions under this program are parallel to those of other student employment on campus. Rates of pay vary depending on the job requirements and the skills of the worker. A Confidential Statement is required. Information may be obtained from the Financial Aid Office, Administration 128.
School of Agriculture
and Natural Resources
## Chart of Recommended Community College Preparation for Agriculture Major Curricula

<table>
<thead>
<tr>
<th>Recommended C. C. Preparation in Terms of Cal Poly Courses</th>
<th>Approximate units</th>
<th>CAL POLY AGRICULTURE MAJORS REQUIRING VARIOUS COURSES1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Biological Sciences</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bio 101, General Biology</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Bot 121, General Botany</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Ent 326, Entomology</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Zoo 131, General Zoology</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Zool 122, General Zoology</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Bact 221, Bacteriology</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Life Science</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td><strong>Physical Sciences</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phys 104, Introductory Physics</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Phys 121-2-3, Physics</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>Phys 121-2-3, Physics for Engr</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>Chem 121-2, 226, Inorganic</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>Chem 121-2, Inorganic</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td><strong>Mathematics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math 103-110, Basic Math</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Math 122-3-4, Ag. Math, or 113-114</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Math 111-14, Algebra &amp; Trig.</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Math 120-141, Anal. Geo. &amp; Calc.</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td><strong>Agriculture &amp; Supporting Courses</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AE 121-2, Ag. Mechanics</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>AE 142, Ag. Power &amp; Machinery</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>SS 121, Soils</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Ec 201 or 211, Economics</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Agt 131-2, or 121-2 Accounting</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Ag Major or Related Courses</td>
<td>18</td>
<td>12</td>
</tr>
<tr>
<td><strong>Subtotals (Semester Units)</strong></td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td><strong>General Education Courses</strong></td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td><strong>Maximum Transfer Units</strong></td>
<td>105</td>
<td>70</td>
</tr>
</tbody>
</table>

1 The prospective transfer student should consult the curriculum requirements specified in this catalog for his particular major, including possible options and concentrations.

2 Recommended courses include English, American History, American Government, Psychology, Speech, Literature, Physical Education and Health, etc.
The School of Agriculture and Natural Resources prepares students in the field of agriculture with the main objective of giving them a broad and full understanding of basic factors involved in production, management, processing, distribution, marketing, sales, and services in related business to make efficient operators and managers. While the school stresses production techniques and basic management to benefit those returning to the farm or entering employment in other agricultural fields, it also requires a core of basic science courses related to the major and general education courses.

This preparation also provides the sound basis necessary for the student desiring to become a teacher of agriculture in California's secondary schools and community colleges.

Curricula in the School of Agriculture and Natural Resources are arranged so that the student receives a maximum of production courses in the major field early in the program. The student who terminates formal education prior to graduation thus acquires some knowledge and experience. In addition, the student is able to determine in a short time whether or not the curriculum selected is appropriate to his or her skills and interests.

Furthermore, the early acquisition by the student of practical, "doing" types of activities provide an incentive to learn basic scientific explanations.

The courses offered in each agricultural curriculum may be grouped into four areas as follows:

1. Major agriculture—The required sequence of courses offered by the department in which the student expects to graduate. These courses constitute the core of specific preparation for the major field.
2. Related agriculture—Supporting courses in agriculture selected from closely allied fields. They supplement the major agriculture block.
3. Science and mathematics—Courses selected from scientific fields which provide basic biological, physical, and social science, and mathematical background and support for the agricultural blocks above.
4. Humanistic and social—Courses which provide cultural background for intelligent participation in a complex world society.

RECOMMENDED PREPARATION

Admission to the School of Agriculture and Natural Resources requires high school graduation, with appropriate grades and aptitude test scores, but does not require that a specific pattern of courses be taken in high school. However, a student who anticipates enrolling in an agricultural major will find a strong background in mathematics and physical and biological sciences to be advantageous.

Attention is directed to the chart on the preceding page which summarizes the recommended community college preparation for agricultural major curricula. This chart should be studied and followed carefully in order to prevent loss of time in completing the degree program after transferring to Cal Poly.

PROGRAMS

Curricula are offered in the following majors in the School of Agriculture and Natural Resources: agricultural engineering, agricultural management, agricultural science, animal science, crop science, dairy science, food industries, fruit science, mechanized agriculture, natural resources management, ornamental horticulture, poultry industry, and soil science.

The Agriculture Education Department provides an additional program of courses required of prospective secondary agriculture teachers.

The Veterinary Science Department offers courses supportive of the animal science and dairy science majors.

The Animal Science Department offers a 12-week course in horseshoeing in the fall and spring quarters.
Agriculture

MASTER OF SCIENCE IN AGRICULTURE

The School of Agriculture and Natural Resources offers a program of graduate study leading to the degree of Master of Science in Agriculture. This broadly-based program is designed to develop professional competencies for positions in agriculture and related industries, teaching, business, and government work which now require levels of preparation beyond the baccalaureate degree. Specializations are currently available in the areas of General Agricultural Sciences, International Agriculture, Mechanized Agriculture, and Soil Conservation.

CURRICULUM FOR THE MASTER OF SCIENCE IN AGRICULTURE DEGREE WITH A SPECIALIZATION IN GENERAL AGRICULTURAL SCIENCES

(For University requirements see the Graduate Studies Announcement)

<table>
<thead>
<tr>
<th>Units</th>
<th>Courses in area of specialization</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The 24 units of 300-400-500 series courses must be distributed among a minimum of three departments in the School of Agriculture and Natural Resources. Fifteen units must be at the 500 level.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Courses other than in the area of specialization</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>These are to be selected from 300-400-500 series courses as approved by the student's graduate adviser or committee. Eight units must be at the 500 level.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Electives from 300, 400 and 500 level courses</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>45</td>
</tr>
</tbody>
</table>

CURRICULUM FOR THE MASTER OF SCIENCE IN AGRICULTURE DEGREE WITH A SPECIALIZATION IN INTERNATIONAL AGRICULTURE

(For University requirements see the Graduate Studies Announcement)

<table>
<thead>
<tr>
<th>Units</th>
<th>Courses in the area of specialization:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AM 515 International Agricultural Marketing</td>
</tr>
<tr>
<td></td>
<td>AM 516 Communication for Change in Developing Countries</td>
</tr>
<tr>
<td></td>
<td>AM 510 World Agricultural Development</td>
</tr>
<tr>
<td></td>
<td>Courses in agriculture at the 500 level as approved by the student's graduate committee, at least 8 units:</td>
</tr>
<tr>
<td></td>
<td>Courses in agriculture to be chosen from the 300 level or above</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Courses outside the area of specialization</td>
</tr>
<tr>
<td></td>
<td>AgEd 580 Special Problems in Agricultural Education</td>
</tr>
<tr>
<td></td>
<td>PolS 510 Administration in Developing Nations</td>
</tr>
<tr>
<td></td>
<td>Courses selected from the following: Geography, Political Science and History of one selected world regional area (Latin America, Africa south of the Sahara, North Africa and the Middle East, or Asia and the Far East), 300 or 400 level courses as approved by the student's graduate committee.</td>
</tr>
<tr>
<td></td>
<td>The student must develop and demonstrate language competency as required by the graduate committee</td>
</tr>
<tr>
<td></td>
<td>Electives from 300, 400, and 500 level courses</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CURRICULUM FOR THE MASTER OF SCIENCE IN AGRICULTURE DEGREE
WITH A SPECIALIZATION IN MECHANIZED AGRICULTURE
(For University requirements see the Graduate Studies Announcement)

Courses in the area of specialization:

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>AE 521 Engineering of Agricultural Equipment</td>
<td>4</td>
</tr>
<tr>
<td>AE 522 Agricultural Process Engineering</td>
<td>4</td>
</tr>
<tr>
<td>AE 533 Advanced Irrigation System Design</td>
<td>4</td>
</tr>
<tr>
<td>AE 581 Graduate Seminar in Agricultural Engineering</td>
<td>3</td>
</tr>
<tr>
<td>AE 599 Thesis, Internship or Approved Courses</td>
<td>9</td>
</tr>
</tbody>
</table>

Courses other than in the area of specialization:

Courses to be selected from the 300-400-500 series outside the area of specialization and approved by the student's graduate committee. At least six units must be in 500 level courses.............. - 15
Electives from 300, 400, and 500 level courses.................... - 6

CURRICULUM FOR THE MASTER OF SCIENCE IN AGRICULTURE DEGREE
WITH A SPECIALIZATION IN SOIL CONSERVATION
(For University requirements see the Graduate Studies Announcement)

Courses in the area of specialization:

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>NRM 502 Resource Conservation</td>
<td>3</td>
</tr>
<tr>
<td>SS 508 Conservation Legislation</td>
<td>3</td>
</tr>
<tr>
<td>SS 521 Soil Morphology</td>
<td>3</td>
</tr>
<tr>
<td>SS 581 Graduate Seminar in Soils</td>
<td>3</td>
</tr>
<tr>
<td>SS 582 Graduate Seminar in Land Management</td>
<td>3</td>
</tr>
<tr>
<td>SS 599 Thesis, Internship or Approved Courses</td>
<td>9</td>
</tr>
</tbody>
</table>

Courses other than in the area of specialization:

Courses to be selected from the 300-400-500 series outside the area of specialization and approved by the student's graduate committee. At least six units must be in 500 level courses.............. - 15
Electives from 300, 400, and 500 level courses.................... - 6

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TECHNICAL CURRICULA IN AGRICULTURE

In keeping with the Universitywide policy of offering major courses which lead to occupational competency from the beginning of the first year of the four-year sequence, it is essential to provide opportunity for students who may find it impossible to complete four-year programs, to obtain as early as possible a concentration of production courses with a minimum of supporting material.

A technical two-year curriculum is available in each of the following agriculture areas: agricultural management, mechanized agriculture, animal science, dairy husbandry and manufacturing, crop science, fruit science, food industries, ornamental horticulture, poultry industry, and soil science. These curricula include a smaller number of units of related and general education courses than are included in the degree programs. This permits the student to acquire the basic fundamentals in the major and a greater freedom of choice of subjects in agricultural production courses. A student not wishing to enroll in a degree curriculum will find that a two-year curriculum offers a maximum opportunity to select courses which will apply directly to an agricultural career. For admission requirements see “Requirements for Admission as an Undergraduate Student.

Upon completion of 98 selected units, a student may receive a technical certificate in the major field.

A student enrolled in the technical program will not be allowed to enroll for credit in any 300 or 400 series courses except when prior approval has been obtained by petition for special consideration.

The following is the two-year technical curriculum for animal science. Other majors follow a similar pattern. Detailed curriculum information is available from the Dean of the School and department heads.

Freshman

<table>
<thead>
<tr>
<th>Course</th>
<th>F</th>
<th>W</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feeds and Feeding (ASci 101)</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market Beef Production (ASci 111)</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elements of Swine Production (ASci 112)</td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Elements of Sheep Production (ASci 113)</td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Agricultural Mechanics (AE 121, 122)</td>
<td></td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>*Applied English Composition</td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Agricultural Math (Math 102)</td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Physical Education Activity</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>*Agricultural Biology (Bio 100)</td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Soils (SS 121)</td>
<td></td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>+Electives</td>
<td>7</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>17</td>
<td>17</td>
</tr>
</tbody>
</table>

Sophomores

<table>
<thead>
<tr>
<th>Course</th>
<th>F</th>
<th>W</th>
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<tbody>
<tr>
<td>Applied Beef Cattle Management (ASci 241)</td>
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<tr>
<td>Applied Swine Management (ASci 242)</td>
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<td></td>
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<tr>
<td>Applied Sheep Management (ASci 243)</td>
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<tr>
<td>Agricultural Power and Machinery Management (AE 142)</td>
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<tr>
<td>*Prin. of Livestock Hygiene and Sanitation (VS 100)</td>
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<tr>
<td>Forage Crops (CrSc 123)</td>
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<tr>
<td>*Farm Records and Farm Mgt. Practice (AM 132)</td>
<td>4</td>
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<td>Health Education (PE 250)</td>
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<td>*U.S. Hist. and Government (Pol Sc 100)</td>
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<tr>
<td>Agricultural Management electives</td>
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</tr>
<tr>
<td>+Electives</td>
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</table>

* These courses are taken in place of the required courses in the same subject matter fields listed in the degree curricula in the first two years and may not be used as credit toward a degree. VS 100 is replaced by CrSc 100 for plant majors.

All two-year technical students are required to take Math 102. Students in Mechanized Agriculture are required to take Math 102 and 103.

† 11 units of 100–200 level ASci courses must be included.
A student enrolled in the technical program may not transfer to a degree program except by following the approved college procedure for such transfers.

The following specialization areas are available to two-year technical students in Animal Science: Beef Cattle Production, Horse Production, Feed Mill Operation. One of these may be selected with the approval of the adviser.

**AGRICULTURAL ENTERPRISE PROJECT FACILITIES**

The School of Agriculture and Natural Resources utilizes the student enterprise program of the California Polytechnic State University Foundation to provide practical experience which supplements the regular production courses. This enterprise program leads to a fuller understanding of important production and managerial problems in agriculture.

The entire farm with its equipment, buildings, and livestock is available to students for their use in conducting a wide variety of agricultural enterprise projects.

The University foundation has some of the best breeding flocks and herds of livestock in the State. In addition to the 150 registered Hereford, Angus and Shorthorn beef cattle, there is a 200-cow commercial beef herd which provides experience in typical range cattle management.

All necessary equipment for beef cattle production—barns, dehorning and loading chutes, corrals, stock horses, etc.—is available.

The foundation swine herd consists of two major breeds—Yorkshires and Hampshires. The facilities include a 10-unit farrowing house and outside lots and pastures for the brood sows. In addition there are 12 feeder units for student projects having a capacity of approximately 20 market hogs per unit. Student projects market between 400 and 500 market hogs each year.

The foundation breeding flock of sheep is made up of two breeds—Hampshire and Suffolk. From 20 to 40 breeding ewes are maintained in each of the breeds, giving the students an opportunity of carrying on typical purebred breeding operations. Opportunities are offered for work with a typical commercial sheep flock of 300 ewes. Students also have the opportunity of learning shearing and care of wool as well as lamb production.

The dairy herd includes purebred Jerseys, Guernseys, and Holsteins. Equipment includes all the necessary facilities for feeding and milking, care of calves and bulls, artificial insemination, milk testing, bottling, separating, and creamery operations. Students conducting dairy projects carry out their operations on a separate grade A dairy.

The poultry flock consists of between 3,500 and 4,000 birds. The equipment includes a modern incubator, egg-handling facilities, brooders and brooder houses, pens for trap-nesting and pedigree work, and related devices. A student assistant and the students themselves care for every operation under the supervision of the department head.

The Ornamental Horticultural Department occupies a unit consisting of ten greenhouses and five shade houses together with a sales unit and two large labs used for nursery instruction. Student projects are operated in all phases of nursery work. Equipment includes all of the essential machinery necessary for operation of a modern unit.

The Crop Science Department is well equipped with all types of machinery found on mechanized farms in California. All of the farming operations are carried on by the students under the supervision of the Crops and Farm Departments through project class work or paid student labor. Orchards, vineyards, crop land, fruit and vegetable packing facilities and marketing outlets are available for instructional purposes.

The Agricultural Engineering Department operating and servicing all of the mechanized equipment on the campus has many opportunities for students to learn practical farm machinery maintenance and repair. The major part of the maintenance work is handled by students under faculty supervision.
The primary function of the Agricultural Education Department is to provide for the preparation of teachers of agriculture for the public secondary schools of California. Specialized pre-professional and professional courses are offered for undergraduates and graduate students.

Students interested in teaching agriculture may receive a B.S. degree in any of the agricultural science production or management fields. Course work toward the teaching credential should be started early in order most effectively to complete the total curriculum.

An Agricultural Science major has been developed which includes a credential preparation program providing for early field experience and undergraduate student teaching. Graduates with a degree in Agricultural Science obtain a concentration of preparation in Animal Production, Plant Production, Agricultural Supplies and Services, Agricultural Mechanics, Agricultural Products and Processing, Ornamental Horticultural or Agricultural Resources Management.

Student teaching may also become a part of the graduate program for agriculture majors. Candidates have five years in which to complete 45 quarter units of post graduate course work necessary for the “clear” teaching credential, after receiving the preliminary teaching credential.

Agricultural education courses may be used to fulfill twenty-four of the forty-five units required for the Master of Science in Agriculture degree with a specialization in General Agricultural Sciences. Detailed information may be obtained in the office of the Dean of the School of Agriculture and Natural Resources.

**CURRICULAR CONCENTRATIONS**

**Animal Production**
A selection of courses stressing principles and practices related to the economic use of resources in the production of livestock and poultry.

**Plant Production**
A selection of courses stressing principles and practices related to the economic use of resources in the culture and production of agricultural plants.

**Agricultural Supplies and Services**
A selection of courses which stresses providing the consumable supplies and services needed in the production phase of agriculture.

**Agricultural Mechanics**
A selection of courses designed to develop knowledge and ability necessary to perform agricultural mechanical operations and processes.

**Agricultural Products and Processing**
A selection of courses concerned with the principles and practices involved in the science and technology of agricultural products.

**Ornamental Horticulture**
A selection of courses stressing the principles and practices involved with the culture of plants used for ornamental or esthetic purposes.

**Agricultural Resources Management**
A selection of courses stressing the principles and practices involved in the conservation, multiple use or improvement of natural resources.
### CURRICULUM IN AGRICULTURAL SCIENCE

#### Freshman

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>General Animal Science (Asci 230)</td>
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<tr>
<td>General Dairy Husbandry (DH 230)</td>
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<tr>
<td>Agronomic Production (CrCs 230/FrSc 230/VgSc 230)</td>
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<tr>
<td>Agricultural Mechanics (AE 121 or 122)</td>
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<tr>
<td>Agricultural Tractors and Equipment Skills (AE 141)</td>
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<tr>
<td>Introduction to Agricultural Education (AgEd 202)</td>
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<tr>
<td>General Botany (Bot 121)</td>
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<tr>
<td>General Zoology (Zoo 131)</td>
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<tr>
<td>Mathematics (Math 102/103 or 113/114)</td>
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<tr>
<td>Freshman Composition (Engl 104)</td>
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<td>Physical Education activity</td>
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To be selected in accordance with the General Education requirements.

#### Sophomore

<table>
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<tr>
<td>Soils (SS 121)</td>
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<tr>
<td>Agricultural Business Sales and Service (AM 201)</td>
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<tr>
<td>Ornamental Gardening (OH 230)</td>
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<tr>
<td>General Poultry Production (PI 230)</td>
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<tr>
<td>Manufacturing Processes (Weld 141, 142)</td>
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<tr>
<td>Agricultural Mechanics (AE 335 or 339)</td>
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<tr>
<td>F.F.A. Programs &amp; Activities (AgEd 303)</td>
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<tr>
<td>Supervised Agricultural Experiences (AgEd 339)</td>
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<tr>
<td>General Inorganic Chemistry (Chem 121, 122)</td>
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<tr>
<td>General Psychology (Pay 202)</td>
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<tr>
<td>Economics (Econ 201 or 211)</td>
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<tr>
<td>Principles of Speech (Sp 200)</td>
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Electives and courses to complete major

#### Junior

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<th>Course</th>
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<tbody>
<tr>
<td>Agricultural Marketing (AM 301)</td>
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<tr>
<td>Farm Records (AM 321)</td>
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<tr>
<td>Drug Education (PE 305)</td>
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<tr>
<td>Learning Process (Ed 335)</td>
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<tr>
<td>Multicultural Education (ED 301)</td>
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</table>

** Natural Science                                                   |   |   | 4 |
| American Government (PolSc 201)                                     |   |   | 3 |
| Growth of American Democracy (Hist 204)                             |   |   | 3 |
| The United States in World Affairs (Hist 205)                       |   |   | 3 |

** Literature or Philosophy                                          |   | 3 | 3 |

<table>
<thead>
<tr>
<th>Course</th>
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<tr>
<td>Advanced Composition (Engl 300)</td>
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<tr>
<td>Agriculture/Agricultural Education elective</td>
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</tbody>
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Agriculture courses to complete major

#### Senior

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Senior Project (Ag 461, 462)</td>
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<tr>
<td>Instructional Processes in Agricultural Education (AgEd 438)</td>
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<tr>
<td>Diagnosis, Prescription and Evaluation (Ed 436)</td>
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<tr>
<td>Practicum or Seminar (AgEd 441 or Ag 463)</td>
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<tr>
<td>Field Experience in Reading Methods (Ed 434)</td>
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</table>

** Humanities elective                                               |   | 3 |   |

** General Education elective                                        |   | 1 |   |

<table>
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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Agriculture/Agricultural Education elective</td>
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</table>

Electives and courses to complete major

** Students with Agricultural Mechanics Concentration take AE 335.  
** To be selected in accordance with the General Education requirements.
The Agricultural Engineering Department offers instruction to all students of the University in the technological and engineering phases of agriculture, including agricultural mechanics, power and machinery, processing soil and water, and surveying.

A student in this department may choose one of two majors: Agricultural Engineering or Mechanized Agriculture. Also available are a two-year technical certificate program in Mechanized Agriculture and specialized study in Maricultural Engineering (engineering support for sea farming).

AGRICULTURAL ENGINEERING MAJOR

A combination of engineering and agricultural courses designed to provide graduates with a technical and practical background for engineering support of agriculture. Opportunities are available in such diverse areas as prime movers, soil conditioning and moving equipment, harvesting and product handling equipment, products processing, agricultural structures. Water management opportunities are also available in such areas as irrigation drainage, hydrology, flood control, research and administration. The curriculum is accredited by the Engineer's Council for Professional Development.

MECHANIZED AGRICULTURE MAJOR

This major gives the student broad agricultural training with emphasis on the applied mechanical phases of agriculture. This curriculum is intended for the student who plans to own or manage a farm, teach vocational agriculture with emphasis on farm mechanics, or do sales and service work in the farm machinery and equipment field (wholesale or retail).

Two buildings containing eight laboratories and two classrooms, together with a large modern farm machinery and equipment building provide excellent facilities. A wide variety of tractors and farm machinery is available for class use and students are provided with ample opportunity for the application of mechanical and engineering know-how to practical production problems in using thousands of acres of university farms as a laboratory. Enterprise project activity is also encouraged.

There are two organized student clubs in the Agricultural Engineering Department. The student branch of the American Society of Agricultural Engineers offers an active program of professional and extra-curricular activity. The Agricultural Engineering Society, a student club composed of agricultural engineering and mechanized agricultural majors, is involved in a broad range of activities and services. These include a Homecoming float, tractor pull team, student scholarships, and Poly Royal displays.

CURRICULUM IN AGRICULTURAL ENGINEERING

<table>
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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Agricultural Mechanics (AE 128)</td>
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<tr>
<td>Power and Machinery (AE 143)</td>
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<tr>
<td>Engineering Surveying (AE 237)</td>
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<tr>
<td>Manufacturing Processes (MP 141, 142)</td>
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<tr>
<td>Analytic Geometry and Calculus (Math 141, 142, 143)</td>
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<tr>
<td>Freshman Composition (Engl 104, 105)</td>
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<tr>
<td>Applied Descriptive Geometry (ET 141)</td>
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<tr>
<td>Engineering Drawing Systems (ET 142)</td>
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</tr>
<tr>
<td>Soils (SS 121)</td>
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<tr>
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<tr>
<td>General Inorganic Chemistry (Chem 121, 122)</td>
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<tr>
<td>** Elective</td>
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<tr>
<td></td>
<td>16</td>
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</table>

* To be selected in accordance with the General Education requirements.

** At least 4 of the elective units must be selected from courses in the School of Agriculture and Natural Resources.
#### Sophomore

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Agricultural Structures Planning (AE 232)</td>
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<tr>
<td>Principles of Irrigation (AE 236)</td>
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<tr>
<td>Economics (Econ 211)</td>
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<td>Digital Computer Applications (Engr 251)</td>
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<td>Life science elective</td>
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<tr>
<td>Analytic Geometry and Calculus (Math 241)</td>
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<td>Differential Equations (Math 242)</td>
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<td>General Physics (Phys 131, 132, 133)</td>
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<td>Engineering Mechanics (ME 211, 212)</td>
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<td>Manufacturing Process (Weld 141, 142)</td>
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#### Junior

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<th>Course</th>
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<tbody>
<tr>
<td>Hydraulics (AE 312)</td>
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<tr>
<td>Hydrology (AE 315)</td>
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<td>Off-the-road Locomotion (AE 326)</td>
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<td>Agricultural Process Engineering (AE 327)</td>
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<td>Irrigation Theory (AE 331)</td>
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<tr>
<td>Engineering Properties of Agricultural Materials (AE 333)</td>
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<td>Dynamic Measurement (AE 338)</td>
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<td>Electrical Circuit Theory (EE 201)</td>
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<td>Electric Circuits Laboratory (EE 261)</td>
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<td>Thermodynamics (ME 302)</td>
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<td>Strength of Materials (Aero 208, 209)</td>
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<td>American Government (Pol Sc 201)</td>
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<tr>
<td>Statistical Analysis (Stat 321)</td>
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<td>* Humanities elective</td>
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<td>* Literature or philosophy elective</td>
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<td>Electives</td>
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<td><strong>Total</strong></td>
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#### Senior

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<th>Course</th>
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<tbody>
<tr>
<td>Agricultural Systems Engineering (AE 403)</td>
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<td>Irrigation Engineering (AE 414)</td>
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<td>Equipment Engineering (AE 421, 422)</td>
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<td>Agricultural Structures Design (AE 433)</td>
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<td>Senior Project (AE 461, 462)</td>
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<td>Undergraduate Seminar (AE 463)</td>
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<tr>
<td>Growth of American Democracy (Hist 204)</td>
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<td>U.S. in World Affairs (Hist 205)</td>
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<tr>
<td>Human Values in Engineering (Hum 402) or Science, Tech &amp; Pub Policy (Pol Sc 404)</td>
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<td>Engineering Economy (IE 414)</td>
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* To be selected in accordance with the General Education requirement.

** At least 4 of the elective units must be selected from courses in the School of Agriculture and Natural Resources.
**Mechanized Agriculture**

**CURRICULUM IN MECHANIZED AGRICULTURE**

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<td>Agricultural Tractors and Equipment Skills (AE 141)</td>
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<td>Agricultural Power and Machinery Management (AE 142)</td>
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<td>Algebra (Math 113)</td>
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<td>College Agebra (Math 114)</td>
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<td>Agricultural Power Transmission (AE 234)</td>
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<td>Principles of Speech (Sp 200)</td>
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<td>Irrigation (AE 340)</td>
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<td>Agricultural Equipment Projects (AE 344)</td>
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<td>Report Writing (Engl 218)</td>
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<td>Business Law Survey (Bus 201)</td>
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**Electives**

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**At least 4 of the elective units must be selected from courses in the School of Agriculture and Natural Resources.**

**8 units must be selected from courses in the School of Agriculture and Natural Resources.**
See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Agricultural Engineering and other subjects.

* To be selected in accordance with the General Education requirement.
+ 8 units must be selected from courses in the School of Agriculture and Natural Resources.
The Agricultural Management curriculum emphasizes training in management for careers in agriculture. The curriculum is based on a solid background in production agriculture which provides for depth and breadth in agricultural management techniques. The thrust of the program is to prepare young people for careers in the management and operations of farms as well as in the management procedures required by firms that supply the service to farms and by those engaged in processing, marketing, distribution and sales of farm products.

The Agricultural Management curriculum provides a choice of two options to meet the specialized needs of students: 1) Agricultural Business Management and 2) Farm Management. The courses required in these options are listed following the year by year presentation of the basic curriculum. Supporting courses include accounting, statistics, law, economics, as well as courses in general education areas of English, mathematics, history, political science and psychology.

Students are required to take a block of agricultural production courses which are closely related to obtaining a background in management techniques for agriculture.

The department also offers a two-year technical program in Agricultural Management.

Students can select courses in specific areas in addition to the two major directions of the program.

**CURRICULAR OPTIONS**

**Agricultural Business Management**

Career placement opportunities for graduates of this program involve management operations required by agribusiness firms providing supplies and service to farmers and by those firms engaged in marketing, distribution and sales of farm products. These careers include sales representatives for agricultural chemical organizations and fertilizer companies and may lead into more responsible management positions. Other careers are found in farm credit institutions, farm brokerage and property management firms, advertising, food chains, food processing, and agricultural county and district fairs.

**Farm Management**

Career placement opportunities for graduates of this option include management of farms, ranches, or feedyards in family businesses or on large-scale farms. Graduates are provided with the specialization needed to analyze and manage farm operations. Careers in farm appraisal are also available to these graduates.
## CURRICULUM IN AGRICULTURAL MANAGEMENT

### Freshman F W S

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit</th>
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<tbody>
<tr>
<td>Introduction to Agricultural Management (AM 101)</td>
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<tr>
<td>Introduction to Agricultural Economics (AM 102)</td>
<td>3</td>
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<tr>
<td>Mathematics (Math 113, 114)</td>
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<tr>
<td>Freshman Composition (Engl 114)</td>
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<tr>
<td>Physical Education</td>
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<tr>
<td>Calculator Operation for Agriculture (AM 140)</td>
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<tr>
<td>** Life Science</td>
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<tr>
<td>Crop Science elective</td>
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<td>Animal, Dairy or Poultry Science elective</td>
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<tr>
<td>* Electives</td>
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** 15 units must be selected in agriculture. Of these units, 9 must be in 300-400 level courses with prefixes other than AM.

### Sophomore

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Principles of Economics (Econ 211)</td>
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<tr>
<td>Agricultural Economics (AM 212)</td>
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<td>Agricultural Economic Analysis (AM 213)</td>
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<td>Principles of Accounting (Actg 221, 222)</td>
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<td>Elementary Probability and Statistics (Stat 211)</td>
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<td>Statistical Methods (Stat 212)</td>
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<tr>
<td>Computer Application to Agriculture (AM 250)</td>
<td>2</td>
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<td>Report Writing (Engl 218)</td>
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<td>Soil Science elective</td>
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<tr>
<td>Food Industries or Agr. Engineering elective</td>
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<tr>
<td>* Electives and courses to complete the option</td>
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### Junior

<table>
<thead>
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<tbody>
<tr>
<td>Agricultural Marketing (AM 301)</td>
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<tr>
<td>Agricultural Cooperative Organization and Management (AM 302)</td>
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<tr>
<td>Agricultural Credit and Finance (AM 310)</td>
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<tr>
<td>Agricultural Management and Government Policy (AM 312)</td>
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<td>Agricultural Management Research (AM 303)</td>
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<td>General Inorganic Chemistry (Chem 121, 122)</td>
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<tr>
<td>Science Elective (Life Science or Chem 226)</td>
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<tr>
<td>** Literature and/or Philosophy</td>
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<tr>
<td>General Psychology (Psy 202)</td>
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<tr>
<td>Principles of Speech (Sp 200)</td>
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<td>* Electives and courses to complete the option</td>
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### Senior

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Agricultural Labor Relations and Personnel Management (AM 401)</td>
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<td>Business Law (Bus 207)</td>
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<td>American Government (Pol Sc 201)</td>
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<tr>
<td>Growth of American Democracy (Hist 204)</td>
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<td>U.S. in World Affairs (Hist 205)</td>
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<td>** Humanities Electives</td>
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<tr>
<td>Senior Project (AM 461, 462)</td>
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<tr>
<td>Undergraduate Seminar (AM 463)</td>
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<tr>
<td>* Electives and courses to complete the option</td>
<td>7</td>
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</table>

** To be selected in accordance with General Education requirements.

*** To be selected from any 300-400 nonrequired AM course.
AGRICULTURAL BUSINESS MANAGEMENT OPTION
(Add Courses Below to Basic Curriculum)

Sophomore
AM 201 Agricultural Business Sales and Service .......... (3)
AM 203 Agricultural Business Organization ............ (3)

Junior
AM 322 Principles of Farm Management ................. (4)
AM 323 Agricultural Business Managerial Acctg. .......... (4)

Senior
AM 324 Agricultural Property Management .................. (4)
AM 404 Agricultural Marketing Management .............. (3)
AM 405 Agricultural Marketing Research Methods ....... (3)
AM 406 Agricultural Business Communication ............ (3)
AM 421 Agricultural Business Operations Analysis ........ (4)

FARM MANAGEMENT OPTION
(Add Courses Below to Basic Curriculum)

Sophomore
AM 305 Agricultural Resources .................. (3)
AM 322 Principles of Farm Management ................. (4)

Junior
AM 324 Agricultural Property Management ............... (4)
AM 326 Farm Appraisal .......................... (4)
AM 413 Crop Management Problems ................... (3)

Senior
AM 415 or 416 Livestock or Dairy Management Problems .... (3)
AM 431 Large Farm Accounting ........................ (4)
AM 433 Agricultural Price Analysis .................... (3)
AM 435 Linear Programming in Agriculture ............... (3)
The objective of the Animal Science Department is to educate men and women for the occupation of farming where beef cattle, horses, sheep, and swine enterprises are an important part of the industry. The majority of graduates from the department are engaged in the livestock and farming business or are employed as ranch workers or managers.

Livestock feeding yards, feed mills, auction sales companies, meat packers, commission firms, and other organizations servicing the livestock industry are sources of employment for graduates. Other employment fields include agricultural teaching, agricultural extension work, agricultural research in the areas of animal nutrition, genetics, and reproductive physiology. The department allows wide latitude in the selection of elective courses so that a student may pursue a secondary emphasis area or broaden the cultural base of his total college education.

The educational approach of the Animal Science Department is to provide students with instruction in theory and application of all phases of livestock production and range management. To this end the department maintains purebred and commercial instructional herds of the chief meat animal species, and a broodmare band of Thoroughbred and Quarter horses. The University herds and flocks are extensively used for laboratory and applied studies of management, feeding, breeding, and marketing techniques and procedures.

The student is encouraged to augment classroom and laboratory instruction through participation in the varied enterprise programs operated by the California Polytechnic State University Foundation. Through these programs large numbers of student-owned beef cattle, sheep and hogs are fed and marketed each year. Provision is also made to give the students an opportunity to own and manage, in partnership with the Foundation, a commercial cow herd and a prototype range band of ewes.

Instruction in the department also encompasses a diversified co-curricular program including three special interest clubs and the sponsorship of championship-calibre national intercollegiate teams in rodeo, livestock judging, and horse showing.

**CURRICULUM IN ANIMAL SCIENCE**

<table>
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<td>Feeds and Feeding (ASci 101)</td>
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<td>Market Beef Production (ASci 111)</td>
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<td>Elements of Swine Production (ASci 112)</td>
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<td>Elements of Sheep Production (ASci 113)</td>
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<td>Agricultural Mechanics (AE 121 or 122)</td>
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<td>Applied Beef Cattle Management (ASci 241)</td>
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<td>Applied Sheep Management (ASci 243)</td>
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| Total     | 18 | 16 | 17 |
### Animal Science

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<td>Agricultural Engineering electives</td>
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<td>General Inorganic Chemistry (Chem 121, 122)</td>
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<td>Organic Chemistry (Chem 226)</td>
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<td>Forage Crops (CrSc 123)</td>
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<td>Animal Hygiene (VS 302)</td>
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<td>Animal Parasitology (VS 203)</td>
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<td>General Psychology (Psy 202)</td>
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<td>Genetics (Bio 303)</td>
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<td>Reproductive Physiology (ASci 401)</td>
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<td>Animal Nutrition (ASci 402)</td>
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<td>Growth of American Democracy (Hist 204)</td>
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</tbody>
</table>

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Animal Science and other subjects.

† 20 units to be selected from courses in ASci, DH, FI, PI, VS. At least 7 units must be at the 300–400 level.

* To be selected in accordance with the General Education requirement.
Two major curricula are offered by the Crop Science Department and are designed to prepare students for field, fruit, or vegetable crop production and for employment in related service areas.

Graduates in both Crop Science and Fruit Science have attained responsible positions in agronomic and horticultural production, teaching, research, extension, quality control and inspection, and sales and service areas. Opportunities for employment in private industry and governmental sectors are available for those with practical knowledge of agricultural skills and techniques and a good background in the sciences and humanities.

The Department has 30 acres of productive citrus, grapes, and deciduous orchard with over 100 varieties represented. Additional non-bearing acreage for instructional use exists and new plantings are under way. About 300 acres are devoted to student production enterprises in field and vegetable crops. An additional 200 acres of campus farm cropland provide opportunities to gain experience through part-time employment. All departmental majors are encouraged to gain experience and earn income by participation in the project enterprise program or by working for the campus farm.

The technological phases of instruction are enhanced by packing and grading equipment, seed processing equipment, and specialized laboratory equipment for the study of various crops. Field trips supplement instruction for crops not common to the San Luis Obispo area.

Students interested in the two-year technical certificate should refer to the School of Agriculture and Natural Resources introductory statement. The department head can supply additional information.

CROP SCIENCE MAJOR

A student in the Crop Science major may elect to specialize in Agronomy, Vegetable Science, Plant Protection, or Agricultural Inspection in the junior and senior years. Employment opportunities for the students graduating in the Crop Science major include private or corporate crop production and management, sales and service, positions with commercial pest control firms, government regulatory agencies, and agriculture related organizations, and as agronomists and horticulturists with government or industry.

FRUIT SCIENCE MAJOR

The Fruit Science Major qualifies graduates for orchard or vineyard management or for related employment for packers or canners, fruit inspection, or plant protection. Instruction includes deciduous fruits, nut crops, citrus, avocados, grapes, berries, tropical and sub-tropical fruits, and minor fruit species. Students may elect to specialize in Fruit Science, Plant Protection, or Agricultural Inspection in the junior and senior years.
## Crop Science

### CURRICULUM IN CROP SCIENCE

#### Freshman

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Concepts of Crop Production (CrSc 131)</td>
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<td>Combine Harvest Crops (CrSc 132)</td>
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<td>Row Crops (CrSc 133)</td>
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<td>Commercial Seed Production and Processing (CrSc 231)</td>
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<td>Vegetable Crops Production (VgSc 232)</td>
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<tr>
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<td>Biochemistry (Chem 328)</td>
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<td>California Fruit Growing (FrSc 236)</td>
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<td>American Government (Pol Sc 201)</td>
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<td>Growth of American Democracy (Hist 204)</td>
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* Math 113 may be substituted for Math 102 and 103 with adviser approval.
†† To be selected from any 300-400 series course in AM.
# At least 12 units to be selected with the approval of the adviser from 300-400 series courses.
** To be selected in accordance with the General Education requirement.
### CURRICULUM IN FRUIT SCIENCE

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#### Sophomore

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<td>Plant Pathology (Bot 323)</td>
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<td>Weed Control (CrSc 221)</td>
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#### Junior

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<td>Experimental Techniques and Analysis (CrSc 411)</td>
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#### Senior

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<td>Plant Breeding (CrSc 304)</td>
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<td>Undergraduate Seminar (CrSc 463)</td>
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<td>Orchard Management (FrSc 437)</td>
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<td>General Field Crops (CrSc 230)</td>
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<td>American Government (Pol Sc 201)</td>
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<td>Growth of American Democracy (Hist 204)</td>
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<td>U.S. in World Affairs (Hist 205)</td>
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See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Crop Science, Fruit Science, Vegetable Science and other subjects.

* Math 113 may be substituted for Math 102 and 103 with adviser approval.
** To be selected from any 300-400 series course in AM.
‡ To be selected in accordance with the General Education requirement
DAIRY AND POULTRY SCIENCE DEPARTMENT

Department Head, Harmon B. Toone

Timothy J. LaSalle     Roland Pautz     Herman E. Rickard
Carl F. Moy           Gary D. Reif      Leo Sankoff

The dairy and poultry programs are combined under one department with two options in Dairy Science and a separate curriculum and major in Poultry Industry.

DAIRY SCIENCE MAJOR

The dairy curriculum is designed to prepare students for employment in the various phases of the dairy industry, including husbandry and manufacturing, as well as the related and allied fields. The basic curriculum is arranged to serve all students within the major with further courses included in the two options of husbandry and manufacturing to provide depth of instruction in either field.

The curriculum provides adequate elective units under either option for students to select additional courses in the sciences, business, education, or other areas of their choice to prepare them for advanced degrees in the field, teaching, or the business world of the dairy industry. Recommendations in these various areas will be given by faculty advisers.

Excellent facilities are provided for students selecting either of the options. The dairy herd includes purebred Jerseys, Guernseys, and Holsteins, located on a well-planned unit, where feeding, milking, calf raising, artificial insemination, and management are carried out. The campus creamery is a new and modern plant, well equipped with the most modern processing equipment. Students are employed on a part-time basis to work in both the production and processing areas. A separate dairy located on campus provides an opportunity for students with dairy projects. This farm accommodates 80-100 head of project cattle owned and cared for by students. There are two 8-unit dormitories at this project farm.

CURRICULAR OPTIONS

Husbandry

The Dairy Husbandry Option emphasizes the preparation of students in production and management areas of the industry, including the selection, management, feeding and breeding of dairy cattle, and efficient, economical milk production.

Manufacturing

The Dairy Manufacturing Option emphasizes preparation for participation in the processing and distribution field, including sales, quality control, field work and dairy inspection.

POULTRY INDUSTRY MAJOR

The function of the Poultry Industry major is to prepare students for a wide variety of positions in commercial poultry production and in the many allied services related directly to the industry. Opportunities in the industry are many and varied as evidenced by the fact that graduates have worked in more than fifty types of jobs in the industry.

The University has facilities for more than 5,000 birds on 12 acres of land. The plant maintains a commercial productive unit, with seven breeds and varieties of chickens, a turkey flock and a number of species of upland game birds. It has a 17,000 egg hatchery equipped to hatch eggs from quail size to turkeys; poultry dressing plant; egg handling and processing facilities, as well as many types of poultry-raising equipment commonly used in California.

Each poultry student has an opportunity to conduct commercially productive projects in market eggs, hatching eggs, broilers, started pullets and game birds which gives him additional experiences in the field of business transactions. Advanced students may have opportunities to conduct technical management or developmental problems.

Students interested in the two-year technical certificate should refer to the introductory statement for the School of Agriculture and Natural Resources, which describes this program. Detailed curriculum information is available from the department head.
### CURRICULUM IN DAIRY SCIENCE

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<td>Elements of Dairying (DH 121)</td>
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<td>Dairy Feeds and Feeding (DH 101)</td>
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<td>Dairy Foods Evaluation (DM 233)</td>
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<td>Biochemistry (Chem 328)</td>
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* To be selected in accordance with the General Education requirement.
Poultry Industry

HUSBANDRY OPTION
(ADD COURSES BELOW TO BASIC CURRICULUM)

Freshman
DH 142 Dairy Cattle Selection ............ (2)
SS 121 Soils ............................................. (4)

Sophomore
DH 222 Commercial Dairy Herd Management........................ (4)
VS 123 Anatomy and Physiology........... (3)
VS 302 Animal Hygiene......................... (3)

Junior
DH 301 Advanced Dairy Cattle Feeding........................................ (2)
DH 323 Breeds, Pedigrees and Management......................................... (4)
Bio 303 Genetics............................................. (3)
AM 321 Farm Records ............................................. (4)

Senior
DH 422 Breed and Selection of Dairy Cattle............................. (4)
ASci 402 Animal Nutrition ............................. (4)
AM 212 Agricultural Economics ...... (3)

MANUFACTURING OPTION
(ADD COURSES BELOW TO BASIC CURRICULUM)

Freshman
DM 132 Frozen Dairy Foods............... (4)
DM 334 Cheese Making ...................... (4)
DM 336 Butter and Dairy Spreads .... (4)
Bact 322 Dairy Bacteriology ................. (4)

Sophomore
DM 326 Fermented Dairy Foods
DM 433 Dairy Equipment and Systems

Senior
DM 431 Dairy Plant Management...... (4)
Actg 131-2 Basic Accounting.......... (6)

CURRICULUM IN POULTRY INDUSTRY

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<tr>
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<td>Poultry Feeding &amp; Nutrition (PI 123) ..................</td>
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|                |   |   |   |
| Sophomore      |   |   |   |
| Poultry Selection and Egg Production (PI 221) .................. | 2 |
| Poultry Production Processing & Marketing (PI 222) .................. | 3 |
| Poultry Incubation (PI 223) .................. | 2 |
| Poultry Plant Design & Equipment (PI 233) .................. | 2 |
| Agricultural Engineering or Welding .................. | 2 |
| Poultry Anatomy and Physiology (PI 231) .................. | 3 |
| Report Writing (Engl 218) .................. | 3 |
| Principles of Speech (Sp 200) .................. | 3 |
| Economics (Econ 201 or 211) .................. | 3 |
| ** Humanities elective ................................ | 3 |
| ** To be selected in accordance with General Education requirement.

90
### Poultry Industry

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<tr>
<td>Applied Poultry Breeding (PI 321)</td>
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<td>Hatchery Business Organization (PI 322)</td>
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<td>Poultry Diseases and Hygiene (PI 323)</td>
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<td>Dairy and Poultry Products Merchandising (DM 202)</td>
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<td>Agricultural Engineering</td>
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<td>Farm Records or Accounting (AM 321 or Actg 221)</td>
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<td>Agricultural Economics or Economics (AM 212 or Econ 212)</td>
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<td>Growth of American Democracy (Hist 204)</td>
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<tr>
<td>General Inorganic Chemistry (Chem 121, 122)</td>
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<td>Organic Chemistry (Chem 226)</td>
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<tr>
<td>Advanced Poultry Enterprise Supervision (PI 402)</td>
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<td>Turkey Industry (PI 421)</td>
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<td>16 16 16</td>
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</table>

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Dairy Husbandry, Dairy Manufacturing, Poultry Industry and other subjects.

* To be selected from Bus 201, FPM 310, IR 118, Mgt 311.
** To be selected in accordance with General Education requirement.
The Food Industries curriculum is designed to prepare students for employment in the various phases of the food industry. Instruction qualifies students for careers in production, quality control, food technology, marketing, and management.

The curriculum provides applied knowledge of the industry that will enable the graduate to accomplish production and management jobs connected with operations of the industry from field to market. Skills acquired in the operations aspects of the industry are coordinated with studies in science, business, and humanities.

The departmental laboratories include complete facilities for small scale commercial production of canned, frozen, dehydrated and concentrated fruit and vegetable products. Meats laboratories provide for complete processing of meat including slaughtering, cutting, curing, smoking and sausage manufacture.

Employment opportunities for graduates are excellent.

**CURRICULUM IN FOOD INDUSTRIES**

**Freshman**
- Survey of Food Industry (FI 101) ............................................... 2
- Introductory Food Engineering (FI 122) ................................... 3
- Elements of Food Preservation (FI 123) .................................. 3
- Meats (FI 210 or 209) .................................................................. 3
- Freshman Composition (Engl 104) ............................................. 3
- Report Writing (Engl 218) ......................................................... 3
- American Government (PolSc 201) ............................................. 3

  **Humanities elective** ............................................................... 3
  Mathematics (Math 113) ............................................................. 3
  Mathematics elective .................................................................... 3
  Physical Education Activity ......................................................... 1
  General Inorganic Chemistry (Chem 121, 122) ......................... 4
  Organic Chemistry (Chem 226) ...................................................... 4
  Principles of Speech (Sp 200) ................................................... 3
  Biochemistry (Chem 328) ............................................................ 4
  Economics (Econ 201 or 211) ..................................................... 3
  General Psychology (Psy 202) .................................................... 3
  Industrial Relations (IR 314) ....................................................... 3
  Plant science elective .................................................................. 4
  Nutrition (HE 210) ...................................................................... 3
  Business elective .......................................................................... 3

  **Electives** .................................................................................. 4

**Sophomore**
- Unit Processing Operations (FI 221, 222, 223) ......................... 3
- Processed Food Inspection (FI 233) ............................................ 3
- General Bacteriology (Bact 221) .................................................. 4
- Principles of Speech (Sp 200) ................................................... 3
- Biochemistry (Chem 328) ............................................................ 4
- Economics (Econ 201 or 211) ..................................................... 3
- General Psychology (Psy 202) .................................................... 3
- Industrial Relations (IR 314) ....................................................... 3
- Plant science elective .................................................................. 4
- Nutrition (HE 210) ...................................................................... 3
- Business elective .......................................................................... 3

To be selected in accordance with the General Education requirement.

At least 12 of the elective units must be chosen with adviser's approval.
## Junior

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<td>Statistical Quality Control (FI 332)</td>
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<td>Packaging (FI 336)</td>
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<td>Sanitation and Waste Disposal (FI 331)</td>
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<tr>
<td>Sausage, Smoked and Canned Meat (FI 338)</td>
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<td>Wines and Fermented Foods (FI 341)</td>
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<td>Food Microbiology (Bact 421)</td>
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<tr>
<td>Growth of American Democracy (Hist 204)</td>
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### Senior

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<td>Food Evaluation (FI 425)</td>
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<td>Food Processing Management (FI 433)</td>
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NATURAL RESOURCES MANAGEMENT DEPARTMENT

Department Head, Marvin J. Whalls
Jack E. Bedwell  Anthony E. Knable  Norman H. Pillsbury
Robert L. Feldman  Walter R. Mark  Robert Snyder
Melvin R. George

Natural resources are vital to the well-being of the nation. Increasing utilization of natural resources for economic uses and outdoor recreation is reflected in a demand for graduates prepared to assume positions of major responsibility. The Natural Resources Management Department prepares students for careers in the management and protection of our natural resources: water, forage, forests, fish and wildlife, wildlands, and recreational lands.

The basic curriculum in natural resources management provides courses in the foundation disciplines of agriculture, humanities, mathematics, and the natural, physical and social sciences. In addition to the basic curriculum, each student of natural resources management is required to complete a concentration of courses in a field of specialization. Pre-graduation employment in a natural resources area reinforces classroom and laboratory experiences, and enhances opportunities for post-graduate employment. Cal Poly cooperates with employers to maximize pre-graduation student employment.

Students are awarded the degree of Bachelor of Science upon completion of the program. Graduates enter employment with federal agencies such as Forest Service, Park Service, and Bureau of Land Management; state agencies such as Natural Resources, Parks and Recreation, and Fish and Game; local agencies such as Park Authorities, Regional Forests and County Parks; and private industry such as lumber companies, utility companies, hunting preserves, and rural recreational enterprises. Qualified graduates are prepared to pursue graduate studies in most universities.

The departmental facilities provide opportunity for development of skills necessary for natural resources management. Field practices utilize special campus sites and nearby public and private resource areas.

CURRICULAR CONCENTRATIONS

Environmental Services
The environmental services concentration prepares students for employment as environmental analysts in the emerging fields of resource planning, environmental protection, and quality control of wildlands, waters and wildlife habitat.

Fishery and Wildlife Management
The fishery and wildlife management concentration prepares students for employment in the fish and wildlife areas of law enforcement, management, and production.

Forest Resources Management
The forest resources management concentration prepares students for employment in forestry. Program emphasis is on forestry practices on chaparral, wood, and timber lands typical of southwestern United States where forage, fire control, watershed management, recreation, and wildlife are of paramount importance.

Parks and Recreation
The parks and recreation concentration prepares students for employment in the development, interpretation, and management of governmental and private resource oriented parks and recreational lands.

CURRICULUM IN NATURAL RESOURCES MANAGEMENT

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<tr>
<td>Recreation Systems and Management (NRM 112)</td>
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<tr>
<td>Introduction to Fisheries and Wildlife Management (NRM 120)</td>
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<td>Forest Resources (NRM 130)</td>
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<td>Agricultural Surveying (AE 131)</td>
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### Natural Resources Management

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<td>Introductory Plant Taxonomy (Bot 123)</td>
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<td>General Zoology (Zoo 131, 132)</td>
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<td>Mathematics (Math 114, 115, 131)</td>
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<td>Freshman Composition (Engl 104, 105)</td>
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<td>Health Education (PE 250)</td>
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<tr>
<td>Resource Planning (NRM 206)</td>
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<td>Introductory Physics (Phys 104)</td>
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<td>Physical Geology (Geol 201)</td>
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<td>Natural Resources Policy (NRM 302)</td>
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<td>Resource Law Enforcement (NRM 303)</td>
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<td>Ecology of Resource Areas (NRM 304)</td>
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<td>Environmental Interpretation (NRM 311)</td>
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<td>The United States in World Affair (Hist 205)</td>
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<td>Resource Law Methods (NRM 403)</td>
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<td>Aerial Photogrammetry (AE 345)</td>
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See COURSES OF INSTRUCTION section of this catalog for description of courses in Natural Resources Management and other subjects.

* Of the total elective units 29 must be chosen in a field of concentration with the approval of the advisor.
The ornamental horticulture curriculum offers the student a comprehensive preparation for attractive positions in the nursery, greenhouse, landscape, and florist industries. This includes both the production and sales-service areas of these major fields. The training stresses production and marketing of nursery plants, cut flowers, pot plants, and tropical foliage plants, landscape design, planting and supervision, and floral design and marketing.

Graduates of the Ornamental Horticulture Department qualify for management positions in nursery, greenhouse, and florist establishments, as well as supervisory positions in parks and grounds. Many of the graduates enter the field of teaching. Some of the most popular areas of employment include plant propagation, nursery sales, cut flower and pot plant production, greenhouse management, landscape design, landscape contracting and maintenance, the field of advising for fertilizer and pesticide companies, and floral design and floral shop management.

The facilities of the department include a student-operated commercial greenhouse range and nursery in which students carry on a project program involving wholesale and retail sales; and a student-operated florist shop in which the students design and sell floral pieces. Also included are 26,600 square feet of glasshouses, 7,500 square feet of shadehouses, coldframes, seedbeds, and an extensive field-growing and container-growing area. Large, modern, well-equipped laboratories adjoin the greenhouse range. Over 200 acres of landscaped campus area serve as an outdoor laboratory. The campus is planted with many interesting and unusual trees and shrubs from all over the world, as well as a large number of native plant materials.

Also available are the latest models of equipment necessary in nurseries, greenhouses, parks and grounds, landscaping, and florist shops. An extensive list of periodicals covering the field of ornamental horticulture is available to students. Through the staff, affiliation in several national and state horticultural organizations is maintained.

Students interested in the two-year technical certificate should refer to the introductory statement for the School of Agriculture and Natural Resources which describes this program. Detailed curriculum information is available from the department head.

**CURRICULAR CONCENTRATIONS**

*Floriculture and Design*
This concentration is designed to educate the student in the production and management of floriculture crops and the use of these crops in floral design.

*Landscape Industry*
This concentration is designed to educate the student to be versatile in the fields of landscape installation and management.

*Nursery Management*
This concentration is designed to prepare the student for production and management work in the nursery industry. Its main courses in the curriculum are propagation and management.
# Ornamental Horticulture

## CURRICULUM IN ORNAMENTAL HORTICULTURE

### Freshman

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<th>Course</th>
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<td>Fundamentals of Ornamental Horticulture (OH 131, 132, 133)</td>
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<td>Ornamental Horticulture Drafting and Sketching (OH 124)</td>
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<td>Soils (SS 121)</td>
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<tr>
<td>Agricultural Mechanics (AE 121)</td>
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<tr>
<td>Ornamental Hort. Construction (OH 126)</td>
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<tr>
<td>Agricultural Surveying (AE 131)</td>
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<td>Agricultural Tractors &amp; Equipment Skills (AE 141)</td>
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<tr>
<td>English Composition (Engl 114)</td>
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<td>Mathematics (Math 102, 103, or 113, 114)</td>
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<tr>
<td>General Botany (Bot 121, 123)</td>
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<td>Physical Education electives</td>
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<td><strong># Electives and courses to complete major</strong></td>
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### Sophomore

<table>
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<th>Course</th>
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<tbody>
<tr>
<td>Plant Materials (OH 231, 232, 233)</td>
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<td>Principles of Landscape Design (OH 223)</td>
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<tr>
<td>Entomology (Ent 220 or CrSc 311)</td>
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<tr>
<td>Fertilizers (SS 221)</td>
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<tr>
<td>Public Speaking (Sp 200)</td>
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<tr>
<td>Economics (Econ 201 or 211)</td>
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<td>General Psychology (Psy 202)</td>
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<tr>
<td>Report or Tech. Writing (Engl 218 or 219)</td>
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### Junior

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<tr>
<td>Diseases and Pests of Orn. Plants (OH 327)</td>
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<tr>
<td>Ornamental and Forest Pathology (Bot 324)</td>
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<td>Basic Accounting (Actg 131, 132)</td>
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<tr>
<td>American Government (Pol Sc 201)</td>
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<tr>
<td>General Inorganic Chemistry (Chem 121, 122)</td>
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<td>Business Law Survey (Bus 201)</td>
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<td>Approved science elective</td>
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<td><strong># Electives and courses to complete major</strong></td>
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### Senior

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<th>Course</th>
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<tr>
<td>Senior Project (OH 461, 462)</td>
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<td>Undergraduate Seminar (OH 463)</td>
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<tr>
<td>Management elective (AM 300-400)</td>
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<tr>
<td>Survey of Organic Chemistry (Chem 226)</td>
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<tr>
<td>* Literature, Philosophy</td>
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<td>* Humanities elective</td>
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<tr>
<td>Growth of American Democracy (Hist 204)</td>
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<tr>
<td>U.S. in World Affairs (Hist 205)</td>
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<tr>
<td>Fruit Science elective (200-400 level)</td>
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<td><strong># Electives and courses to complete major</strong></td>
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</table>

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Ornamental Horticulture and other subjects.

# Of the total elective units 26-29 must be chosen in a field of concentration with the approval of the advisor. To be chosen in accordance with the General Education requirement.
The curriculum of the Soil Science Department prepares graduates for employment in professional positions encompassing the various fields of agriculture, such as soil conservationists, land appraisers, fertilizer distributors, farm advisers, farm managers, farm operators or agriculture teachers, and highly specialized positions such as those of soil surveyors, laboratory technicians, college instructors, and soil specialists.

Facilities of the department have been developed to provide laboratory and glasshouse space and equipment to emphasize the utilization of classroom knowledge in a practical work situation. The use of demonstration plots and the application of accepted cultural practices on the campus farm are among the methods utilized to bridge the gap between the classroom and working experiences.

Students who elect to major in soil science have the opportunity to study in the foundation disciplines of agriculture, humanities and science. The students who select courses in soil science as electives will obtain an essential understanding of the important relationship between man and the soil in regard to meeting the demands for a higher productive capacity for food and fiber.

Students interested in the two-year technical certificate should refer to the introductory statement of the School of Agriculture and Natural Resources which describes the program. Detailed curriculum information is available from the department head.

**CURRICULUM IN SOIL SCIENCE**

<table>
<thead>
<tr>
<th>Freshman</th>
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<tr>
<td>Orientation in Soil Science (SS 100)</td>
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<td>Soils (SS 121)</td>
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<tr>
<td>Soil Management (SS 122)</td>
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<tr>
<td>Soil Materials (SS 123)</td>
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<td>Crop Science elective</td>
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<tr>
<td>Animal Production (ASci 230 or DH 230 or PI 230)</td>
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<td>Agricultural Surveying (AE 131)</td>
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<td>General Inorganic Chemistry (Chem 121, 122)</td>
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<td>Freshman Composition (Engl 104, 105 or 218)</td>
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<tr>
<td>§ Mathematics</td>
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<td>General Botany (Bot 121)</td>
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<tr>
<td>Health Education (PE 250)</td>
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§ A minimum of 9 units shall be chosen with the approval of the adviser from 100 or 200 series courses in mathematics.
### Sophomore

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Soil Conservation (SS 202)</td>
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</tr>
<tr>
<td>Fertilizers (SS 221)</td>
<td>4</td>
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<tr>
<td>Fruit Science elective</td>
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</tr>
<tr>
<td>Ornamental Horticulture elective</td>
<td>3</td>
</tr>
<tr>
<td>Irrigation (AE 340)</td>
<td>4</td>
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<tr>
<td>Introduction to Natural Resources (NRM 101)</td>
<td>3</td>
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<td>§ Mathematics</td>
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<td>Organic Chemistry (Chem 226)</td>
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<td>Biochemistry (Chem 328)</td>
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<td>Economics (Econ 201 or 211)</td>
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<td>Physical Education Activity</td>
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<tr>
<td>American Government (Pol Sc 201)</td>
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<tr>
<td>Growth of American Democracy (Hist 204)</td>
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<td>Physics (Phys 104 or 121)</td>
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### Junior

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Soil Classification (SS 321)</td>
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<tr>
<td>Soil Fertility (SS 322)</td>
<td>3</td>
</tr>
<tr>
<td>Land Use Planning (SS 433)</td>
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<tr>
<td>Farm Records (AM 321) or Basic Accounting (Actg 131)</td>
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<tr>
<td>† Management elective</td>
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<td>†† Botany elective</td>
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<tr>
<td>General Bacteriology (Bact 221)</td>
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</tr>
<tr>
<td>General Entomology (Ent 326) or Insect Control (CrSc 311)</td>
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</tr>
<tr>
<td>U.S. in World Affairs (Hist 205)</td>
<td>3</td>
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<tr>
<td>Principles of Speech (Sp 200)</td>
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<td>Literature philosophy elective</td>
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<tr>
<td>Experimental Techniques and Analysis (CrSc 411)</td>
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### Senior

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Soil Microbiology (SS 422)</td>
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<td>Soil Chemistry (SS 423)</td>
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<tr>
<td>Soil Physics (SS 432)</td>
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<tr>
<td>Senior Project (SS 461, 462)</td>
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<tr>
<td>Undergraduate Seminar (SS 463)</td>
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<tr>
<td>** Approved Social Sciences Course</td>
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<tr>
<td>Literature philosophy elective</td>
<td>3</td>
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<tr>
<td>†† Botany elective</td>
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<tr>
<td>** Humanities elective</td>
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<tr>
<td>† Management elective</td>
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<tr>
<td>Electives</td>
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### Notes

- A minimum of 9 units shall be chosen with the approval of the adviser from 100 or 200 series courses in mathematics.
- † To be selected from any 300–400 series course in AM, or Bus. Adm.
- †† To be selected from Bot 322, 323, 325, or 123.
- ** To be selected in accordance with the General Education requirement.
- See COURSES OF INSTRUCTION section of this catalog for description of courses in Soil Science and other subjects.
The Veterinary Science Department offers basic veterinary science courses for students enrolled in the animal science and dairy science majors. Veterinary science courses are open for elective credit to students who have completed the required prerequisites. Consultative services are offered to students pursuing pre-veterinary training as a complement to their major field of study. The department also provides veterinary service for the University's animal resources, meat inspection, and preventive medicine related to the potentials for zoonotic disease.
School of Architecture
and Environmental Design
The School of Architecture and Environmental Design offers five interacting bachelor of science degree programs: Architecture, Architectural Engineering, City and Regional Planning, Construction, and Landscape Architecture. The student is kept aware that these programs have a common objective and that they are all aimed at the betterment of human physical environment. These programs endeavor to give the student a set of social values, a technical background, and a training which result in creative expressions that are effective both professionally and personally.

Two graduate programs are offered: the Master of Architecture is designed for the person who seeks registration as a licensed professional architect; the Master of City and Regional Planning is designed for the person who aspires for a planning position at the professional level.

The excellent School facilities include design laboratories, dark rooms, soils laboratory, stress laboratory, shops, construction yard, project yard and grading galleries. An outlying area of 12 acres known as the "Canyon" is available for extensive experimental construction. The location of the campus between the great population centers of San Francisco and Los Angeles is ideal for an environmental design school in that it permits concentration and provides for environmental studies ranging from rural to large metropolitan complexes. There is a continual stream of visiting instructors. Field trips are arranged to various parts of the State as required work.

The School is a Member of the Association of Collegiate Schools of Architecture and maintains a Student Chapter of the American Institute of Architects and Scarab, the professional architectural fraternity. Likewise, student chapters of the American Institute of Planners, the Engineering Grading Contractors Association, and the Construction Specification Institute are active and maintain liaison between the respective professional organizations and the School.

All student work submitted for course credit becomes School property and will be returned only at the discretion of the instructor.
Common Coursework

The first two years of all five programs contain much common material and develop basic skills and background. Students who are unsure of their degree objective should consult with their advisors in order to maintain programs of study which will keep their options flexible.

The prospective transfer student can best prepare for architecture, architectural engineering or construction by taking equivalent Mathematics, Physics and other General Education courses. Wherever possible, the student should prepare including as much as possible of the following: 24 semester units of introductory architectural courses: Perspective 2, Freehand Drawing 1, Basic Graphics 2, Architectural Design 10, Materials of Construction 2, Architectural Drafting 4.

CURRICULUM IN ARCHITECTURE

The objective of this four year program which leads to a Bachelor of Science degree in Architecture is to develop design and related technical skills necessary as a base for entry into a broad range of environmental design disciplines. As these skills are related to the solving of problems of the built environment involving people, the designer is also required to develop an understanding and sensitivity to human needs. This degree or an equivalent program is prerequisite for acceptance into the Master of Architecture program, which in turn leads to professional registration as an architect. The Master of Architecture degree is accredited by the National Architectural Accrediting Board (NAAB).

Freshman

<table>
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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Intro to Architecture and Environmental Design (EDes 101)</td>
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<tr>
<td>Descriptive Drawing (Edes 110)</td>
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<td>Introduction to Drawing and Perspective (EDes 111)</td>
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<td>Basic Graphics (EDes 112)</td>
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<td>Materials of Construction (Arch 106)</td>
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<td>Analytic Geometry and Calculus (Math 141, 142, 143)</td>
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<td>Engineering Surveying (AE 237)</td>
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<td>Freshman Composition (Engl 104)</td>
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<td>General Psychology (Psy 202)</td>
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<tr>
<td>American Government (Pol Sc 201)</td>
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<td>Growth of American Democracy (Hist 204)</td>
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Sophomore

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<td>Introduction to Environmental Design Science (EDes 221)</td>
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<td>Principles of Site Analysis (EDes 213)</td>
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<tr>
<td>or Introduction to Urban Environment (CRP 211)</td>
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<td>Digital Computer Applications (EDes 250)</td>
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<td>Architectural Practice (Arch 231, 232)</td>
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<tr>
<td>Structures (ArcE 221, 222, 223)</td>
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<tr>
<td>Introduction to Urban Environment (CRP 212)</td>
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<td>General Physics (Phys 133 or 137)</td>
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<td>Survey of Economies (Econ 201)</td>
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<td><strong>Philosophy elective</strong></td>
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<td><strong>Life Science elective</strong></td>
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<td><strong>Total</strong></td>
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**To be selected with advisor approval.
*To be selected in accordance with the General Education requirements.
Architectural Engineering

Junior

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<th>Course</th>
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<tbody>
<tr>
<td>History of Architecture (Arch 317, 318, 319)</td>
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<td>Architectural Practice (Arch 341, 342, 343)</td>
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<tr>
<td>Architectural Design (Arch 351, 352, 353)</td>
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<tr>
<td>Structures (ArcE 321, 322, 323)</td>
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<tr>
<td>Stress Analysis Laboratory (ArcE 301)</td>
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<td>Building Support Systems (Arch 308, 309)</td>
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Senior

<table>
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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Senior Project (Arch 461, 462)</td>
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<td>Undergraduate Seminar (EDes 463)</td>
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<tr>
<td>Architectural Practice (Arch 441, 442, 443)</td>
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<td>Architectural Design (Arch 451)</td>
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<tr>
<td>Social Science elective</td>
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<td>Electives</td>
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15 15 14

CURRICULUM FOR THE MASTER
OF ARCHITECTURE DEGREE

(For University requirements see the Graduate Studies Announcement)

<table>
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<tr>
<th>Course</th>
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<tbody>
<tr>
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<td>Courses at 400 and 500 level in the School of</td>
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72

CURRICULUM IN ARCHITECTURAL ENGINEERING

The four year program in Architectural Engineering leads to the Bachelor of Science degree and has its major emphasis in the structural engineering of buildings. The curriculum is creative in purpose with aptitudes in science and mathematics recommended. Students of architectural engineering are educated with architects in a way to give their work the same dedication. Graduates of this program will in general seek professional registration as civil and structural engineers. The Architectural Engineering curriculum is accredited by the Engineers Council for Professional Development (ECPD).

Freshman

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City and Regional Planning

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Sophomore

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Junior

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<td>Soil Mechanics (ArcE 421)</td>
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Senior

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** To be selected with advisor approval.
* To be selected in accordance with the General Education requirements.
The four year curriculum leading to a Bachelor of Science degree in City and Regional Planning is directed to the professional field which guides and designs the communities wherein we live. Inasmuch as the education of the student of planning is associated with that of the architect and the engineer, the program has an additional emphasis on design of the physical environment as well as on the process of planning. Concern with the activities of people and their values is essential. The degree in City and Regional Planning is “recognized” by the American Institute of Planners.

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**Sophomore**

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*To be selected in accordance with the General Education requirements.

**To be selected with adviser approval.
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**CURRICULUM FOR THE MASTER OF CITY AND REGIONAL PLANNING**

(For University requirements see the Graduate Studies Announcement)

Courses, or equivalents, to be completed prior to acceptance for graduate study:

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Depending on individual student preparation 5-8 courses from the following:

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Unit Range                                               15-33

Required:

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Approved electives to develop specialization           21-39

90
**CURRICULUM IN CONSTRUCTION**

The four year program in Construction leads to the Bachelor of Science Degree. Major emphasis is placed on organizing and managing the construction phase of society’s efforts to improve the environment. The constructor is an important member of the building team and requires a professional knowledge of techniques, materials, equipment, job planning and cost control to add to the contributions of the planning and design professions. Graduates of this program can help supply the urgent needs of the construction industry and its related fields.

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<tr>
<td>General Physics (Phys 133 or 137) .........................................</td>
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<tr>
<td>Survey of Economics (Econ 201) .............................................</td>
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<tr>
<td><strong>Philosophy elective</strong> ................................................................</td>
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<td><strong>Life Science elective</strong> ................................................................</td>
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<tr>
<td><strong>Literature elective</strong> ..................................................................</td>
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<tr>
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<table>
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<th>Junior</th>
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<tr>
<td>Construction Practice (Cstr 341, 342, 343) ..................................</td>
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<td>Stress Analysis Laboratory (ArcE 301) .......................................</td>
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<td>Structures (ArcE 321, 322, 323) ............................................</td>
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<td>Building Support Systems (Arch 308, 309) ...................................</td>
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<td>General Chemistry (Chem 124) ..................................................</td>
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<td>Basic Accounting (Actg 131) ...................................................</td>
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<tr>
<td>Business Law Survey (Bus 201) ...............................................</td>
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<tr>
<td>Mathematics of Statistics (Stat 321) ......................................</td>
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<td>Industrial Relations (IR 314) .............................................</td>
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<tr>
<td><strong>Humanities elective</strong> ..................................................................</td>
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<td><strong>Total</strong></td>
<td>15</td>
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</table>

**To be selected with adviser approval.**

**To be selected in accordance with the General Education requirements.
**CURRICULUM IN LANDSCAPE ARCHITECTURE**

This four-year program, which leads to a Bachelor of Science degree in Landscape Architecture, is recognized by the California Board of Landscape Architects, and is accredited by the American Society of Landscape Architects. Emphasis is placed on the design and functional organization of open space and the conservation and revitalization of both the natural and urban landscapes at scales ranging from domestic units to systems of urban, rural and regional land use. The program will prepare landscape architects to work with architects, engineers and planners in the design of a diversity of functional spaces for human use and enjoyment.

<table>
<thead>
<tr>
<th>Freshman</th>
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<tbody>
<tr>
<td>Intro to Architecture and Environmental Design (EDes 101)</td>
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<tr>
<td>Descriptive Drawing (EDes 110)</td>
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<tr>
<td>Introduction to Drawing and Perspective (EDes 111)</td>
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<tr>
<td>Basic Graphics (EDes 112)</td>
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<tr>
<td>Materials of Construction (Arch 106)</td>
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<td>Finite Math for Gen Education (Math 110)</td>
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<td>Finite Math for Business (Math 210)</td>
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<tr>
<td>Structure and Behavior of Matter (PSc 101)</td>
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<tr>
<td>General Botany (Bot 121)</td>
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<td>Physical Geology (Geol 201)</td>
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<td>Freshman Composition (Engl 104)</td>
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<td>Written or Oral Communication</td>
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<td>Engineering Surveying (AE 237)</td>
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<td>American Government (PolSc 201)</td>
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<td>Growth of American Democracy (Hist 204)</td>
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<td>U.S. in World Affairs (Hist 205)</td>
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<td>Soils (SS 121)</td>
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<td>Environmental Design Fundamentals (EDes 201, 202, 203)</td>
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<td>Principles of Site Analysis (EDes 213)</td>
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<td>Digital Computer Applications (EDes 250)</td>
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<tr>
<td>Introduction to Landscape Architecture (LA 201)</td>
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<td>Landscape Architecture Practice (LA 231)</td>
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<td>Introduction to Urban Environment (CRP 212)</td>
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<tr>
<td>Structures for Landscape Architects (ArcE 311)</td>
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<tr>
<td>Landscape Plants (OH 237, 238, 239)</td>
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<td>Native Plant Materials (Bot 238)</td>
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<td>Human Ecology (Bio 301)</td>
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<tr>
<td>Introduction to Sociology (Soc 105)</td>
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<tr>
<td>Introduction to Conservation (Cons 311)</td>
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<td>Survey of Economics (Ec 201)</td>
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<td>Physical Education activity</td>
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**To be selected with adviser approval.**
### Architecture

#### Junior

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<th>Course</th>
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<td>Landscape Architecture Theory (LA 301)</td>
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<td>History of Landscape Architecture (LA 317)</td>
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<td>Landscape Practice (LA 341, 342, 343)</td>
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<td>Landscape Plant Composition (LA 347)</td>
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<td>Design for Landscape Architects (LA 351, 352, 353)</td>
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<td>Approved technical elective</td>
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<tr>
<td>Implementation of Landscape Design (OH 451, 452)</td>
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<tr>
<td>Irrigation, Drainage and Grading Practices (AE 337)</td>
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<tr>
<td>Business Law Survey (Bus 201)</td>
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<tr>
<td>Urban Sociology (Soc 313)</td>
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15 15 15

#### Senior

<table>
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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Professional Practice (LA 441)</td>
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<tr>
<td>Design for Landscape Architects (LA 451, 452, 453)</td>
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<td>Senior Project (LA 461, 462)</td>
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<td>Undergraduate Seminar (EDes 463)</td>
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<td>* Literature elective</td>
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<td>* Philosophy elective</td>
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<td>Electives</td>
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</table>

15 15 15

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Architecture, Architectural Engineering, City and Regional Planning, Construction, Environmental Design, Landscape Architecture, and other subjects.

*To be selected in accordance with the General Education requirements.*
School of Business
**SCHOOL OF BUSINESS**

Roy E. Anderson, Acting Dean

The primary objective of the School of Business is education for business administration. The School of Business seeks to equip its majors with basic knowledge, analytical skills, and attitudes essential to employment in business, government, and other responsible positions in our society, and to serve students throughout the University by providing them with an understanding of the business and economic world in which they live.

To achieve these goals, the School is organized into four departments—Accounting, Business Administration, Economics, and Management. This organization recognizes that education for business requires the interaction of business specialists with faculty in supporting disciplines to provide ability to function in the socio-economic environment in which business exists.

The School offers programs leading to degrees of Bachelor of Science in Business Administration, Master of Business Administration, and Bachelor of Science in Economics. A pre-law advisement service is available to all University students.

The School’s educational philosophy follows the Cal Poly tradition—that of enlisting maximum student involvement in the learning process through career-oriented study, special projects, and internships. Educational programs are designed to help the student achieve maximum personal development, to prepare the student for entry into the business world, and to foster citizenship, leadership, and constructive community living. The curriculum includes general education requirements and specialized studies in the student’s major field. Optional areas of concentration within each major enable the student to select the program most closely suited to the chosen career field.

**CURRICULUM FOR THE MASTER OF BUSINESS ADMINISTRATION DEGREE**

(For University requirements see the Graduate Studies Announcement)

The following are normally taken as undergraduate electives or requirements prior to acceptance for graduate study:

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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<tbody>
<tr>
<td>CSc 100, 140 Data Processing</td>
<td>(2) (2)</td>
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<tr>
<td>Bus 201 Business Law Survey</td>
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<tr>
<td>Econ 211, 212 Principles of Economics</td>
<td>(3) (3)</td>
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<tr>
<td>Mktg 204 Principles of Marketing</td>
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<tr>
<td>Math 221 or 141 Calculus</td>
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Integrated Program:

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Actg 510 Foundations in Accounting</td>
<td>4</td>
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<tr>
<td>Mgt 530 Foundations in Management</td>
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<tr>
<td>Actg 501 Accounting for Planning and Control</td>
<td>4</td>
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<tr>
<td>Mktg 508 Marketing Management I</td>
<td>4</td>
</tr>
<tr>
<td>Mgt 527 Quantitative Methods I</td>
<td>4</td>
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<tr>
<td>Econ 511 Micro-Economics</td>
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<tr>
<td>FPM 525 Business Finance</td>
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<tr>
<td>Econ 512 Macro-Economics</td>
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<tr>
<td>Bus 506 Business and Society</td>
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<tr>
<td>IR 584 Seminar in Human Resources Management</td>
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<tr>
<td>Mgt 581, 582, 583 Seminar in Applied Decision Making (4, 4, 4)</td>
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Electives:

Fifteen units to be selected with advisory committee approval from the following courses:

<table>
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<tr>
<th>Course</th>
<th>Units</th>
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<tbody>
<tr>
<td>Actg 500, Bus 500, Bus 526, FPM 522, IR 518, Mgt 500, Mgt 513, Mgt 528, Mktg 566, Econ 500, Econ 513, Econ 582, Stat 540, Math 540</td>
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</table>

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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<tbody>
<tr>
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</table>
The primary objective of the Accounting Department is to prepare students for high-level careers in public, industrial, and governmental accounting. This is accomplished through a) a broad base of general education to provide an awareness of a person's physical and social environment; b) a common core of business study to provide a general understanding of disciplines such as management, marketing, finance, and economics; c) training in entry-level technical skills, and d) exploration in depth of issues facing accountants in matters of theory, practice, and ethics. The Department also provides courses on a service basis for many other departments of the University. The degree awarded is the Bachelor of Science in Business Administration with a concentration in Accounting.

**CURRICULUM IN ACCOUNTING**

<table>
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<tr>
<th>Freshman</th>
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<tbody>
<tr>
<td>The Business Enterprise (Bus 101)</td>
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<tr>
<td>Introduction to Human Relations in Business (IR 118)</td>
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<td>English Composition (Eng 114, 115)</td>
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<td>Principles of Speech (Sp 200)</td>
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<tr>
<td>Physical Education activity</td>
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<tr>
<td>Health Education (PE 250)</td>
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<tr>
<td>* Natural Sciences</td>
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<td>Finite Mathematics for General Education (Math 110)</td>
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<td>Finite Mathematics for Business (Math 210)</td>
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<tr>
<td>Calculus for Business and Economics (Math 221)</td>
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<td>Data Processing (CSc 100)</td>
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<tr>
<td>Business Data Processing (CSc 140)</td>
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*To be selected in accordance with the General Education Requirements.*
## Sophomore

<table>
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<th>Course Description</th>
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<tbody>
<tr>
<td>Micro/Macro of Economics (Econ 221, 222)</td>
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<tr>
<td>Principles of Accounting (Actg 221, 222)</td>
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<tr>
<td>American Democracy and World Affairs (Hist 206)</td>
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<tr>
<td>Social Sciences (Geog 315, Ant 201, Soc 105, or Soc 201)</td>
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<tr>
<td>Traditional Logic/Modern Logic (Phil 221 or 222)</td>
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- **Natural Sciences** 3
- **Elementary Probability and Statistics (Stat 211)** 3
- **Statistical Methods (Stat 212)** 3
- **Business Law (Bus 207)** 4
- **General Psychology (Psy 202)** 3
- **American Government (PolS 201)** 3
- **Electives** 3

| Total | 17 | 17 | 3 |

## Junior

<table>
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<th>Course Description</th>
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<td>Industrial Relations (IR 314)</td>
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<td>Money, Banking and Credit (Econ 337)</td>
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<td>Managerial Accounting (Actg 301)</td>
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<td>Financial Management (FPM 342)</td>
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<td>Marketing Analysis I (Mktg 301)</td>
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<td>Management Process—Theory and Practice (Mgt 312)</td>
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<td>Corporate Communication (Eng 310)</td>
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<td>Management Applications of Data Processing (Mgt 321)</td>
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<td>Tax Accounting (Actg 304)</td>
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<td>Intermediate Accounting (Actg 321, 322)</td>
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**Electives and courses to complete the major** 1

| Total | 16 | 16 | 5 |

## Senior

<table>
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<tr>
<th>Course Description</th>
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<td>Organizational Behavior (IR 415)</td>
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<td>Business Strategy and Policy (Mgt 413, 414)</td>
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<td>Business Research (Bus 419)</td>
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<td>Senior Project (Actg 460)</td>
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<td>Government Regulation of Business (Bus 404)</td>
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* **Literature** 4

**Electives and courses to complete the major** 5

| Total | 16 | 16 | 10 |

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Accounting, Business, Finance and Property Management, Industrial Relations, Management, Marketing and other subjects.

* To be selected in accordance with the General Education Requirements.

** Total of 16 units of Accounting electives must be chosen with the approval of the Accounting Adviser.
The Department offers an undergraduate program leading to the Bachelor of Science Degree in Business Administration with concentrations available in Finance and Property Management and in Marketing Management.

The objectives of the Business Administration Department are to provide a level of education that will qualify graduates for entry-level positions in the fields of marketing, finance or real estate. Within the concentrations there is sufficient flexibility to allow each student the opportunity to develop proficiency in subject matter basic to an occupational goal.

The Department provides service courses to many departments of the University, notably in business law and marketing, in addition to the required core courses in the School of Business.

**CURRICULAR CONCENTRATIONS**

**Finance and Property Management**
This concentration is designed as a flexible program for the student wishing to pursue opportunities in the fields of finance and real estate.

**Marketing Management**
Marketing includes all macro and micro activities involved in directing the flow of goods and services from producers through intermediate processors to ultimate consumers. This concentration emphasizes management of organization marketing activities in coordination with all other activities to accomplish organization objectives.

**CURRICULUM IN BUSINESS ADMINISTRATION**

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<th>Freshman</th>
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<td>Human Relations (IR 118)</td>
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<td>Finite Mathematics for Business (Math 210)</td>
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<td>Data Processing (CSc 100)</td>
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*To be selected in accordance with the General Education requirement.*
Sophomore

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<td>General Psychology (Psy 202)</td>
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Junior

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<td>Money, Banking and Credit (Econ 337)</td>
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<td>Managerial Accounting (Actg 301)</td>
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Senior

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<td>Business Policies and Organization (Mgt 413, 414)</td>
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<td>Business Research (Bus 419)</td>
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<td>Senior Project (Bus 460)</td>
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<td>Government Regulation of Business (Bus 404)</td>
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See COURSES OF INSTRUCTION sections in this catalog for descriptions of courses in Accounting, Business, Economics, Finance and Property Management, Industrial Relations, Management, Marketing, and other subjects.

* To be selected in accordance with the General Education requirement.

** 27 of the elective units in the junior and senior years must be chosen with the approval of the adviser in a field of concentration.
The Economics Department has two broad purposes: it serves all schools of the campus by offering courses which will help students to understand the overall functioning of the American economy; secondly, it offers an undergraduate program leading to the Bachelor of Science Degree in Economics.

The Economics degree program will prepare students for employment in business and government as economists, analysts and general managers. The teaching of economics in high school is another occupational field for the economist. Finally, the program will prepare students to undertake graduate study in economics, law, business administration and related fields in the Social Sciences.

**CURRICULAR CONCENTRATIONS**

Economics majors may take any concentration offered by the School of Business or the Division of Social Sciences in lieu of the economics concentrations described below, provided appropriate prerequisites are satisfied.

**Business and Industrial Economics**

The Business and Industrial Economics concentration, designed for those students who intend to seek business and industrial application of the economics discipline, provides a balanced program of economic and business theory and application.

**International Trade and Development**

This concentration provides a core of trade and development theory, plus study in ancillary elective fields that meet the occupational needs of students. It is designed for those students interested in working in an international area in the public or private sectors.

**Quantitative Economics**

This concentration will offer a combination of mathematics, statistics, and quantitative economics courses. As a unit they are designed to provide the graduate with a background adequate for employment in a variety of business and other situations where the economic decision makers rely on the precision of the mathematician's tools, or for entrance to graduate study in such fields as economics, business administration, or operations research.

**CURRICULUM IN ECONOMICS**

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* To be selected in accordance with the General Education requirement.
Economics

### Sophomore

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<td>Principles of Accounting (Actg 221, 222)</td>
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<td>American Government (PolS 201)</td>
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### Senior

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<td>Monetary and Fiscal Policy (Econ 414)</td>
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See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Economics and other subjects.

*To be selected in accordance with the General Education requirement.
** 18-19 units to be selected in a field of concentration.
The objectives of the Management Department are to provide knowledge and skills of modern management theory and practice through the study of subjects critical to management performance (including general management, industrial relations, and management information systems); to develop in the student knowledge and skills of a second area or function to facilitate initial employment and subsequent career development; to help the student to acquire an appreciation of cultural, economic, political and technological trends which affect the role of managers in contemporary society; to help professionally-oriented students use theories, concepts, research findings, problem-solving techniques and analytical skills in management situations; and to provide a broad background and generalist viewpoint by encouraging study of individual courses in several knowledge and skill areas (including labor, economics, and social and political science).

The degree awarded is the Bachelor of Science in Business Administration with concentrations in Industrial Relations, Management, and Management Information Systems.

**CURRICULAR CONCENTRATIONS**

**Industrial Relations**

The two areas of interest within this concentration relate to labor-management relations and personnel management.

**Management**

This concentration stresses the managerial process and decision making fundamental to all levels and functional areas of the business and industrial enterprise. The management program offers both quantitative and general management emphases to satisfy the individual needs of the student relative to business or academic ambitions.

**Management Information Systems**

This concentration is designed to prepare students for careers involving the analysis, design, and operation of business information systems within industry and government. It provides training and practice in administrative data processing and in the analysis of managerial information requirements.

**CURRICULUM IN MANAGEMENT**

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<td>The Business Enterprise (Bus 101)</td>
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<td>Introduction to Human Relations in Business (IR 118)</td>
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* To be selected in accordance with the General Education Requirements.
# Management

**Sophomore**

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<td>American Democracy and World Affairs (Hist 206)</td>
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<td>Money, Banking and Credit (Econ 337)</td>
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<td>Financial Management (FPM 342)</td>
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<td>Management Process-Theory and Practice (Mgt 312)</td>
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**Senior**

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<td>Organizational Behavior (IR 415)</td>
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<td>Business Strategy and Policy (Mgt 413, 414)</td>
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<td>Business Research (Bus 419)</td>
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See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Accounting, Business, Business Administration, Finance and Property Management, Industrial Relations, Management, Marketing and other subjects.

* To be selected in accordance with the General Education Requirements.
** 27 Units of concentration electives must be chosen with approval of adviser.
School of Communicative Arts and Humanities
The School of Communicative Arts and Humanities provides a record of man's experience and potential as a creative, imaginative, and reflective being. The school seeks to help each student to understand self and society. The school seeks to relate itself to the technological disciplines in a way that will help contribute to the solution of human problems. Accordingly, a wide range of courses is offered to serve every thoughtful man and woman without regard to specialized professional interests. These include humanities courses which supplement the various departmental offerings in the School and are offered under the direction of a Humanities Coordinator. The courses aim to heighten the student's sense of the interdisciplinary nature of humanistic studies and to increase awareness of humanistic values.

Programs leading to the bachelor's degree are offered in applied Art and Design, English, Graphic Communications, History, Journalism, and Speech Communication. The Master of Arts degree is offered in English. Substantial course offerings are included in the departments of Foreign Languages, Music, and Philosophy. Strong cocurricular programs are found in Drama, Forensics, Journalism, and Music.
The Art Department offers a four-year curriculum leading to the Bachelor of Science Degree in Applied Art and Design. The curriculum prepares students for professional participation in the fields of crafts design or graphic design.

Crafts design students are prepared for professional careers as artist-craftsmen capable of designing, executing, and marketing works of limited edition or mass-produced character. Areas of emphasis are ceramics, metals, and wood.

Graphic design students are prepared for professional careers in advertising design, editorial design, illustration and related areas. The curriculum emphasizes creative problem-solving, and addresses the development of specific skills in the design, layout, and execution of graphic problems with supportive knowledge of reproduction limitations. Graphic design students have the unique opportunity, through course offerings in photography and graphic communications, to gain practical experience in production methods.

Both the crafts design and graphic design options support creative and aesthetic growth and require the development of technical skills as a foundation for personal direction and enrichment.

The Department recognizes that art, crafts and design are increasingly relevant to many occupational fields. Accordingly, art prefix courses are frequently required within various university majors and the Art Department provides this service through a strong and diversified program.

In addition to the major and support programs, general education courses are available for all students who wish to enrich their understanding, appreciation, and practical skills in the areas offered within the Art Department.

**CURRICULUM IN APPLIED ART & DESIGN**

<table>
<thead>
<tr>
<th>Freshman</th>
<th>F</th>
<th>W</th>
<th>S</th>
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</thead>
<tbody>
<tr>
<td>Fundamentals of Drawing (Art 201)</td>
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<tr>
<td>Art History (Art 211, 212)</td>
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<tr>
<td>Ceramics (Art 249)</td>
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<tr>
<td>Survey of Economics (Econ 201)</td>
<td></td>
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<tr>
<td>Basic Accounting (Actg 131)</td>
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<tr>
<td>Principles of Speech (Sp 200)</td>
<td></td>
<td>3</td>
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<tr>
<td>English Composition (Engl 114, 115)</td>
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<tr>
<td>General Psychology (Psy 202)</td>
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<td>Physical science</td>
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<td>Health Education (PE 250)</td>
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* To be selected with advisor approval in accordance with General Education requirements.
### Art & Design

#### Sophomore

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Basic Photography (Art 220)</td>
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<tr>
<td>Design Fundamentals (Art 221, 222, 223)</td>
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<tr>
<td>Metals (Art 248)</td>
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<tr>
<td>Wood (Art 254)</td>
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<tr>
<td>Functions of Design (Art 255)</td>
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<tr>
<td>Advanced Drawing (Art 344 or 345)</td>
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<tr>
<td>Marketing Principles (Mktg 204)</td>
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<tr>
<td>American Government (Pol Sc 201)</td>
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<tr>
<td>General Biology (Bio 101)</td>
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#### Junior

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<tbody>
<tr>
<td>Contemporary Art (Art 315)</td>
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<tr>
<td>Display &amp; Exhibition Design (Art 336)</td>
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<tr>
<td>Professional Practice in Art (Art 386)</td>
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<tr>
<td>Cultural Anthropology (Art 201)</td>
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<td>Natural Science</td>
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<tr>
<td>Literature</td>
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<td>Literature/philosophy</td>
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<tr>
<td>American Democracy &amp; World Affairs (Hist 206)</td>
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<td>Electives and courses to compete major</td>
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#### Senior

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<th>Course</th>
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<tbody>
<tr>
<td>Senior Project (Art 461, 462)</td>
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<tr>
<td>Undergraduate Seminar (Art 463, 464)</td>
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<tr>
<td>Studio Practices (Art 472)</td>
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<td>Electives and courses to complete major</td>
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#### CRAFTS DESIGN OPTION

(Add Courses Below to Basic Curriculum)

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<tr>
<td>IT 125 Industrial Wood Process ...............................................</td>
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<tr>
<td>MP 127 Manufacturing Processes Fundamentals ..................................</td>
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<tr>
<td>Weld 141 Manufacturing Processes .............................................</td>
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<tr>
<td>Art 348 Metalsmithing ............................................................</td>
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<tr>
<td>Art 354 Intermediate Wood ......................................................</td>
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<tr>
<td>Art 349 Ceramics .........................................................................</td>
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<tr>
<td>GrC 323 Pre-separated Art for Camera ..........................................</td>
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#### GRAPHIC DESIGN OPTION

(Add Courses Below to Basic Curriculum)

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<tr>
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<td>EDes 111 Introduction to Drawing and Perspective ...........................</td>
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<td>Sophomore</td>
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<tr>
<td>GrC 122 Design with Type ................................................................</td>
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<td>GrC 223 Copy Preparation ................................................................</td>
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<td>Junior</td>
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<tr>
<td>Art 331, 332, 333 Graphic Design ..............................................</td>
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<tr>
<td>Art 355 Printmaking ......................................................................</td>
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<td>(3)</td>
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<tr>
<td>Senior</td>
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<td></td>
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<tr>
<td>Art 431, 432, 433 Advanced Graphic Design .....................................</td>
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<td></td>
<td>(9)</td>
</tr>
<tr>
<td>GrC 323 Pre-separated Art for Camera ..........................................</td>
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<td>(3)</td>
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</table>

* To be selected with advisor approval in accordance with General Education requirements.
The English Department serves students in all schools by providing courses which will increase a student's understanding, appreciation, and use of language, in reading and composition. The department offers a variety of courses which, through close study of the works of acknowledged masters of language usage and through providing opportunities for all students to use language with greater accuracy and skill, contribute to the general education of all majors.

The primary occupational objective of the department is the preparation of qualified teachers of English for elementary and secondary schools and for the community colleges. For this purpose the department offers a program leading to the Bachelor of Arts degree in English and a program leading to the Master of Arts degree for English instructors in the junior colleges. To produce teachers well versed in the areas of English commonly taught, the major curricula provide a balanced emphasis in study of the language and in the use of the language in composition and literature. Students majoring in English progress through four significant stages: first, a study of principles governing language, composition, and literature; second, a study of content illustrating these principles; third, application by the students of principles to content produced by themselves and others; fourth, application of both principles and content to problems commonly met in the teaching situation. In addition, the English major provides excellent preparation for careers where a strong background in English is appropriate (medicine, law, or business), or where such abilities as effectively organizing, substantiating, and expressing ideas are necessary.

**CURRICULUM IN ENGLISH**

<table>
<thead>
<tr>
<th>Course</th>
<th>F</th>
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<th>S</th>
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<tbody>
<tr>
<td>English Composition (Engl 114, 115)</td>
<td>4</td>
<td>4</td>
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<tr>
<td>Introduction to Genres (Engl 204)</td>
<td></td>
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<td>4</td>
</tr>
<tr>
<td>Principles of Speech (Sp 200)</td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Physical Education Activity</td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Health Education (PE 250)</td>
<td></td>
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<tr>
<td>§ Basic Mathematics for General Education (Math 100)</td>
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<tr>
<td>History of Western Civilization (Hist 101, 102)</td>
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<tr>
<td>* Natural Science</td>
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<tr>
<td>Electives</td>
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<tr>
<td></td>
<td>16</td>
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</table>

§ Students preparing for an Elementary Credential should take Math 327 and 328.
* A minimum of 15 units of natural science is required for graduation. (See General Education Requirement).
## English

### Sophomore

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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<tbody>
<tr>
<td>Introduction to European Literature (Engl 211)</td>
<td>4</td>
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<tr>
<td>Advanced Composition (Engl 304, 305)</td>
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</tr>
<tr>
<td>British Literature (Engl 221, 222)</td>
<td>4</td>
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<tr>
<td>American Government (Pol Sc 201)</td>
<td>3</td>
</tr>
<tr>
<td>Growth of American Democracy (Hist 204)</td>
<td>3</td>
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<tr>
<td>U.S. in World Affairs (Hist 205)</td>
<td>3</td>
</tr>
<tr>
<td>Natural Science</td>
<td>3</td>
</tr>
<tr>
<td>Cultural Anthropology (Ant 201)</td>
<td>3</td>
</tr>
<tr>
<td>General Psychology (Psy 202)</td>
<td>3</td>
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<tr>
<td>Social Sciences</td>
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<tr>
<td>Electives</td>
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### Junior

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>American Literature (Engl 311, 312)</td>
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<tr>
<td>Modern English Grammar (Engl 301)</td>
<td>4</td>
</tr>
<tr>
<td>Introduction to Shakespeare (Engl 210)</td>
<td>4</td>
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<tr>
<td>English electives (300-400 series)</td>
<td>4</td>
</tr>
<tr>
<td>Oral Interpretation (Sp 305)</td>
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<tr>
<td>Introduction to Philosophy (Phil 101)</td>
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<tr>
<td>Art, Music, or Drama</td>
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<td>Electives</td>
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### Senior

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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<tbody>
<tr>
<td>Senior Project (Engl 461)</td>
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<tr>
<td>History of the English Language (Engl 303)</td>
<td>4</td>
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<tr>
<td>English electives (300-400 series)</td>
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<tr>
<td>Significant Writers (Engl 414, 417, or 418)</td>
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<td>Electives</td>
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### CURRICULUM FOR THE MASTER OF ARTS DEGREE

(For University requirements see the Graduate Studies Announcement)

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Engl 502 Introduction to Critical Analysis</td>
<td>3</td>
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<tr>
<td>Engl 503 Contemporary Language Study</td>
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<tr>
<td>Engl 504 Problems in Language</td>
<td>3</td>
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<tr>
<td>Engl 505 Problems in Composition</td>
<td>3</td>
</tr>
<tr>
<td>Engl 511 Problems in American Literature</td>
<td>6</td>
</tr>
<tr>
<td>Engl 512 Problems in British Literature</td>
<td>6</td>
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<tr>
<td>Engl 590 Graduate Seminar in English</td>
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</tbody>
</table>

Additional units in the Engl 400 and 500 series, selected with advisory committee approval. At least 3 units must be Engl 504, 511, or 512.

Elective units which may be in other disciplines, selected with advisory committee approval.

Total Units

45

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in English and other subjects.

* A minimum of 15 units of natural science is required for graduation. (See General Education requirement.)

** To be selected in accordance with the General Education requirement.

† At least 10 of the elective units must be at the 300-400 level.
Instruction in foreign languages is offered to prepare the student for specific technical, vocational, literary, and cultural needs at home and overseas. Linguistic principles of language learning and language teaching focus on the understanding and use of the particular language.

French, German (including Scientific German), and Spanish are offered. Opportunity for study of other languages is provided through Foreign Language 101, 102, 103. The subject matter and teaching methods used provide a usable, practical knowledge of the language studied.

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in French, German, Foreign Language, and Spanish.
The Graphic Communications Department offers a four-year curriculum leading to the Bachelor of Science degree. The curriculum is designed to prepare graduates for positions of responsibility in the printing, publishing, and packaging industries.

The program provides courses in general education together with a core of printing technology courses. Courses which are specific to one of the curricular options are also provided. The student is introduced to all stages of the printing processes, and chooses a specialized option in the graphic communications field at the appropriate time. The program is not designed to provide vocational training for machine operators. Rather, students are educated for leadership as managers and other skilled professionals who are well grounded in printing technology.

The Graphic Communications Department occupies 33,000 square feet of floor space in the modern Graphic Arts Building. Theory and practice are taught in modern classrooms incorporating the latest in teaching aids. Ten well-equipped laboratories of printing equipment provide the student with diverse experience in the practical aspects of the industry.

**CURRICULAR OPTIONS**

**Computer Graphic Communications**

This option is designed for the printing major who wishes a career in communication processing. The option prepares the student for careers in computer typography, estimating, scheduling, production management, quality control, and graphic terminal displays.

**Design Reproduction**

Students intending to seek careers in graphic arts reproduction should enroll in this option. In addition to course offerings in reproduction design, the option is designed to familiarize the student with technical limitations imposed upon the designer by the printing processes.

**Printing Management**

This option is designed as a flexible program for the student interested in pursuing employment as a printing plant manager, planner, quality control specialist, production control specialist, estimator, or printing salesman. The program also prepares the student for employment as a technical representative for manufacturers of graphic arts machinery and products.

**Packaging**

This option is designed for the student who desires a career in the growing field of packaging. The program provides a basis for the analysis of problems in package design, technology, and management in both consumer and industrial packaging.
# CURRICULUM IN GRAPHIC COMMUNICATIONS

## Freshman
```
<table>
<thead>
<tr>
<th>Course</th>
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</thead>
<tbody>
<tr>
<td>Introduction to Graphic Communications (Gr C 101)</td>
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<tr>
<td>Substrates and Ink (Gr C 111)</td>
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<tr>
<td>Design with Type (Gr C 122)</td>
<td>6</td>
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<tr>
<td>Binding and Finishing (Gr C 123)</td>
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<tr>
<td>Letterpress (Gr C 132)</td>
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<tr>
<td>English Composition (Engl 114)</td>
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<tr>
<td>Technical Writing (Engl 219)</td>
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<td>Pre-Calculus Algebra (Math 118)</td>
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<td>Data Processing (CSc 100)</td>
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<td>General Psychology (Psy 202)</td>
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<tr>
<td>Physical Education Activity</td>
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<td>Health Education (PE 250)</td>
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## Sophomore
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</thead>
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<tr>
<td>Introduction to Printing Management (Gr C 204)</td>
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<td>Copy Preparation for Reproduction (Gr C 223)</td>
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<tr>
<td>Composing Machines (Gr C 224)</td>
<td>3</td>
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<tr>
<td>Process Camera (Gr C 227)</td>
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<td>Image Assembly and Platemaking (Gr C 228)</td>
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<td>Offset Lithographic Presswork (Gr C 229)</td>
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<td>Relief Printing Specialties (Gr C 233)</td>
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<td>General Biology (Bio 101)</td>
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<td>** Basic Photography (Art 220)</td>
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<td>* Literature</td>
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<td>* Approved art course</td>
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<td>Principles of Economics (Econ 211, 212)</td>
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<td>Electives and courses to complete major</td>
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## Junior
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<tr>
<td>Composition Systems (Gr C 301)</td>
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<td>Printing Equipment Management (Gr C 326)</td>
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<td>Estimating (Gr C 303)</td>
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<td>Theory of Color (Gr C 304)</td>
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<td>Plant Organization and Layout (Gr C 333)</td>
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<td>Screen Processes (Gr C 357)</td>
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<td>American Government (Pol Sc 201)</td>
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<tr>
<td>American Democracy and World Affairs (Hist 206)</td>
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## Senior
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<td>Printing Management (Gr C 421, 422)</td>
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<tr>
<td>Senior Project (Gr C 461)</td>
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<td>Principles of Speech (Sp 200)</td>
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<td>Traditional Logic (Phil 221)</td>
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* To be selected with adviser approval in accordance with the General Education Requirement.
** Journalism courses may be substituted with adviser's approval.
Graphic Communications

**COMPUTER GRAPHIC COMMUNICATIONS OPTION**
(Add courses below to basic curriculum)

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<tr>
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<tr>
<td>GrC 302 Technical Basics for Printing (3)</td>
<td></td>
<td>GrC 429 Advanced Composition Systems ........................................ (3)</td>
</tr>
<tr>
<td>CSc 221 Computer Principles and Programming ........................................... (3)</td>
<td></td>
<td>CSc 345 Data Structures ......................................................... (3)</td>
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<tr>
<td>CSc 222 Digital Computer Symbolic Programming .............................................. (3)</td>
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<td>CSc 452 Computer Programming Systems ................................................ (3)</td>
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<tr>
<td>CSc 306 Programming of Small Computers ....................................................... (3)</td>
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<td>CSc 235 Computer Graphics .............................................................. (3)</td>
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<tr>
<td>CSc 310 Programming Language/One (PL/1) ........................................ (3)</td>
<td>EL 131,132 Introduction to Circuits, Devices ........................................ (4)</td>
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<tr>
<td>IE 214 Production Control ................. (2)</td>
<td>Mgt 418 Quantitative Methods and Controls in Business ................................. (3)</td>
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</table>

**DESIGN REPRODUCTION OPTION**
(Add courses below to basic Curriculum)

| Sophomore | | | Senior |
|------------|-----------------|--------|
| Art 222-3 Design Fundamentals .......... (6) | | Art 331-2-3 Graphic Design ......................... (9) |
| GrC 323 Pre-Separated Art for Camera ........................................ (3) | GrC 439 Adv. Line and Halftone Media .............................................. (5) |

**PRINTING MANAGEMENT OPTION**
(Add courses below to basic Curriculum)

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<tr>
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<tr>
<td>Gr C 302 Technical basics for Printing (3)</td>
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<td>Gr C 401 Printing Sales ................................. (4)</td>
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<td>Gr C 312 Theory of Lithography...... (3)</td>
<td>Gr C 408 Newspaper and Publications Management .................................. (3)</td>
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<td>Actg 131, 132 Basic Accounting ...... (6)</td>
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<td>Gr C 411 Estimating, Pricing and Costing ........................................ (4)</td>
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<td>CSc 140 Business Data Processing .... (2)</td>
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<td>Stat 211 Statistics ..................... (3)</td>
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<tr>
<td>Mktg 204 Marketing Principles......... (4)</td>
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**PACKAGING OPTION**
(Add courses below to basic Curriculum)

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<td>GrC 401 Printing Sales ................................. (4)</td>
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<td>GrC 330 Packaging Substrates .......... (3)</td>
<td>GrC 431 Package Estimating ......................... (3)</td>
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<td>FI 230 Elements of Food Processing .. (4)</td>
<td>GrC 437 Consumer Packaging .................................. (3)</td>
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<td>IT 327 Plastics Technology ............ (2)</td>
<td>Bus 201 Business Law Survey .................. (3)</td>
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<tr>
<td>Mktg 204 Marketing Principles......... (4)</td>
<td>IT 408 Industrial Packaging .................... (3)</td>
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</tbody>
</table>

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Graphic Communications and other subjects.
The History Department serves all schools of the University by offering general education courses in American democracy and world affairs. The Department offers a Bachelor of Arts degree built on a broad social science and humanities base. In addition, the History Department offers a broad range of courses in Latin America, East Asia, Africa, and the Middle East. Ethnic study courses are offered in Afro-American and Chicano history.

The History major provides strong preparation for elementary and secondary teaching and for employment in government and business.

**CURRICULUM IN HISTORY**

**Freshman**
- History of Western Civilization (Hist 101, 102) ........................................... 5  5  5
- English Composition (Engl 114, 115) ..................................................... 4  4  4
- Physical Education Activity ................................................................. 1  1  1
- *Natural Science* .................................................................................. 3  3  3
- National and California Government (Pol Sc 101, 102) ....................... 3  3
- Introduction to International Relations (Pol Sc 105) .............................. 3
- Mathematics for General Education (Math 100) .................................. 2
- Health Education (PE 250) .............................................................. 4
- Electives ............................................................................................... 6

**Sophomore**
- United States History (Hist 201, 202) .................................................. 4  4  4
- *Natural Science* .................................................................................. 3  3  3
- Economics (Econ 211 or 201) ............................................................ 3
- Principles of Sociology (Soc 201, 202) ................................................ 3  3
- Principles of Speech (Sp 200) ............................................................ 3
- Cultural Anthropology (Ant 201) ........................................................ 3
- General Psychology (Psy 202) ............................................................ 3
- Electives ............................................................................................... 6

**Junior**
- Introduction to Historiography (Hist 301) ............................................ 4
- U.S. In World Affairs (Hist 205) ........................................................... 3  6  3
- U.S. History at 400 level ................................................................. 4  4
- *Literature* ......................................................................................... 4
- **Literature or Philosophy** ............................................................... 4
- **Electives** ....................................................................................... 4  5  5

**Senior**
- Senior Project (Hist 460) ................................................................... 2
- European History at 300-400 level ...................................................... 3  3
- History at 300-400 level ................................................................. 3  3  6
- Social Sciences at 300-400 level ....................................................... 3  3
- *Philosophy, Art, Drama* ................................................................. 3
- **Electives** ....................................................................................... 4  6  6

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in History and other subjects.

*To be selected in accordance with the General Education requirement.

**At least 18 units must be at the 300-400 level. Two years of foreign language are highly recommended.
The Journalism Department offers a professional program leading to the Bachelor of Science Degree in Journalism. All journalism majors must complete the basic journalism curriculum, which includes courses in the journalism core and supplementary courses in the humanities, natural sciences, and social sciences. Each major must also complete a specified number of required and elective courses in one of the following concentrations: Agricultural Journalism, Broadcast Journalism, News-Editorial, Photojournalism, or Public Relations-Advertising.

No more than 50 credits of the 198 applied toward the degree may be in journalism or related communications courses unless the student takes more than 198 credits to maintain the 1:3 credit ratio between journalism and related courses.

All journalism majors are expected to serve as staff members of departmental communications media, including Mustang Daily, the student newspaper; student magazines, or KCPR, the FM-sacrosanct radio station. They are also expected to participate in professional and scholarly organizations in their interests. The department sponsors student chapters of the Society of Professional Journalists, Sigma Delta Chi; the National Press Photographers Association; and the Agricultural Communicators of Tomorrow.

CURRICULAR CONCENTRATIONS

Agricultural Journalism
Prepares for farm or farm-city careers in reporting and editing, radio and television news; public relations and publicity; advertising copywriting, and layout. Twenty-nine of the elective units must be chosen with the approval of the adviser.

Broadcast Journalism
Prepares students for careers as reporters and newscasters for radio and television. Emphasizes the acquisition of knowledge and skills necessary for initial employment upon graduation as well as those necessary for future growth to positions of responsibility in the news and public affairs aspects of the electronic media.

News-Editorial
Prepares students for reporting and editing jobs on the staffs of magazines, newspapers, or wire services. Emphasizes acquisition of knowledge and skills necessary for initial employment upon graduation as well as those necessary for future growth to positions of responsibility in print media.

Photojournalism
Prepares students to work as photographer-reporters for newspapers, magazines, and television. Emphasizes the acquisition of knowledge and skills in color as well as black and white photography, including still, motion picture, and multi-media work.

Public Relations-Advertising
Prepares students for business, governmental, and institutional positions in advertising and public relations. Emphasizes the acquisition of knowledge and skills needed for future growth into management positions with the communications media and other institutions.
### CURRICULUM IN JOURNALISM

#### Freshman

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<td>English Composition (Engl 114, 115)</td>
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<tr>
<td>Introduction to Human Relations in Business (IR 118)</td>
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<td>Mathematics (Math 100 or 102)</td>
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<td>Life science</td>
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<td>Reporting (Jour 203)</td>
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<tr>
<td>Introduction to Sociology (Soc 105)</td>
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<td>Health Education (PE 250)</td>
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<td>Basic Photography (Art 220)</td>
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<td>Introduction to Philosophy (Phil 101)</td>
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<td>Communication Theory (Sp 214)</td>
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<td>Reporting II (Jour 304)</td>
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<td>Natural science</td>
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<tr>
<td>Survey of Economics (Ec 201)</td>
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<td>American Government (Pol Sc 201)</td>
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<td>American Democracy and World Affairs (Hist 206)</td>
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<td>General Psychology (Psy 202)</td>
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<td>American Political Processes (Pol Sc 302)</td>
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<td>American Literature (Engl 311)</td>
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<td>Advanced Composition (Engl 300)</td>
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<td>Global Geography (Geog 308)</td>
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<td>Urban Sociology (Soc 313)</td>
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<td>Senior Project (Jour 460)</td>
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<td>Media Internship (Jour 444)</td>
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<td>Law for Journalists (Jour 302)</td>
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See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Journalism and other subjects.

† Unless already acceptable typists, majors will be required to attain typing proficiency during their freshman year.

§ 29 of the elective units must be taken in a field of concentration.
Through its courses and activities, the Music Department provides opportunities for personal enrichment to students from all other departments of the University. It offers students with an interest in music a broader insight into the general field of music through courses in appreciation, theory, harmony, and music history; it gives musically inclined students the opportunity to participate in University musical organizations and to further their proficiency both in singing and in playing instruments; and it provides the prospective teacher with basic skills and instructional techniques in music required for the elementary credential.

The courses and activities of the Music Department are open to all qualified men and women students.

The Music Department also serves as a cultural center for both the University and community through a program of public performances by student and faculty groups and through department-sponsored concerts, clinics, workshops, and lectures by outstanding individuals from outside the University.

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Philosophy and other subjects.

The courses offered in the Philosophy Department are intended to give the student a more comprehensive view of the world. The program in philosophy supplements courses in the major and can help the student to relate the major field to other investigations, particularly to scientific, religious and social movements. The courses call attention to the perennial questions reflective people have asked concerning human beings and the universe, and help the student to develop a personal philosophy.

This program will acquaint the student with the developments in metaphysics (the nature of reality), epistemology (the means by which knowledge is acquired), axiology (value theory), and logic.

The courses in the Philosophy Department give all students the opportunity to participate in philosophical discussion and to further their proficiency in expounding and defending philosophical positions.

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Philosophy and other subjects.
The Speech Communication Department, through its courses in speech communication and drama, serves the entire University. Its offerings enable students to fulfill requirements in general education, prepare for communication-centered careers, and/or enhance both cultural awareness and individual potentials.

The objectives of the Department are to prepare prospective teachers of speech for positions in the public schools, and to provide substantial coursework for students planning to enter various other communication-oriented occupational fields.

The Department offers both an academic major and a teacher certification program. All Speech Communication majors must complete the basic Speech Communication curriculum. They may then consult with their advisors for a concentrated elective program in General Speech, Communication Theory, or Drama. The major program is geared not only to provide broad theoretical knowledge of the various speech communication fields, but also to give students extensive participation in many different speech communication activities.

Many cocurricular activities are available for students who are interested in the speech arts. Intercollegiate forensic tournaments provide opportunities for Cal Poly speakers to compete with students from other universities and colleges in debate and other speech events. The University drama program annually presents a full season of plays. Additional student activities include public speaking, oral interpretation, and reader's theatre presentations to campus and community audiences, as well as laboratory drama and laboratory experiences in the management of communicative disorders.

**CURRICULUM IN SPEECH COMMUNICATION**

<table>
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<tr>
<td>Freshman</td>
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<td>Argumentation (Sp 215)</td>
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<td>Mathematics for General Education (Math 100)</td>
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<td>English Composition (Engl 114, 115)</td>
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<td>History of Western Civilization (Hist 101, 102)</td>
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† To be selected in accordance with the General Education requirement.
### Speech Communication

**Sophomore**

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<td>Essentials of Discussion (Sp 217)</td>
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<td>Advanced Forensic Activity (Sp 350)</td>
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<td>Voice and Phonetics (Sp 306)</td>
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<td>Introduction to Genres (Engl 204)</td>
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<td>Introduction to Theater (Dr 220)</td>
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<td>† Natural sciences (include Engr 301)</td>
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<tr>
<td>Survey of Economics (Econ 201)</td>
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<tr>
<td>or Introduction to Sociology (Soc 105)</td>
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<td>Health Education (PE 250)</td>
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<td>Computers and Computing (CSc 110)</td>
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<td>General Psychology (Psy 202)</td>
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**Junior**

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Advanced Composition (Engl 300 or 304)</td>
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<tr>
<td>Introduction to Communicative Disorders (Sp 302)</td>
<td></td>
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<tr>
<td>Persuasion (Sp 304)</td>
<td></td>
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<tr>
<td>Oral Interpretation (Sp 305)</td>
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<tr>
<td>Rhetoric (Sp 317, 318)</td>
<td></td>
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<tr>
<td>American Government (Pol Sc 201)</td>
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<tr>
<td>Growth of American Democracy (Hist 204)</td>
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<tr>
<td>United States in World Affairs (Hist 205)</td>
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<tr>
<td>Physical Education Activity</td>
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<td>* Electives</td>
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**Senior**

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<tr>
<td>American Public Address (Sp 408, 409)</td>
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<tr>
<td>Senior Project (Sp 461)</td>
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<tr>
<td>Undergraduate Seminar (Sp 463)</td>
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<tr>
<td>Broadcast Announcing (Jour 326)</td>
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<tr>
<td>Acting (Dr 320)</td>
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<tr>
<td>Introduction to Shakespeare (Engl 210)</td>
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<tr>
<td>* Electives</td>
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</tbody>
</table>

\[\text{See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Speech, Drama and other subjects.}\]

† To be selected in accordance with the General Education requirement.

* Of the total elective units in the junior and senior years, 13 are restricted electives to be chosen in speech/drama at the 300-400 level with the approval of a departmental adviser.
School of Engineering
and Technology
<table>
<thead>
<tr>
<th>Recommended C.C. Preparation in Terms of Cal Poly Courses</th>
<th>Qty/Units</th>
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<tbody>
<tr>
<td><strong>Mathematics</strong></td>
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<tr>
<td>Math 120, Math for Engrs</td>
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</tr>
<tr>
<td>Math 131, Technical Calc</td>
<td>4</td>
</tr>
<tr>
<td>Math 132, Technical Calc</td>
<td>4</td>
</tr>
<tr>
<td>Stat 211, Elem Prob &amp; Stat</td>
<td>3</td>
</tr>
<tr>
<td>Math 141, Anal Geom &amp; Calc</td>
<td>4</td>
</tr>
<tr>
<td>Math 142, Anal Geom &amp; Calc</td>
<td>4</td>
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<tr>
<td>Math 241, Anal Geom &amp; Calc</td>
<td>4</td>
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<tr>
<td>Math 242, Diff Equations</td>
<td>4</td>
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<tr>
<td><strong>Physics</strong></td>
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<tr>
<td>Phys 121, College Physics</td>
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</tr>
<tr>
<td>Phys 122, College Physics</td>
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<tr>
<td>Phys 123, College Physics</td>
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<tr>
<td>Phys 131, Phys for Engrs</td>
<td>4</td>
</tr>
<tr>
<td>Phys 132, Phys for Engrs</td>
<td>4</td>
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<tr>
<td>Phys 133, Gen Phys for Engrs</td>
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<tr>
<td>Phys 211, Optics &amp; Atom Phys</td>
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<tr>
<td><strong>Chemistry</strong></td>
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<tr>
<td>Chem 121, Gen Inorg Chem</td>
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</tr>
<tr>
<td>Chem 122, Gen Inorg Chem</td>
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</tr>
<tr>
<td>Chem 124, Gen Chem</td>
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<tr>
<td>Chem 125, Gen Chem</td>
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<tr>
<td>Chem 126, Gen Chem</td>
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<tr>
<td><strong>Engineering &amp; Supporting Courses</strong></td>
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<tr>
<td>Engineering Drafting</td>
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<tr>
<td>Engr 251, Digital Comp Appl</td>
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<tr>
<td>Mfg Processes</td>
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</tr>
<tr>
<td>Strength of Mat</td>
<td>5</td>
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<tr>
<td>Engr Statics and Dynamics</td>
<td>7</td>
</tr>
<tr>
<td>Initial courses in Electricity and Electronics</td>
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</tr>
<tr>
<td>Power Tech (IT 122-2), Tech Comp (IT 101), Mktg Prin (Mktg 204)</td>
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<tr>
<td>Lower Division Lab Courses in End Arts</td>
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<tr>
<td><strong>General Education</strong></td>
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<tr>
<td>Soc Sc (Pay 202, Pol Sci 201, Econ)</td>
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<tr>
<td>Hist 204-5, Humanities (Lit, Phil, etc.)</td>
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<tr>
<td>Miscellaneous: PE (1), Engl Comp &amp; Writing (6), Life Science (3), etc.</td>
<td>12</td>
</tr>
<tr>
<td>Maximum Transfer Units</td>
<td>105</td>
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</table>
The Engineers' Council for Professional Development defines engineering "as the profession in which a knowledge of the mathematical and natural sciences gained by study, experience, and practice is applied with judgment to develop ways to utilize economically the materials and forces of nature for the benefit of mankind."

Engineering at Cal Poly is strongly oriented toward preparing young people for immediate entry into the practice of engineering in the industrial world upon graduation from one of the four-year bachelor's degree programs. Each student selects a major as a freshman and takes at least one course per quarter in that major from the first quarter at Cal Poly. This process increases motivation to master the mathematics, basic science, and engineering science which constitute a very important half of each engineering curriculum.

Engineering graduates of Cal Poly are in great demand and find an endless variety of engineering challenges awaiting them. They enter design, manufacturing, research, development, sales, maintenance, operation, etc. in industry, government, consulting firms, and many related activities. Increasing numbers find employment outside of the engineering profession in positions where an engineering education is either required or preferred.

Engineering curricula offered in the School of Engineering and Technology leading to the Bachelor of Science degree are: Aeronautical Engineering, Civil Engineering, Electrical Engineering, Electronic Engineering, Engineering Science, Environmental Engineering, Industrial Engineering, Mechanical Engineering, Metallurgical Engineering.

The School of Engineering and Technology also offers curricula leading to the Bachelor of Science degree in Engineering Technology and Industrial Technology and the Bachelor and Master of Arts in Industrial Arts. Both industrial arts degrees are offered by the Industrial Technology Department.

Engineering Technology is defined by the Engineers' Council for Professional Development as that part of the technological field which requires the application of scientific and engineering knowledge and methods combined with technical skills in support of engineering activities; it lies in the occupational spectrum between the craftsman and the engineer at the end of the spectrum closest to the engineer.

Industrial technology is defined by the National Association of Industrial Technology as a baccalaureate degree program designed to prepare individuals for technical managerial, production supervisory, and related types of professional leadership positions.

Industrial Arts provides professional and credentialling preparation of future industrial education teachers for the secondary schools and community colleges.

Attention is directed to the preceding chart on recommended junior college preparation for engineering and technology major curricula. This chart should be studied and followed in order to prevent loss of time in completing the program after transferring to Cal Poly. In addition the University grants credit for lower division work in accordance with provisions agreed upon in the Engineering Liaison Committee.

Engineering students must select their social sciences and humanities electives with a view to satisfying not only the general education requirement of the California State University and Colleges, but also the humanities and social sciences requirements of the Engineers' Council for Professional Development (ECPD).
COOPERATIVE PROGRAMS

The School of Engineering and Technology offers cooperative work-study programs in which students gain practical experience by working in industry or government installations in a predetermined pattern of alternating period of work and study. Under a cooperative program the students receive experience in their profession plus income during work periods.

In general, students under these programs will require more time to complete curriculum requirements, depending upon the time of starting and the nature of the individual's work-study plan. Cal Poly attempts to place students in programs which are to their best educational and financial advantage.

Students in a cooperative program are considered by Cal Poly to be continuing students while they are employed in industry. They may reside in Cal Poly housing during work periods and may attend student activities provided they pay the activity fee.

MASTER OF ENGINEERING DEGREE

The Master of Engineering curriculum offers a broadly based program supported by the entire School and the Agricultural Engineering Department in the School of Agriculture and Natural Resources. It is designed as an interdisciplinary program for the generalist, and the project leader.

In more detail, the objectives of the program are to provide:
1. The appropriate job-entry education for the more complex areas of engineering such as research and development, innovative design, and systems analysis and design.
2. Both updating and upgrading opportunities for practicing engineers.
3. Appropriate graduate preparation for further graduate study in engineering.
4. Quality preparation for teachers of pre-engineering, engineering technology, and most aspects of undergraduate engineering curricula.
5. An excellent base for lifelong individual study by the graduate.

CURRICULUM FOR THE MASTER OF ENGINEERING DEGREE

(For University requirements see the Graduate Studies Announcement)

<table>
<thead>
<tr>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Engr 599—Design Project/Thesis</td>
</tr>
<tr>
<td>Mathematical Science—at least three units at the 500 level</td>
</tr>
<tr>
<td>Engineering courses in a primary engineering field—at least six units at 500 level</td>
</tr>
<tr>
<td>Engineering courses in a secondary field—at least three units at the 500 level</td>
</tr>
<tr>
<td>Electives—these courses must be supportive courses chosen from engineering or the sciences (physical, biological, computer, social or mathematical)</td>
</tr>
<tr>
<td>**45</td>
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</tbody>
</table>

* The student may be permitted a non-thesis option by:
  1. obtaining approval of the advisor and the Engineering Graduate Studies Committee,
  2. substituting nine units of 500 level coursework which support the chosen fields, and
  3. passing a comprehensive examination covering the graduate program.

** At least 24 units must be in courses organized primarily for graduate students (500 level). All course selection must be approved by the student's advisor and the Engineering Graduate Studies Committee.
The Aeronautical Engineering curriculum prepares students for engineering work dealing with the structure, propulsion, control, and ground support equipment for aircraft, missiles, and spacecraft. The problems faced by the aerospace industry offer an unusual engineering challenge. Much of the analysis must be accomplished at the very frontiers of knowledge yet products must nevertheless be designed and manufactured. Thus, an exceptionally wide gamut of engineering abilities is required within the industry and government.

The curriculum of the Aeronautical Engineering Department is accredited by the Engineers' Council for Professional Development. It places emphasis on both analysis and design. Supplementary to both is the basic work in drafting, shops, and laboratory. Throughout the entire four-year curriculum there is constant interplay between theory and application. Opportunities are available for advanced elective work in the student's field of special interest.

Graduates of the Aeronautical Engineering Department obtain employment in all phases of the aerospace industry such as general design, aerodynamics, stress analysis, flight testing, and field engineering.

The department has laboratories for fabrication propulsion, structural test, and aerodynamics, and also has two design rooms and a hangar with adjoining airstrip.

The department sponsors a student chapter of the national society—the American Institute of Aeronautics and Astronautics.

### CURRICULUM IN AERONAUTICAL ENGINEERING

<table>
<thead>
<tr>
<th>Freshman</th>
<th>F</th>
<th>W</th>
<th>S</th>
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<tbody>
<tr>
<td>Aerospace Fundamentals (Aero 121, 122, 123)</td>
<td>2</td>
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<tr>
<td>* Manufacturing Processes</td>
<td>2</td>
<td>1</td>
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<tr>
<td>Digital Computer Applications (Engr 251)</td>
<td>2</td>
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<tr>
<td>Applied Descriptive Geometry (ET 141)</td>
<td>4</td>
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<tr>
<td>Analytic Geometry and Calculus (Math 141, 142, 143)</td>
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<td>General Physics (Phys 131, 132)</td>
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<td>Freshman Composition (Engl 104)</td>
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<tr>
<td>Literature elective</td>
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<tr>
<td>Life science elective</td>
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<td>General Psychology (Psy 202)</td>
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<tr>
<td>General Chemistry (Chem 124)</td>
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<td><strong>Total</strong></td>
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* To be selected from Weld 141, 142, 144, 251, 252; MP 141, 142, 143, 144, 145, 153, 154; IE 141.
## Aeronautical Engineering

### Sophomore

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<th>Course</th>
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<tbody>
<tr>
<td>Strength of Materials (Aero 207)</td>
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<tr>
<td>Strength of Materials Laboratory (Aero 229)</td>
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<tr>
<td>Electric Circuit Theory (EE 201)</td>
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<tr>
<td>Electric Circuits Laboratory (EE 261)</td>
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<tr>
<td>Manufacturing Processes</td>
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<tr>
<td>General Physics (Phys 133)</td>
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<tr>
<td>Engineering Mechanics (ME 211, 212)</td>
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<tr>
<td>Analytic Geometry and Calculus (Math 241)</td>
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<td>Differential Equations (Math 242)</td>
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<td>Advanced Engineering Mathematics (Math 318)</td>
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<td>General Chemistry (Chem 125)</td>
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<tr>
<td>Introduction to Numerical Methods (CSc 332)</td>
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<td>American Government (Pol S 201)</td>
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<td>Survey of Economics (Econ 201)</td>
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<td>Physical Education Activity</td>
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### Junior

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<tbody>
<tr>
<td>Aerothermodynamics (Aero 301, 302, 303)</td>
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<tr>
<td>Aerodynamics (Aero 306)</td>
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<tr>
<td>Stress Analysis (Aero 324)</td>
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<td>Advanced Structures (Aero 408)</td>
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<tr>
<td>Electronics (EL 321)</td>
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<td>Materials Engineering (Met 306)</td>
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<td>Electronic Laboratory (EL 361)</td>
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<tr>
<td>Reporting Writing (Engl 218)</td>
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<tr>
<td>American Democracy and World Affairs (Hist 206)</td>
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<tr>
<td>Mechanical Vibrations (ME 316)</td>
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<td>Physical Education Activity</td>
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### Senior

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<th>Course</th>
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<tbody>
<tr>
<td>Stability and Control (Aero 415)</td>
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<td>Aero Design (Aero 444, 445)</td>
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<td>Analog Computers (Aero 322)</td>
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<tr>
<td>Senior Project (Aero 461, 462)</td>
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<td>Undergraduate Seminar (Aero 463)</td>
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<td>Gas Dynamics I (Aero 404)</td>
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<td>Propulsions (Aero 401)</td>
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<tr>
<td>Approved Engineering science elective</td>
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<tr>
<td>Elective Aeronautical Engineering (400 level)</td>
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<td>Engineering Economy (IE 415)</td>
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<tr>
<td></td>
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<td>16</td>
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</tbody>
</table>

See COURSES OF INSTRUCTION section of this catalog for description of courses in Aeronautical Engineering and other subjects.

† To be selected in accordance with the General Education requirement with adviser approval.
The Civil Engineering degree program is concerned with all types and facets of the transportation and public works problems of the state and nation. The program emphasizes the team design concept and systems approach to problem solving.

Graduates of the program will be trained for the expanding needs of the state and nation in transportation, structural work, and hydraulics under the broad programs of transportation and public works. The emphasis is on preparation for immediate entry into the profession, and students completing the program will find a wide variety of positions available in local, state, and federal government service. These include positions with airport, transit and regional planning agencies and districts as well as with firms involved in the planning, design, and construction of highways, airfields, waterways, and varied structures. In addition, planning and industrial firms and consulting opportunities offer a wide range of career choices.

The curriculum includes surveying, structures, operations research, computer science, and transportation planning—all based upon broad coverage of the engineering sciences and basic sciences, mathematics, social sciences, and humanities. The program is oriented toward the practical problems of the industrial world, but adequate scientific depth is maintained so that graduates will be readily accepted into graduate programs in civil engineering.

### CURRICULAR OPTIONS

**Public Works**

Emphasizes planning, design, construction, operation, and maintenance of major public works systems such as utilities, dams, recreational facilities, etc.

**Transportation**

Emphasizes planning, design, construction, operation, and maintenance of all types of transportation systems including air, water, and land based systems.

### CURRICULUM IN CIVIL ENGINEERING

<table>
<thead>
<tr>
<th>Freshman</th>
<th>F</th>
<th>W</th>
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<tbody>
<tr>
<td>Civil Engineering Fundamentals (CE 121, 122, 123)</td>
<td>2</td>
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<tr>
<td>Applied Descriptive Geometry (ET 141)</td>
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<tr>
<td>Engineering Problems—Digital Computers (Engr 251)</td>
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<tr>
<td>Engineering Surveying (AE 237)</td>
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<tr>
<td>* Manufacturing Processes</td>
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<tr>
<td>Analytic Geometry and Calculus (Math 141, 142, 143)</td>
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<tr>
<td>General Chemistry (Chem 124, 123)</td>
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* Select from MP 141, 142, 143, 144; IE 141; WM 141, 142.
### Civil Engineering

<table>
<thead>
<tr>
<th>Year</th>
<th>Course Description</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshman</td>
<td>General Physics (Phys 131)</td>
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</tr>
<tr>
<td></td>
<td>Freshman Composition (Engl 104, 105 or 218)</td>
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</tr>
<tr>
<td></td>
<td>Life Science Elective</td>
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<td></td>
<td>Literature Elective</td>
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</tr>
<tr>
<td></td>
<td>Physical Education</td>
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**Sophomore**

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<td>Engineering Mechanics (ME 211, 212)</td>
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<td>Strength of Materials (Aero 208, 209)</td>
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<td>American Democracy &amp; World Affairs (Hist 206)</td>
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**Senior**

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**Student may select any combination of PE courses to total 3 units.**

**To be selected from General Education list.**
Civil Engineering

PUBLIC WORKS OPTION
(Add courses below to Basic Curriculum)

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<td>Stat 212 Statistical Methods</td>
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<td>IE 414 Engineering Economics</td>
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TRANSPORTATION OPTION
(Add courses below to Basic Curriculum)

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<td>CE 435 Airport Planning and Design</td>
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<td>Soc 313 Urban Sociology</td>
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</table>
The Electronic and Electrical Engineering Department offers two degree programs, which are accredited by the Engineers' Council for Professional Development: the B.S. Degree in Electronic Engineering and the B.S. Degree in Electrical Engineering. When applying for admission one of the two majors must be selected. These two majors have identical curricula through the sophomore year with minor differences in the junior year. Consequently, the student may elect a major change from one to the other as late as during the junior year.

The main objective of the department is to prepare the student for engineering; i.e., finding the answers to urgent problems in reshaping the environment to meet human needs, taking into account all implications. The curriculum provides a sound theoretical background along with current, immediately useful, practical engineering knowledge. The student begins the major in the first term with orientation and has one or more major courses each term until graduation. The many laboratory courses provide practical instrumentation experience and lead logically into design beginning in mid-third year.

Senior students select specialized interest courses which make them more attractive to industry as early contributors. The student wishing to pursue graduate work directly may select appropriate senior courses in keeping with this goal. In the required senior design project, students demonstrate their understanding of engineering knowledge and their capability to apply that knowledge creatively to practical problems of design with a minimum of supervision. Learning in the humanities and the social sciences extends over all years.

Students are encouraged to participate in the clubs sponsored by the department. These are the Institute of Electrical and Electronic Engineers Student Branch, an international professional society; Eta Kappa Nu, a National Electrical and Electronic scholastic honor society; Poly Phase Club, an active socially-oriented organization; International Society for Hybrid Microelectronics; and the Audio Engineering Society.
Electronic Engineering

BASIC CURRICULUM

The first two years of the Electronic Engineering and Electrical Engineering curricula introduce the student to material basic to both of these disciplines.

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| 15 | 16 | 16 |

Sophomore

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| 17 | 17 | 17 |

CURRICULUM IN ELECTRONIC ENGINEERING

Electronic Engineering is that branch of engineering which deals with the development, design and application of circuits, devices and systems for communication, computers, controls, information processing and display, and system instrumentation. The curriculum includes basic circuit, field and device theory accompanied by logic and switching circuit design. Course updating keeps the curriculum in step with current technical advancements in the electronic field.

Senior elective courses provide specialized preparation in a selected area such as active and passive network synthesis, advanced communications, computer system design, microelectronic circuit engineering, microprocessor systems applications, microwave engineering, and solid state devices.

The department has laboratories equipped to support the program. They provide not only hands-on instrumentation experience, but also design experience.
### CURRICULUM IN ELECTRICAL ENGINEERING

Electrical Engineering is that branch of engineering which deals with industrial process control systems and with generation, distribution, control and utilization of electric power. The curriculum includes basic circuit, field and device theory accompanied by control systems and power system analysis. Course updating keeps the curriculum in step with current technical advancements in the electrical field.

Senior elective courses provide specialized preparation in a selected area such as advanced control systems, energy conversion, power system analysis, protection and stability and solid state motor control.

The Electric Power Institute, sponsored by the department and underwritten by major utility companies and electrical equipment manufacturers, offers advanced seminars and lectures in the power field and provides limited student and faculty exchange opportunities.

The department has laboratories equipped to support the program. They provide not only hands-on instrumentation experience, but also design experience.

† To be selected in accordance with General Education requirements.
* A minimum of 3 units in Engineering Science bearing non-EL or EE prefixes are required. Three senior laboratories with El or EE prefixes are required and two lecture courses in the major are required.

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#### Junior

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| Electives                                              | 16 | 17 | 17 |
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Total: 17 F, 18 W, 17 S

### Senior

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<tbody>
<tr>
<td>Control Systems (EE 431)</td>
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<td>Senior Project (EE 461, 462)</td>
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<td>Power Systems Analysis (EE 406)</td>
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<td>Human Values (Hum 402) or Science, Technology and Public Policy (Pol Sc 404) or The New Deal and Contemporary America (HIST 407)</td>
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Total: 16 F, 16 W, 18 S

+ To be selected in accordance with General Education Requirements.
** A minimum of 3 units in Engineering Science. Three Senior Laboratories with EL or EE prefixes and two lecture courses in the major are required.
ENGINEERING SCIENCE
(Interdisciplinary Program)
Coordinator, Richard K. Dickey

The curriculum in Engineering Science is designed for those students seeking comprehensive education in the fundamental principles and concepts of engineering as distinguished from specialization in one engineering discipline. It is a broad, flexible program in engineering which provides ample opportunity for each student (with aid from an adviser) to plan a program to meet personal career objectives. For example, a student can create excellent programs in engineering physics, bio-engineering, pre-medicine, etc.

The engineering sciences are based on an extensive study of mathematics, physics, and chemistry. They are (1) mechanics of solids and fluids, (2) electrical science including electric and magnetic fields, circuits, and electronics, (3) thermodynamics and statistical mechanics, (4) materials science, (5) information theory, (6) logic and computing devices, (7) systems analysis, and (8) transfer and rate processes, including heat and mass transfer.

The curriculum provides ample elective time for the selection of courses appropriate to the student's career objectives. Of the total 41 elective units, 21 are required to be chosen from a list of design systems and synthesis courses. In order to create a meaningful sequence of courses, the student will probably have to defer some of the technical courses (shown in the display below) to the senior year and start more electives in the junior year.

At the beginning of the junior year, no later than the end of the first quarter, the student will be required to submit to the Coordinator a "study plan" of electives. They must form a meaningful sequence of courses combining a consistent engineering and/or science flavor.
# CURRICULUM IN ENGINEERING SCIENCE

## Freshman

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<th>Course Description</th>
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<tr>
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<td>Digital Computer Applications (Engr 251)</td>
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<td>Manufacturing Process</td>
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<td>Applied Descriptive Geometry (ET 141)</td>
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<td>Analytic Geometry and Calculus (Math 141, 142, 143)</td>
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<td>General Chemistry (Chem 124, 125)</td>
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<td>General Physics (Phys 131, 132)</td>
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## Sophomore

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<td>Engineering Mechanics (ME 211, 212)</td>
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<td>Electric Circuit Analysis (EE 211, 212)</td>
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<td>Electric Circuits Laboratory (EE 241, 242)</td>
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<td>Analytic Geometry and Calculus (Math 241)</td>
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<td>Differential Equations (Math 242)</td>
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<td>General Physics (Phys 133)</td>
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<td>Network and Systems Analysis (EE 301)</td>
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<td>Advanced Circuits Laboratory (EE 341)</td>
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<td>Electronic Devices and Circuits (EL 307)</td>
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<td>Electronic Devices Laboratory (EL 347)</td>
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<td>Theory of Materials (Met 301, 302)</td>
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<td>American Government (Pol Sc 201)</td>
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<td>Partial Differential Equations (Math 319)</td>
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<td>Introduction to Numerical Analysis (CSc 332)</td>
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<td>Thermodynamics (ME 302, 303)</td>
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<td>Fluid Mechanics (ME 341)</td>
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<td>American Democracy and World Affairs (Hist 206)</td>
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## Senior

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<tr>
<td>Senior Project (Engr 461, 462)</td>
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<td>Undergraduate Seminar (Engr 463)</td>
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<td>Human Values (Hum 402)</td>
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See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Engineering and other subjects.

* To be selected from MP 141, 142, 143, 144, 145; Weld 141, 142, 144, 145.

** To be selected in accordance with the General Education requirements.

† Twenty-one of the elective units must be chosen with the approval of the adviser.
The Engineers Council for Professional Development defines engineering technology: "Engineering technology is that part of the technological field which requires the application of scientific and engineering knowledge and methods combined with technical skills in support of engineering activities; it lies in the occupational spectrum between the craftsman and the engineer at the end of the spectrum closest to the engineer."

The engineering technologist is somewhat less specialized than the engineer, focusing on a wider range of subject matter and skills. In general, the Bachelor of Science in Engineering Technology has less depth in basic and engineering sciences but more specific capability and training in skills and in the areas of production, applied design, equipment modification, service and repair. The Engineering Technology baccalaureate graduate has more depth in both theory and skills than the associate degree technician. In fact, the program is structured to maximize transfer credit from associate technology programs offered by the California Community College System. Considerably more than half of the students in the program are transfer students from these institutions. Field trips to industrial organizations and operations are an on-going part of the Engineering Technology program.

The curriculum in engineering technology is composed of a core of courses taken by all students plus the options shown below. Each student must select one or more of the options for an area of specialization. All options of the curriculum are accredited by the Engineers' Council for Professional Development.

The Bachelor of Science in Engineering Technology training leads to careers in production, quality assurance, field service, maintenance, testing and marketing.

**CURRICULAR OPTIONS**

**Air Conditioning-Refrigeration Technology**
- Emphasizes heating, ventilating, air distribution controls, building sanitation, air conditioning and refrigeration systems; specifically, the areas of modern commercial, industrial and manufacturing system applications.

**Electronic Technology**
- Emphasizes the practical and applied aspects of the electronic field with study in analog circuits, communication systems, control systems, digital computers, and instrumentation.

**Manufacturing Processes Technology**
- Emphasizes design and construction of production tooling, and the study of traditional and non-traditional methods of manufacturing processes, including numerical control.

**Mechanical Technology**
- Emphasizes applied machine design, mechanical equipment and systems, including fluid power, process control and instrumentation, production planning and supervision, plant equipment repair and maintenance.

**Welding Technology**
- Emphasizes all aspects of the welding field including techniques, nondestructive testing, power sources, and production problems.
CURRICULUM IN ENGINEERING TECHNOLOGY

**Freshman**

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<th>Course Description</th>
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<td>Electronic Instrument Practices (ET 125)</td>
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<td><strong>Manufacturing Processes</strong></td>
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<td>Electrical Practices (ET 126)</td>
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<td>Report Writing (Engl 218)</td>
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<td>Technical Calculus (Math 131, 132)</td>
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<td>College Physics (Phys 121, 122)</td>
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**Sophomore**

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<tr>
<td><strong>Applied Descriptive Geometry (ET 141 or 156)</strong></td>
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<td><strong>Engineering Drawing Systems (ET 142 or 122)</strong></td>
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<td>Digital Computer Applications (Engr 251)</td>
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<td>Statics (ME 205)</td>
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<td>Metallurgy for Engineering Technology (Met 235)</td>
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<td>Technical Calculus (Math 133)</td>
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<td>College Physics (Phys 123)</td>
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<td>General Inorganic Chemistry (Chem 121)</td>
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<td>Production Cost Estimating (IE 201)</td>
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**To be selected with approval of adviser.**
Engineering Technology

**Junior**

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<tr>
<td>Mechanics of Materials (Aero 202)</td>
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<tr>
<td>Fluid Mechanics (ME 311)</td>
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<td>Dynamics (ME 206)</td>
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<td>Electric Machines (EE 231)</td>
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<td>Engineering Analysis (IE 222)</td>
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<td>American Government (Pol Sc 201)</td>
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**Senior**

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<td>Undergraduate Seminar (ET 463)</td>
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<td>Thermodynamics (ME 301)</td>
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<td>* Life science</td>
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<td>Industrial Management (Mgt 311)</td>
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<td>American Democracy and World Affairs (Hist 206)</td>
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**AIR CONDITIONING-REFRIGERATION TECHNOLOGY OPTION**

(Add Courses Below to Basic Curriculum)

**Freshman**

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<tbody>
<tr>
<td>ET 121 Air Conditioning-Refrigeration Principles</td>
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<tr>
<td>ET 123 Environmental Graphics</td>
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<tr>
<td>EnvE 233 Fluid Systems</td>
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<td>EnvE 204 Heating and Ventilating Measurements</td>
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<td>Weld 157 Welding Survey</td>
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<tr>
<td>ET 313 Plumbing and Building Sanitation</td>
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**Sophomore**

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<tbody>
<tr>
<td>EnvE 251 Environmental Engineering Measurements</td>
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**Junior**

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<th>Course</th>
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<tr>
<td>ET 201 Air Conditioning and Refrigeration Codes</td>
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<tr>
<td>ET 321 Air Distribution Systems</td>
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<td>ET 331 Refrigeration Systems</td>
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<td>ET 332 Refrigeration Systems</td>
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<td>ET 425–6 Air Conditioning Systems</td>
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<td>ET 439 Instruments and Controls</td>
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**Senior**

* To be selected in accordance with the General Education requirement.

** 8 units from ET 432, 433 and 438 must be selected with adviser's approval.
### ELECTRONIC TECHNOLOGY OPTION

*Add Courses Below to Basic Curriculum*

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<tr>
<td>Freshman</td>
<td>MP 243 Electronic Assembly Techniques</td>
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<td>Weld 151 Micro Bonding</td>
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<td>ET 232-3 Electronic Circuits and Devices</td>
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#### CSc 218 Boolean Algebra .......... (4)
#### ET 311 Advanced Networks .......... (4)
#### ET 334 Dig. Comp. Cir. and Hardware .......... (4)

#### Senior

- ET 431 Active Linear Circuits .......... (4)
- **ET 432 Automatic Control .......... (4)
- **ET 433 Communication Systems .......... (4)
- **ET 438 Mini Computer Technology .......... (4)

### MANUFACTURING PROCESSES TECHNOLOGY OPTION

*Add Courses Below to Basic Curriculum*

<table>
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<th>Course</th>
<th>Credits</th>
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<tr>
<td>Freshman</td>
<td>MP 142 Manufacturing Processes: Milling</td>
<td>(1)</td>
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<td></td>
<td>MP 224 Advanced Machining Technology</td>
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<tr>
<td></td>
<td>Weld 235 Non-Destructive Examination</td>
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</tr>
<tr>
<td></td>
<td>Weld 259 Advanced Welding</td>
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<tr>
<td></td>
<td>IE 214 Production Control</td>
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<td>Sophomore</td>
<td>MP 224 Advanced Machining Technology</td>
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<td>IE 214 Production Control</td>
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#### Junior

- MP 322 Tool Design ....................... (3)
- MP 434, 5, 6 Tool and Manufacturing Engineering ........................ (9)

### MECHANICAL TECHNOLOGY OPTION

*Add Courses Below to Basic Curriculum*

<table>
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<tr>
<td>Freshman</td>
<td>ME 136 Thermal Systems</td>
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<td>ME 146 Thermal Syst. Lab</td>
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<td>Sophomore</td>
<td>ET 237 Ind Hydr and Pneumatics</td>
<td>(4)</td>
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<td>ET 221 Mech. Equip. of Bldg.</td>
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<td>ET 320 Mechanisms</td>
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### WELDING TECHNOLOGY OPTION

*Add Courses Below to Basic Curriculum*

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<tr>
<td>Freshman</td>
<td>MP 142 Manufacturing Processes: Milling</td>
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<tr>
<td></td>
<td>Weld 235 Non-Destructive Examination</td>
<td>(4)</td>
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<tr>
<td></td>
<td>MP 224 Advanced Machining Technology</td>
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<tr>
<td></td>
<td>Weld 259 Advanced Welding</td>
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<td>IE 214 Production Control</td>
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<td>Weld 324-5-6 Welding Technology .......</td>
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<td>Weld 336 Welding Power Sources ..........</td>
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<td>Weld 434-5-6 Adv. Weld Tech. ..........</td>
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<tr>
<td></td>
<td>MP 322 Tool Design</td>
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</tr>
</tbody>
</table>

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Engineering Technology, Manufacturing Processes and other subjects.

** 8 units from ET 432, 433 and 438 must be selected with adviser's approval.
Environmental Engineering is concerned with the interrelation of man, materials, and processes in a complex and changing environment. The broad field of environmental engineering includes control of air and water pollution, industrial hygiene, reduction of noise and vibration, air conditioning, heating, ventilation, and refrigeration. It also includes conservation of energy and the utilization of new energy sources such as solar energy.

The program offers a sound background in the fundamentals of thermodynamics, heat transfer, fluid mechanics, mass transfer, and physico-chemical characteristics of living and inanimate matter. The student will specialize in one of the curricular concentrations described below. The problem-oriented approach to instruction, in modern well-equipped laboratories, shops and design rooms, provides the student an excellent opportunity to gain understanding and experience as a joint exploration with the faculty. The curriculum is accredited by the Engineers' Council for Professional Development.

The Environmental Sciences and Engineering Club and a student branch of the American Society of Heating, Refrigeration, and Air Conditioning Engineers offer vigorous programs of technical and other activities, including field trips each year to the Los Angeles and San Francisco areas to study typical installations of systems. Student memberships are also available in the Air Pollution Control Association, the California Water Pollution Control Association, and the Water Pollution Control Federation.

Graduates obtain employment primarily with consulting engineers, manufacturers, contractors, and governmental agencies.

**CURRICULAR CONCENTRATIONS**

Air Conditioning-Refrigeration

This concentration prepares students to enter those phases of engineering dealing particularly with thermal systems and their control in a variety of applications. These applications include: heating, ventilating, and air conditioning of buildings; energy conservation, insulation, and solar energy utilization; refrigerated food processing and storage; industrial refrigeration; and environmental control in motor vehicles, railroad equipment, and aircraft.

Air Pollution Control

This concentration provides training in the field of air pollution control. An engineering approach to the subject prepares the student to enter careers in air quality management, and industrial, public and private agencies concerned with solving problems of air pollution.

Water Pollution-Waste Management

This concentration provides training in two important areas of environmental quality control, approached from an engineering point of view. The student will be prepared for a career in industry or in public service.

**CURRICULUM IN ENVIRONMENTAL ENGINEERING**

<table>
<thead>
<tr>
<th>Course</th>
<th>F</th>
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<tbody>
<tr>
<td>Environmental Engineering Systems (EnvE 101)</td>
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<td>Manufacturing Processes (MP 143)</td>
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<tr>
<td>General Psychology (Psy 202)</td>
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<tr>
<td>Applied Descriptive Geometry (ET 141)</td>
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<td>Environmental Graphics (ET 122)</td>
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<td>Analytic Geometry and Calculus (Math 141, 142, 143)</td>
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<td>General Physics (Phys 131, 132)</td>
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<td>Freshman Composition (Engr 104, 105)</td>
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<td>General Chemistry (Chem 124, 125)</td>
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**Students concentrating in AC & R may substitute Chem 126 or Phys 211.**
### Sophomore

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<td>Environmental Engr. Measurements (EnvE 251)</td>
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<td>Heating and Ventilating (EnvE 204)</td>
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<td>Fluid Systems (EnvE 231)</td>
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<td>Digital Computer Applications (Engr 251)</td>
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<td>Engineering Mechanics (ME 211, 212)</td>
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<td>Thermodynamics (ME 302)</td>
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<td>Manufacturing Processes (ME 302)</td>
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<tr>
<td>Analytic Geometry and Calculus (Math 241)</td>
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<td>Differential Equations (Math 242)</td>
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<td>General Physics (Phys 133)</td>
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<td>Statistical Analysis (Stat 321, 322)</td>
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<td>American Government (Pol Sc 201)</td>
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### Junior

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<td>Electronics Laboratory (EL 361)</td>
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<td>Heat Transfer (EnvE 313)</td>
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<td>Environmental Air Quality (EnvE 325)</td>
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<td>Strength of Materials (Aero 208)</td>
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<td>Fluid Mechanics (ME 341)</td>
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<td>Electric Circuit Theory (EE 201)</td>
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<td>Electric Circuits Laboratory (EE 261)</td>
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<td>Materials Engineering (Met 306)</td>
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<td>American Democracy and World Affairs (Hist 206)</td>
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<td>Survey of Economics (Econ 201)</td>
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### Senior

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<td>Advanced Mass and Energy Transfer (EnvE 403)</td>
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<td>Automatic Process Control (EnvE 416)</td>
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<td>Senior Project (EnvE 461, 462)</td>
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<td>Undergraduate Seminar (EnvE 463)</td>
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<td>* Literature Elective</td>
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<td>* Literature or Philosophy</td>
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<td>* Humanities Elective</td>
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<td>Human Values (Hum 402), or Business Law Survey (Bus 201) or Engineering Economy (IE 414)</td>
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<td>Advanced System Design (EnvE 441, 442)</td>
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</table>

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Environmental Engineering and other subjects.

# To be selected from MP 141, 142, 144; IE 141; Weld 141, 142, 144, 157.

§ 25 of the elective units must be chosen with the approval of the adviser according to the field of concentration.

* To be selected in accordance with the General Education requirements.
Industrial Engineering is the profession concerned with solving engineering and management problems by applying scientific logic and by utilizing energy, materials, facilities, and personnel most effectively. Its objective is to improve quality and efficient production of goods and services for humankind and to act as the interface between technology and the human factor. Engineering methods and practical knowledge are used in formulating decision models for optimum application of management principles.

Industrial engineering graduates can choose from a most challenging range of career activities: operations research and analysis, production planning and scheduling, plant design, management, human factors engineering design, data processing and analysis, measurement, quality control and reliability assurance, technical economic planning, resource conservation, productivity measurement, and, in general, systems analysis and design. The physical, engineering, and social sciences form the broad base for these endeavors.

The curriculum, accredited by the Engineers' Council for Professional Development, is oriented to provide graduates with the capability of producing results with a minimum of additional training. Graduates are also well prepared for successful postgraduate study. Health care industries, banks, retail chains, farms, airlines, mines, computer firms, as well as government and traditional manufacturing industries, employ graduates of this discipline. Active within the department are student chapters of the American Institute of Industrial Engineers and Alpha Pi Mu, the national honorary society for industrial engineers.

Department and University laboratories and equipment, including computers and programmable calculators, are integrated into coursework from matriculation until graduation to investigate, test, and apply theoretical principles learned in the classroom.

### CURRICULAR CONCENTRATIONS

**Manufacturing**

A selection of courses stressing the synthesis and improvement of the production process utilizing statistics, economics, operations research, social sciences, human factors, principles of management, and manufacturing methods.

**Systems**

A selection of courses stressing the analysis and synthesis of systems. Mathematical and statistical models for management planning and control including the concepts of human factors, information theory, and data feedback as applied to productive systems.

### CURRICULUM IN INDUSTRIAL ENGINEERING

<table>
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<th>Freshman</th>
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<tr>
<td>Digital Computer Applications (Engr 251)</td>
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<td>Introduction to Industrial Engineering (IE 101)</td>
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<td>Industrial Systems Analysis (IE 123)</td>
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* MP 141, 142, 143, 144, Weld 141, 142, 144.
§ To be selected in accordance with the General Education Requirement.
Industrial Engineering

** Technical elective ................................................................. 2
Physical Education Activity .......................................................... 1

** Sophomore

<table>
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<th>Course</th>
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<td>Manufacturing Engineering Laboratory (IE 251)</td>
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<td>Industrial Costs and Controls (IE 239)</td>
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<tr>
<td>Man-Machine Systems (IE 223)</td>
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<td>Engineering Mechanics (ME 211)</td>
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<td>Analytic Geometry and Calculus (Math 241)</td>
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<td>Differential Equations (Math 242)</td>
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<td>Statistical Analysis (Stat 321)</td>
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<td>General Physics (Phys 131, 132, 133)</td>
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<tr>
<td>American Government (Pol Sc 201)</td>
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<tr>
<td>American Democracy &amp; World Affairs (Hist 206)</td>
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** Junior

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<td>Operations Research (IE 304, 419)</td>
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<td>Human Factors Engineering (IE 319)</td>
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<td>Statistical Quality Control (IE 430)</td>
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<td>Manufacturing Design (IE 343)</td>
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<td>Engineering Economy (IE 414)</td>
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<td>Strength of Materials (Aero 208)</td>
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<td>Electric Circuit Theory (EE 201)</td>
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<td>Engineering Mechanics (ME 212)</td>
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<td>Statistical Analysis (Stat 322)</td>
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<td>Principles of Economics (Econ 211)</td>
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** Senior

<table>
<thead>
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<th>Course</th>
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<td>Fundamentals of Supervision (IE 441, 442)</td>
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<td>Senior Project (IE 461, 462)</td>
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<td>Thermodynamics (ME 302)</td>
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<td>Electronics (El 321)</td>
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<td>Principles of Economics (Econ 212)</td>
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</table>

** Electives and courses to complete major .................................. 4 3

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Industrial Engineering and other subjects.

** Twenty-one of the elective units must be chosen with the approval of the advisor in a field of concentration.
The Industrial Technology Department offers two curricula which prepare graduates for employment in a broad range of professional positions in industrial management, industrial production, industrial marketing or industrial and public education. For those interested in employment in industry the course offerings qualify students for occupations in the mid-ground between engineering and business. For those planning to teach the technical subjects of industry there are both broad and specific offerings concerning course content and methods in all the major areas. A program leading to the Master of Arts degree is offered for qualified graduates interested in industrial education, whether in the public schools or in industry.

Emphasis is placed upon the study of tools, machines, materials, processes and products. Special consideration is given to the industrial application of mathematics, physics and chemistry. Also of major importance is the development of the ability to work with people concerning matters of a technical nature.

Each student gains a substantial general education through courses in the areas of language communication, social sciences, mathematics, physical education and the arts. Ability to communicate in technical areas is further developed through courses in technical writing and technical drawing.

The Industrial Technology Department's curricula provide for instruction and laboratory experiences in drafting, wood technology, electricity, electronics, metal technology, power technology, and graphic arts.
CURRICULUM IN INDUSTRIAL TECHNOLOGY

This Bachelor of Science degree program emphasizes preparation for technical leadership responsibilities with a broad variety of industries including manufacturing, communication, transportation and utility services. Graduates in the field of industrial technology function in the mid-ground between the applied aspects of engineering and administration. Students who enjoy working primarily with people in solving technical problems are particularly well suited for careers in industrial technology. Preparation for professional specialization in industrial sales, production management, plant facilities, or quality management is provided through the selection of appropriate electives.

Freshman

<table>
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<tr>
<th>Course</th>
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<tr>
<td>Technical Computation (IT 101)</td>
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<td>Industrial Technology Careers (IT 112)</td>
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<td>Fundamentals of Technical Drawing (ET 151)</td>
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<td>Manufacturing Processes</td>
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<td>College Algebra and Trigonometry (Math 120)</td>
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<td>Technical Calculus (Math 131)</td>
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<td>College Physics (Phys 121, 122)</td>
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<td>Life science elective</td>
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Sophomore

<table>
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<th>Course</th>
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<tbody>
<tr>
<td>Marketing Principles (Mktg 204, or Mktg 301)</td>
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<tr>
<td>Industrial Electricity (IT 237, 238)</td>
<td>3</td>
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<tr>
<td>** Elementary Probability and Statistics (Stat 211)</td>
<td>3</td>
<td></td>
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<tr>
<td>** Statistical Methods (Stat 212)</td>
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<tr>
<td>Humanities elective</td>
<td></td>
<td></td>
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<tr>
<td>Principles of Economics (Econ 211, 212)</td>
<td>3</td>
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<tr>
<td>Principles of Accounting (Actg 221, 222)</td>
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<td>College Physics (Phys 123)</td>
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Junior

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<th>Course</th>
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<tbody>
<tr>
<td>Quality Systems Applications (IT 350)</td>
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<tr>
<td>Industrial Electrical Systems (IT 331)</td>
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<td>Electronic Control Systems (IT 332)</td>
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<td>Electronic Computer Applications (IT 333)</td>
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<td>Product Evaluation (IT 326)</td>
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<td>Power Technology (IT 222)</td>
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<td>Technical Sketching (IT 245)</td>
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<td>Industrial Materials (IT 229)</td>
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<td>Industrial Marketing (IT 405)</td>
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<td>Industrial Management (Mgt 311)</td>
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<tr>
<td>General Inorganic Chemistry (Chem 121, 122)</td>
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<td>General Psychology (Psy 202)</td>
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<tr>
<td>Literature or philosophy elective</td>
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<td>† Electives</td>
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<td>Total units</td>
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</table>

* Chosen from MP 141, 142, 143, 144, IE 141; Weld 141, 142, 144.
** Consult with adviser. Stat 321–322 should be substituted for Stat 211–212 as prerequisites depending on the adviser-approved electives.
† 15 of the units must be chosen with approval of the adviser.
Industrial Arts

Senior

<table>
<thead>
<tr>
<th>Course</th>
<th>F</th>
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<tbody>
<tr>
<td>Cost Reduction and Control (IT 406)</td>
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<td>Industrial Equipment Selection (IT 415)</td>
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<td>Mechanical Systems (IT 431, 432, 433)</td>
<td>3</td>
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<tr>
<td>Technical Management Problems (IT 418)</td>
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<tr>
<td>Senior Project (IT 461, 462)</td>
<td>2</td>
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</tr>
<tr>
<td>Undergraduate Seminar (IT 463)</td>
<td></td>
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</tr>
<tr>
<td>American Government (Pol Sc 201)</td>
<td>3</td>
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<tr>
<td>American Democracy and World Affairs (Hist 206)</td>
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<td>Electives</td>
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<td></td>
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</table>

CURRICULUM IN INDUSTRIAL ARTS

This major provides for the undergraduate professional preparation of future industrial education teachers at the secondary and junior college levels. Students select one concentration from the seven listed below. In addition to specialization in one field, the student receives a broad basic training in most of these specialties. Graduates of this major have an extensive understanding of industrial manufacturing procedures plus the ability to work well with students in helping them to become familiar with processes of industry. The program leads to a Bachelor of Arts degree. The Single Subjects Credential (for secondary teaching) is available upon successful completion of this program. Those preferring not to go into teaching may substitute technical laboratory electives for the student teaching requirement.

CURRICULAR CONCENTRATIONS

Automotives

Emphasizes the industrial education teaching aspects of power mechanics and automotive technology including engines, fuel system, chassis, electronics and power trains.

Drafting

Prepares students to teach drafting in the public schools.

Electronics

Prepares for the teaching of industrial education electronics with emphasis upon electronic principles, component, functions, construction testing, trouble shooting and repair of equipment plus planning, equipping and organizing for the teaching of electronic programs.

Graphic Arts

This concentration prepares the student to teach industrial arts graphic arts in the public schools. Specialized courses in this industrial area are offered by the Graphic Communications Department and by the Art Department.

Metals

Emphasis is upon a broad general metals knowledge with skill in the areas of bench metal, layout, foundry, machining, welding and related art metal as well as metal production processes suitable for secondary school instruction.

Wood/plastics

Basic materials and processes. School wood laboratory equipment, maintenance, production processes, mill cabinet work and building construction. Processing, mold construction, process control, and test methods for plastics.

† 15 of the units must be chosen with approval of the adviser.
# Industrial Arts

## Freshman

<table>
<thead>
<tr>
<th>Course</th>
<th>F</th>
<th>W</th>
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<tbody>
<tr>
<td>Technical Computation (IT 101)</td>
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<td>Industrial Education Careers (IT 111)</td>
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<tr>
<td>Fundamentals of Technical Drawing (ET 151)</td>
<td>2</td>
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<tr>
<td><strong>Manufacturing Processes</strong></td>
<td>4</td>
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<td>Industrial Wood Process (IT 125)</td>
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<tr>
<td>College Algebra (Math 114 or 115)</td>
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<tr>
<td>Freshman Composition (Engl 104, 105)</td>
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<td>College Physics or Chemistry (Phys 121, 122 or Chem 121, 122)</td>
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<td>Life science elective</td>
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**MP 141, 142, 143, 144; IE 141; Weld 141, 142, 144.**

**23 of the elective units must be chosen with the approval of the adviser in a field of concentration. A minimum of 18 of these must be at the 300-400 level.**

## Sophomore

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
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<td>Automotive Power (IT 250)</td>
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<td>Technical Sketching (IT 245)</td>
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<td>Industrial Materials (IT 229)</td>
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<tr>
<td>General Psychology (Psy 202)</td>
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<tr>
<td>American Government (Pol Sc 201)</td>
<td></td>
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<tr>
<td>Industrial Electricity (IT 237, 238)</td>
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<tr>
<td>Wood Technology (IT 353)</td>
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<tr>
<td>Advanced Composition (Engl 300)</td>
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<tr>
<td>Principles of Speech (Sp 200)</td>
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<td>Elementary Probability and Statistics (Stat 211)</td>
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<tr>
<td>Survey of Economics (Econ 201)</td>
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<td>3</td>
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<td>Introduction to Literature (Engl 207)</td>
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## Industrial Arts

<table>
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<tr>
<th>Course</th>
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<tr>
<td>Technical Drawing (IT 444)</td>
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<tr>
<td>Curriculum and Methods of Industrial Ed (IT 424)</td>
<td>3</td>
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<tr>
<td>Plastics Technology (IT 327)</td>
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<td>Industrial Design (IT 346)</td>
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<td>Learning Process (Ed 335)</td>
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<td>Physical Science (Phys 123 or Chem 226)</td>
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<td>Multicultural Ed (Ed 301)</td>
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<td>Diagnosis, Prescription and Evaluation (Ed 436)</td>
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<td>Mechanical Systems (IT 433)</td>
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<td>Approved 300-400 IT courses</td>
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<tr>
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<td><strong>Industry Business Management elective</strong></td>
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<td>Student Teaching (Ed 440) or electives</td>
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<td>American Democracy and World Affairs (Hist 206)</td>
<td>5</td>
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<td>Electives and courses to complete major</td>
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</table>

**Notes:**
- 23 of the elective units must be chosen with the approval of the adviser in a field of concentration.
- To be selected from IR 311, 314, Mgt 201, 311.

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### MASTER OF ARTS IN INDUSTRIAL ARTS

The Master of Arts in Industrial Arts program provides preparation for professional responsibilities including leadership in industrial education. It is designed to be of practical value to secondary school and community college instructors in industrial arts and trade-technical subjects. It will also aid those preparing for administrative-type positions in these areas. The program also meets the requirements for the permanent California Secondary Single-Subject Teaching Credential. The master's degree in a subject field such as Industrial Arts is required for regular credentialing to teach at the community college level.

The curriculum includes opportunities for obtaining knowledge and skills at advanced levels in technical areas and covers aspects common to current industrial education in curriculum, facilities, trends, organization, administration and research.

### CURRICULUM FOR THE MASTER OF ARTS DEGREE

For University requirements see Graduate Studies Announcement

<table>
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<th>Required:</th>
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<tr>
<td>IT 515 History and Philosophy of Industrial Education</td>
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<td>IT 520 Organization and Administration of Industrial Education</td>
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<td>IT 521 Curriculum in Industrial Education</td>
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<td>IT 522 Facility Planning in Industrial Education</td>
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<td>IT 527 Trends and Issues in Industrial Education</td>
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<td>IT 580 Graduate Seminar in Industrial Education</td>
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<td>IT 599 Industrial Education Thesis or Project</td>
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<td>Courses in professional education at the 500 level chosen with approval of the adviser</td>
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<tr>
<td>Elective courses at the 300, 400, and 500 levels, including a minimum of 6 additional units in industrial education, with adviser approval</td>
<td>14</td>
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</tbody>
</table>

See COURSES OF INSTRUCTION section of the catalog for description of courses in Industrial Technology and other subjects.
MECHANICAL ENGINEERING DEPARTMENT
Department Head, John J. Kane
Robert W. Adamson Otto C. Davidson Lawrence H. Nelson
James G. Andresen Edward R. Garner Leon F. Osteyee
Edward H. Baker Raymond G. Gordon D. John Price
Laurence H. Carr Roger A. Keech Charles R. Russell
Richard N. Christensen Fredrick B. Malmborg Ramesh T. Shah
Franklin S. Crane James L. Meriam Edward O. Stoffel

Mechanical engineering concerns itself primarily with the design, construction, and use of a wide variety of equipment ranging from manufacturing machinery and power generation equipment to consumer goods. Of primary concern to the mechanical engineer is the proper application of rigid, fluid, and thermal mechanics in the design and use of this equipment.

Graduates obtain employment primarily with manufacturers, contractors, public utilities, and governmental agencies. Types of work performed by graduates include design, engineering sales, engineering test, supervision of manufacture and erection.

The curriculum gives the student a thorough grounding in mechanical engineering and a choice of a curricular concentration in nuclear engineering or in general professional specialties as approved by the adviser. Engineering courses are found in all four years. In the junior and senior years, the professional specialties include such courses as turbomachinery, mechanical design, heat and mass transfer, mechanical control systems, and nuclear power plants. The curriculum is accredited by the Engineers' Council for Professional Development.

Laboratories are an important part of the student's education. The student is enrolled in mechanical engineering laboratories from the beginning of the freshman year until graduation. These laboratories include work in power generation, fluid flow, heat transfer, vibration, strength of materials, and others.

There are two organized student clubs in the Mechanical Engineering Department: a student branch of the American Society of Mechanical Engineers and a student branch of the Society of Automotive Engineers. These clubs offer students an active program of professional and social activity.

CURRICULAR CONCENTRATIONS

Nuclear
The nuclear concentration places emphasis on nuclear energy for those who may wish to develop a particular expertise in design for use of nuclear power.

General
The term "general" is used to distinguish the variety of programs available under traditional mechanical engineering from the nuclear concentration, above.

CURRICULUM IN MECHANICAL ENGINEERING

Freshman
# Thermal and Mechanical Systems (ME 136-146, 134) .................... 4 4
  Applied Descriptive Geometry (ET 141) ........................................ 2
  Applied Engineering Drawing (ET 155) ........................................ 1
* Manufacturing Processes .................................................. 1 2
  Analytic Geometry and Calculus (Math 141, 142, 143) ................... 4 4 4
  General Chemistry (Chem 124, 125) ........................................ 4 4
  General Physics (Phys 131) ................................................ 4
  Freshman Composition (Engl 104, 105) .................................... 3 3
  Physical Education Activity ................................................ 1 1 1

16 16 15

# Qualified transfer students may, with departmental approval, substitute either ME 234 or 237 and 4 units of approved technical electives.
* Chosen from MP 141, 142, 143, 144; IE 141; Weld 141, 142, 144.
### Sophomore

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Engineering Mechanics (ME 211, 212)</td>
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<td>Strength of Materials (Aero 208, 209)</td>
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<tr>
<td>Materials Engineering (Met 306)</td>
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<td>Materials Engineering Laboratory (Met 341)</td>
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<tr>
<td>* Manufacturing Processes</td>
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<tr>
<td>Modern Physics (Phys 210)</td>
<td>4</td>
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<tr>
<td>Calculus, Differential Equations (Math 241, 242)</td>
<td>4</td>
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<td>Advanced Engineering Mathematics (Math 318)</td>
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<td>General Physics (Phys 132, 133)</td>
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<td>Digital Computer Applications (Engr 251)</td>
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<tr>
<td>Survey of Economics (Econ 201)</td>
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<td>American Government (Pol Sc 201)</td>
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### Junior

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<td>Introduction to Design (ME 327)</td>
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<td>Thermodynamics (ME 302, 303)</td>
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<td>Thermodynamics Laboratory (ME 343)</td>
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<td>Fluid Mechanics (ME 341, 342)</td>
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<td>Fluid Mechanics Laboratory (ME 345)</td>
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<td>Mechanical Vibrations (ME 316)</td>
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<td>Vibrations Laboratory (ME 317)</td>
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<td>Heat Transfer (EnV 313)</td>
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<td>Electric Circuit Theory (EE 201)</td>
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<td>Electric Circuits Laboratory (EE 261)</td>
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<td>Electronics (EL 321)</td>
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<td>Electronic Laboratory (EL 361)</td>
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<td>Energy Conversion and Electromagnetics (EE 325)</td>
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<tr>
<td>Energy Conversion Laboratory (EE 365)</td>
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<tr>
<td>American Democracy and World Affairs (Hist 206)</td>
<td>5</td>
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<tr>
<td>Psychology (Psy 202 or 311)</td>
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<tr>
<td>Engineering Economy (IE 415)</td>
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<td>Electives and courses to complete major</td>
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### Senior

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Mechanical Control Systems (ME 422)</td>
<td>4</td>
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<tr>
<td>Senior Project (ME 461, 462)</td>
<td>2</td>
</tr>
<tr>
<td>Undergraduate Seminar (ME 463)</td>
<td>2</td>
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<tr>
<td>† Literature or Philosophy</td>
<td>4</td>
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<td>† Life Science</td>
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<td>† Humanities</td>
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<tr>
<td>** Electives and courses to complete major</td>
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</tbody>
</table>

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Mechanical Engineering and other subjects.

* Chosen from MP 141, 142, 143, 144; IE 141; Weld 141, 142, 144.
** 20 units of the electives must be chosen in a field of concentration. Concentration lists are available at the departmental office.
† To be selected with adviser approval in accordance with the General Education requirement.
METALLURGICAL AND WELDING
ENGINEERING DEPARTMENT
Department Head, Richard C. Wiley
Harry H. Honegger Robert B. Leonesio Orien W. Simmons

The Metallurgical Engineering Department prepares students for employment as metallurgical engineers, and also provides service courses in metallurgy to students in other departments. The curriculum is accredited by the Engineers' Council for Professional Development. It offers opportunity to pursue specialized metallurgical areas on an elective basis in the senior year.

Students who graduate as metallurgical engineers are employed by private industry and government agencies to deal with problems of design and manufacture of metals and alloys, corrosion protection, nondestructive testing, application of materials to specific needs and requirements including process development. Typical position titles are metallurgist, metallographer, materials engineer, welding engineer, nondestructive test engineer, and inspection and quality control specialist.

The Metallurgical Engineering Department is well equipped with various laboratories and shops. There are two metallurgical engineering laboratories for student use. The metallography laboratory is equipped with the latest instruments for study of internal structures of metals and alloys. The metallurgy laboratory includes equipment for vacuum melting and processing, heat treatment, nondestructive testing, air melting furnaces, a "wet" laboratory, and a physical testing laboratory.

The Department sponsors a student chapter of the national society, The American Society for Metals. The chapter offers an active program of professional and social activity.

CURRICULUM IN METALLURGICAL ENGINEERING

<table>
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<tr>
<th>Course</th>
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<tr>
<td>Introduction to Metallurgy (Met 121)</td>
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<tr>
<td>Manufacturing Processes (Weld 141, 142)</td>
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<td>* Manufacturing Processes (MP 144)</td>
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<tr>
<td>General Chemistry (Chem 124, 125)</td>
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<td>General Physics (Phys 131)</td>
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<td>Analytic Geometry and Calculus (Math 141, 142, 143)</td>
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<td>Report Writing (Engl 218 or Engl 103)</td>
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* MP 141 and 142 may be substituted for MP 144.
§ To be selected in accordance with the General Education requirement.
Metallurgical Engineering

Sophomore

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<th>Course</th>
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<td>Materials Engineering (Met 306)</td>
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<td>Materials Engineering Laboratory (Met 341)</td>
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<td>Physical Metallurgy (Met 222)</td>
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<td>Nonferrous Alloys (Met 223)</td>
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<td>Digital Computer Applications (Engr 251)</td>
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<td>Engineering Mechanics (ME 211, 212)</td>
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<tr>
<td>Fundamentals of Tech Drawing (ET 151)</td>
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<td>General Physics (Phys 132, 133)</td>
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<td>Analytic Geometry and Calculus (Math 241)</td>
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<td>American Government (Pol Sc 201)</td>
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<td>Survey of Economics (Econ 201)</td>
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Junior

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<tr>
<td>Theory of Materials (Met 301, 302, 303)</td>
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<td>Metallurgical Engineering (Met 324, 325, 326)</td>
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<td>Statistical Analysis (Stat 321, 322)</td>
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<td>Strength of Materials (Aero 208, 209)</td>
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<td>Heat Transfer (EnvE 313)</td>
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<td>Physical Chemistry (Chem 305, 306)</td>
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Senior

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<th>Course</th>
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<tbody>
<tr>
<td>Advanced Theory of Materials (Met 421, 422, 423)</td>
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<tr>
<td>Applied Metallurgical Engineering (Met 424, 425, 426)</td>
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<td>Senior Project (Met 461, 462)</td>
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<td>Undergraduate Seminar (Met 463)</td>
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<td>Electric Circuit Theory (EE 201)</td>
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<td>Electric Circuit Laboratory (EE 261)</td>
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<td>Electronics (EL 321)</td>
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<td>Electronic Laboratory (EL 361)</td>
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<tr>
<td>Advanced Technical Topic</td>
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</tbody>
</table>

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Metallurgical Engineering and other subjects.

§ To be selected in accordance with the General Education requirement.
School of Human Development
and Education
The School of Human Development and Education offers several major curricula leading to Bachelor of Science, Master of Arts, and Master of Science degrees. In addition, each department provides courses which are designed to serve all other departments in the University in offering experiences to students that enhance their general education.

Departments offering a major are Child Development, Home Economics and Physical Education. The Ethnic Studies Department and the Psychology Department offer a wide range of electives for students majoring in other fields. Master's degrees are offered in Education, Home Economics, and Physical Education. The Bachelor of Arts in Liberal Studies is offered in connection with the teacher education program. The School, through the Education Department, assists in the coordination of a campus-wide teacher education program and in the preparation of individuals seeking teaching, counseling or administrative services, reading and special education specialist credentials.

The School has taken the leadership in the sponsorship or direction of numerous community oriented projects which are timed to meet social needs in cooperation with local, state and federal agencies. One such project is the High School Equivalency Program.

The University supports a strong co-curricular program, and to this end the School of Human Development and Education provides valuable experience in intramural sports activities. Specialized co-curricular activities include: California Association for Health, Physical Education and Recreation, Student California Teachers Association, Phi Upsilon Omicron (Home Economics), and others.
The curriculum in Child Development covers many aspects of child and family development. The objectives of the department are to prepare competent and sensitive professionals in child and family-related fields and to share the knowledge of human development with students from all departments at the University.

The curriculum is multi-disciplinary. Course work is provided in Anthropology, Sociology, Psychology, Home Economics, the Arts and Humanities, Science and Mathematics as well as in Child Development and Family Studies. The Child Development Department operates five pre-school laboratories on campus and places students in many apprenticeship situations in San Luis Obispo County in keeping with the Cal Poly philosophy of "learn by doing."

**CURRICULAR CONCENTRATIONS**

**Child Development Concentration**

The Child Development Concentration prepares students for teaching, administrative and specialist positions with public or private institutions in the U.S. or overseas and for graduate work leading to teaching and research positions at the College level. Child Development graduates may choose to work with infant, preschool, kindergarten and elementary age children or their parents. The faculty is interested in attracting men, as well as women, into one of the most crucial and rewarding careers available in the 1970's.

**Family Studies concentration**

The Family Studies concentration is an interdisciplinary program designed to provide the knowledge and experience necessary for a variety of careers in family, community and volunteer agencies. This program is particularly appropriate for women or men who wish to work in welfare, adoption and mental health agencies and for those students who wish to pursue further training at the graduate level.

**CURRICULUM IN CHILD DEVELOPMENT**

<table>
<thead>
<tr>
<th>Course Description</th>
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<tbody>
<tr>
<td>Pairing, and Marriage (CD 103)</td>
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<tr>
<td>The Child, Family, and Community (CD 108)</td>
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<tr>
<td>Orientation (CD 101)</td>
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<tr>
<td>Observing and Reporting Techniques (CD 130)</td>
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<td>Freshman Laboratory: Beginning Study of the Child and Family (CD 131)</td>
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<td>Freshman Composition (Eng 104; 105 or 300)</td>
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<td>Introduction to Sociology (Soc 105)</td>
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<tr>
<td>Social Problems (Soc 106)</td>
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<tr>
<td>Biology (Bio 101)</td>
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<tr>
<td>Introduction to College Mathematics (Math 109)</td>
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<td>Art (Art 212 or 231 or 232)</td>
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<td>Health Education (PE 250)</td>
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<td>Safety and First Aid (PE 280)</td>
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<td>General Psychology (Psy 202)</td>
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* Of the total elective units, 21–24 shall be chosen in a field of concentration with the approval of the advisor.
## Child Development

### Sophomore

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<th>Course</th>
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<tr>
<td>Infancy (CD 232)</td>
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<td>Preschool Child (CD 233)</td>
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<td>Family Development (CD 203)</td>
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<td>Programs for Young Children (CD 239)</td>
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<td>Laboratory Study of Young Children (CD 240)</td>
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<tr>
<td>Adult, Family, and Community (CD 322)</td>
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<td>Principles of Speech (Sp 200)</td>
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<td><strong>Children's Literature (Engl 205)</strong></td>
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<td>American Democracy (Hist 204)</td>
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<td>U.S. in World Affairs (Hist 205)</td>
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<td>Nutrition (HE 210)</td>
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<td>Cultural Anthropology (Ant 201)</td>
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<td>Survey of Economics (Econ 201)</td>
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<td>American Government (Pol Sc 201)</td>
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<td>Music (Mu 101 or 204)</td>
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<td>Maternal and Child Nutrition (HE 310)</td>
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<td>Social Stratification (Soc 323)</td>
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<td>Personal and Home Management (HE 203)</td>
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<td>Human Inheritance (Bio 302)</td>
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<td>Senior Project (CD 461, 462)</td>
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<td>Social Psychology (Psy 401)</td>
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<td>Abnormal Behavior (Psy 307)</td>
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<td>Afro-American Pre-School Child (CD 301)</td>
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See COURSES OF INSTRUCTION section of this catalog for description of courses in Child Development, Home Economics and other subjects.

** Family Studies Concentration students may take any Literature course.

* Of the total elective units, 21-24 shall be chosen in a field of concentration with the approval of the advisor.

† Family Studies concentration students may take any Drama course.
The Education Department faculty, in addition to teaching professional courses, advises fifth-year and graduate students who are working toward initial teaching and advanced credentials. Students planning to teach in elementary school should refer to the degree program in Liberal Studies.

The University offers the following subject matter programs which have been approved by the Commission for Teacher Preparation and Licensing to meet the single subject examination waiver requirement:

<table>
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<th>Single subject waivers for:</th>
<th>Subject matter program:</th>
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<td>Mathematics</td>
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<td>Physical Education</td>
<td>Men's Physical Education</td>
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<td>Physical Education</td>
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<td>History</td>
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<tr>
<td>Social Sciences</td>
<td>Social Sciences</td>
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</table>

The Education Department offers the Master's Degree in Education; and professional courses in elementary school teaching, secondary school teaching, administrative services, pupil personnel services, and reading. It provides for preparation of persons to teach vocational subjects in the schools and advisement for the Bachelor of Vocational Education Degree. Instruction is also given in administrative and supervisory phases of vocational education.

Instructors in many departments at California Polytechnic State University help students develop subject competence and methods of teaching. Each teaching candidate is prepared to be a professional staff member in a public school. An institutional approach to teacher education is provided by the University Coordinating Committee for Teacher Education. Excellent relationships with community and school district personnel enable teaching candidates to engage in a variety of beneficial experiences.

The Education Department provides coordination for the following teacher credential programs which are approved by the State Commission for Teacher Preparation and Licensing:

- Administrative Services
- Agricultural Specialist
- Multiple Subjects (Elementary School)
- Pupil Personnel Services—Counseling, Child Welfare and attendance
- Reading Specialist
- Single Subjects (Secondary School)
- Special Education Specialist—Learning Handicapped

All credential work is offered in the competency-based format and in close cooperation with
Education

the public schools where field experience is provided.

The Education Department operates a Reading Development Center and a Reading Clinic providing a broad range of instruction in basic reading, diagnosis, remediation, and curriculum planning for reading in the elementary and secondary schools. The center uses the latest equipment and instructional materials in the preparation of persons to teach reading or to be a reading specialist in the elementary or secondary school.

Additional specialized learning laboratories provide resources for courses in instructional media, learning processes, and curriculum and methods.

CURRICULUM FOR THE MASTER OF ARTS DEGREE IN EDUCATION

Candidates may, on advisement, pursue programs leading to several specializations designed to meet the particular needs of individual students.

The specializations available are Administrative Services, Counseling and Guidance, Curriculum and Instruction, Reading, and Social Sciences. All programs require 45 quarter units of acceptable graduate work with a minimum of 24 units of 500 series courses.

The specialization in Social Sciences must include a minimum of 18 units of acceptable course work in the subject field of specialization (12 units of which must be in 500 series courses), and a minimum of 12 units of 500 series course work in Education.

Programs with a specialization in Administrative Services, Curriculum and Instruction, Counseling and Guidance, or Reading must include a minimum of 24 units of 500 series course work in Education, and a minimum of 12 units of course work acceptable for graduate credit outside the field of education. See Graduate Studies Announcement for further details.

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Education and other subjects.
The University presently offers in several departments a number of courses which are classified as ethnic studies designed to facilitate the study of various cultures and subcultures, their origins, development, contributions, and changing characteristics. The underlying premise is that in studying the society and culture of a people, a combination of several disciplines can be utilized to produce comparative insights and a more comprehensive knowledge. Although a major is not offered in ethnic studies, a selection of courses from this area may supplement the requirements for many degree programs, and some will satisfy the general education-breadth requirement.

The following courses are typical of those available in ethnic studies and students are referred to the current class schedule for cultures or areas to be emphasized within the courses in a given quarter.

**INTERDISCIPLINARY COURSE OFFERINGS**

**Anthropology**
- Ant 201 Cultural Anthropology (3)
- Ant 302 World Prehistory (3)
- Ant 301 Applied Anthropology (3)
- Ant 310 California Archeology (3)
- Ant 341 Comparative Societies (3)

**Architecture**
- Arch 301, 302 History of Non-Western Architecture (3) (3)

**Art**
- Art 314 American Art (2)
- Art 316 Non-Western Art (2)

**Child Development**
- CD 301 Afro-American Pre-School Child (3)
- CD 302 Mexican-American Pre-School Child (3)

**Economics**
- Econ 325 Underdevelopment and Economic Growth (3)
- Econ 401 International Trade (3)

**Education**
- Ed 315 Contemporary Education of the Afro-American (3)
- Ed 322 Community Laboratory (3)
- Ed 402 Minority Student Counseling and Guidance (3)
- Ed 414 Teaching Reading to Bilingual Students (3)
- Ed 416 Contemporary Education of the Chicano (3)
- Ed 521 Teaching the Culturally Different (3)

**English**
- Engl 124, 125, 126 Intensive Composition (3) (3) (3)
- Engl 214 Afro-American Literature (4)
- Engl 215 Mexican-American Literature (4)
- Engl 414 Significant World Writers (4)
- Engl 418 Significant American Writers (4)
- Engl 504 Problems in Language (3)
- Engl 522 Teaching English as a Second Language (3)

**Ethnic Studies**
- Eth S 105 Introduction to Ethnic Studies (1)
- Eth S 114 Racism in American Culture (3)
Ethnic Studies

Foreign Language
ForL 101, 102, 103 Foreign Language—Independent Study (3) (3) (3)
(See course listing for specific languages)

Geography
Geog 250 Physical Geography (4)
Geog 308 Global Geography (3)
Geog 315 Economic Geography (3)
Geog 401 Area Geography (3)

History
Hist 101, 102 History Civilization (5) (5)
Hist 307, 308, 309 Latin American History (3) (3) (3)
Hist 314 The Middle East (3)
Hist 321 Chicano History in the Southwest (3)
Hist 325 Ethnic Groups in American History (4)
Hist 331 Afro-American History (3)
Hist 332 Recent Afro-American History (3)
Hist 341 Mexican History (3)
Hist 381, 382 African History (3) (3)
Hist 411, 412, 413 History of East Asia (3) (3) (3)

Music
Mu 208 Ethnic Music of the World (3)
Mu 306 Ethnic Music of the World II (3)

Philosophy
Phil 305 Western Religions (4)

Physical Education
PE 118 Folk Dance (1)

Political Science
Pol Sc 303 Minority Group Politics (3)
Pol Sc 311 Inter-American Relations (3)
Pol Sc 402 Politics and Governments of Developing Areas (3)
Pol Sc 465 Contemporary Problems and Institutions of the Middle East and Africa (3)
Pol Sc 468 Contemporary Problems and Institutions of Africa South of the Sahara (3)

Sociology
Soc 106 Social Problems (3)
Soc 313 Urban Sociology (3)
Soc 315 Race Relations (3)
Soc 316 American Minorities (3)
Soc 323 Social Stratification (3)
Soc 330 Social Change (3)
Soc 344 Sociology of Poverty (3)

Spanish
Span 101, 102, 103 Elementary Spanish (4) (4) (4)
Span 104 Intensive Elementary Spanish (12)
Span 201, 202, 203 Intermediate Spanish (3) (3) (3)
Span 251, 252, 253 Barrio Spanish (3) (3) (3)
Span 301 Significant Writers in Spanish (4)
Span 324 Spanish Translation (3)
The principal objectives of the Home Economics Department are to provide educational preparation for: (1) teachers of home economics in the secondary schools, (2) managers and dieticians in food service programs. In addition, persons with a more general interest in home economics will find the curricula prepare for other occupational pursuits and provide a sound basis for successful family and personal life. Students are invited to consult with the department concerning their special interests in the field of home economics.

In addition to providing general education courses, the curricula place considerable emphasis upon applied courses during the first two years and provide other courses basic to the advanced work in the later years.

The Home Economics Department offers two related bachelor of science degree programs: Dietetics-Food Administration and Home Economics. A graduate program leading to the Master of Science in Home Economics also is offered.

Dietetics-Food Administration

The Dietetics-Food Administration curriculum fulfills the academic requirements for admission to a Dietetics internship or equivalency which must be completed before qualifying for registration as a dietitian with the American Dietetic Association. It also prepares the graduate for careers in the field of food administration. Graduates are sought for administrative management, therapeutic teaching, research, and public service positions in hospitals, clinics, schools, governmental agencies, and public eating facilities. Graduates are also prepared to pursue graduate work in dietetics, foods or nutrition.
Home Economics

This degree program is designed to give a foundation in all areas of home economics. Careful choice of electives with the help of an adviser will provide preparation for professional home economics positions in interior design, textiles-clothing, secondary home economics teaching, and other areas.

In addition to the required courses, students preparing to teach home economics are required to complete credential requirements specified by the Home Economics and Education Departments.

CURRICULUM IN DIETETICS-FOOD ADMINISTRATION

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<tbody>
<tr>
<td><strong>Freshman</strong></td>
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<tr>
<td>Introduction to Foods (HE 121)</td>
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<tr>
<td>Design Analysis for Home Economics (HE 122)</td>
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<tr>
<td>Family Development (CD 203)</td>
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<tr>
<td>General Inorganic Chemistry (Chem 121, 122)</td>
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<td>English Composition (Engl 114, 115)</td>
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<td>Introduction to Sociology (Soc 105)</td>
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<td>Mathematics (Math 100, 110, or 113)</td>
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<td>Health Education (PE 250)</td>
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<td>Art</td>
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<tr>
<td>Principles of Accounting (Actg 221, 222)</td>
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<tr>
<td><strong>Sophomore</strong></td>
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<tr>
<td>Personal Home and Management (HE 203)</td>
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<td>Problems of Family Housing (HE 207)</td>
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<td>Nutrition (HE 210)</td>
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<td>Home Food Conservation (HE 226)</td>
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<td>Meat Procurement and Use (FI 209)</td>
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<td>Elementary Probability and Statistics (Stat 211)</td>
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<td>General Zoology (Zoo 131)</td>
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<td>Organic Chemistry (Chem 226)</td>
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<td>General Bacteriology (Bact 221)</td>
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<td>Purchasing (Mgt 206)</td>
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<td>General Psychology (Psy 201 or 202)</td>
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<td>Principles of Speech (Sp 200)</td>
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<td>Physical Education Activity</td>
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<td>Survey of Economics (Econ 201)</td>
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### Home Economics

#### Junior

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<tr>
<td>Maternal and Child Nutrition (HE 310)</td>
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<tr>
<td>Meal Management (HE 321)</td>
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<tr>
<td>Advanced Nutrition (HE 328)</td>
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<tr>
<td>Advanced Nutrition Laboratory (HE 348)</td>
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<tr>
<td>Human Anatomy and Physiology (Zoo 237, 238, 239)</td>
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<tr>
<td>Biochemistry (Chem 328)</td>
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<tr>
<td>Behavior in Organizations (Psy 302)</td>
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<tr>
<td>The Learning Process (Ed 335)</td>
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<td>Industrial Relations (IR 314)</td>
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<td>Literature elective</td>
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<tr>
<td>Cultural Anthropology (Ant 201)</td>
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#### Senior

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<th>Course</th>
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<td>Community Nutrition (HE 410)</td>
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<td>Methods of Teaching Nutrition (HE 415)</td>
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<td>Meals for Special Occasions (HE 421)</td>
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<td>Quantity Cookery (HE 425)</td>
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<td>Food Production Management (HE 426)</td>
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<td>Equipment and Layout (HE 427)</td>
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<td>Diet Therapy (HE 429)</td>
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<tr>
<td>Senior Project (HE 461, 462)</td>
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<td>Undergraduate Seminar (HE 463)</td>
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<td>Food Microbiology (Bact 421)</td>
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<tr>
<td>American Government (Pol Sc 201)</td>
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<tr>
<td>Growth of American Democracy (Hist 204)</td>
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<td>U.S. in World Affairs (Hist 205)</td>
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**CURRICULUM IN HOME ECONOMICS**

#### Freshman

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<tbody>
<tr>
<td>Family Development (CD 203)</td>
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<td>3</td>
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<tr>
<td>Introduction to Foods (HE 121)</td>
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<td></td>
<td>5</td>
</tr>
<tr>
<td>Design Analysis for Home Economics (HE 122)</td>
<td></td>
<td></td>
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<tr>
<td>Clothing Construction (HE 131)</td>
<td></td>
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<tr>
<td>Freshman Composition (Engl 114)</td>
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<td>Physical Education activity</td>
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<tr>
<td>* Mathematics</td>
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<tr>
<td>** Art</td>
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<tr>
<td>Health Education (PE 250)</td>
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<tr>
<td>Introduction to Sociology (Soc 105)</td>
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<td>General Inorganic Chemistry (Chem 121, 122)</td>
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* Math 109 recommended for students who need basic review.

** To be selected in accordance with General Education Requirements.
Home Economics

Sophomore

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<th>Course</th>
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<tbody>
<tr>
<td>Personal and Home Management (HE 203)</td>
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<tr>
<td>Problems of Family Housing (HE 207)</td>
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<tr>
<td>Nutrition (HE 210)</td>
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<tr>
<td>Child Development—Preschool Years (CD 233)</td>
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<td>Interior Design (HE 242)</td>
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<tr>
<td>Psychology elective</td>
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<tr>
<td>**Principles of Speech (Sp 200)</td>
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<tr>
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<tr>
<td>Survey of Economics (Econ 201)</td>
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<td>At least 7 units from:</td>
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<td>Chem 226, Zoo 131, Bact 221, Bio 101, Bot 121</td>
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Junior

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<tr>
<td>Maternal and Child Nutrition (HE 310)</td>
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<td>Meal Management (HE 321)</td>
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<td>Textiles (HE 322)</td>
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<td>Management of Consumer Resources (HE 324)</td>
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<td>Demonstration Techniques (HE 326)</td>
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<td>Household Equipment (HE 331)</td>
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<td>**Report Writing or Adv. Composition (Engl 218 or 300)</td>
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<td>Dynamics of Clothing (HE 341)</td>
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<td>**Literature and/or philosophy</td>
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Senior

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<td>Undergraduate Seminar (HE 463)</td>
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<td>American Government (PoIS 201)</td>
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<td>† American Democracy and U.S. in World Affairs (Hist 204, 205)</td>
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<td>** Philosophy and/or Literature</td>
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CURRICULUM FOR THE MASTER OF SCIENCE DEGREE

(For University requirements see the Graduate Studies Announcement)

Required

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<th>Course</th>
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<tr>
<td>HE 511 Research Design</td>
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<tr>
<td>HE 580 or 582 Graduate Seminar</td>
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<tr>
<td>HE 599 Thesis or additional approved course work and comprehensive examination</td>
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<tr>
<td>Courses in the general field of Home Economics selected from 500 series level</td>
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<tr>
<td>Courses in major area(s) of interest selected from 400 and 500 series level</td>
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<tr>
<td>Electives selected from 400 to 500 series level</td>
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See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Home Economics and other subjects.

*** Speech 200 and English 300 required for credentialing in teaching program.
† History 206 may be substituted for History 204 and History 205. Students taking History 206 must take a minimum of one additional unit in the humanities in accordance with the General Education Requirement.
The Bachelor of Arts in Liberal Studies is a degree major designed primarily to provide the undergraduate preparation for the student who intends ultimately to satisfy requirements for a teaching credential authorizing multiple subject instruction; i.e., elementary school teaching. The total degree requirement of 186 quarter units is distributed as follows: 126 units of subject matter coursework to meet credential regulations in the areas of Mathematics and Science, English and Speech, Humanities and Fine Arts, Social Sciences; 12 additional units to complete general education breadth requirements; 37 units of professional education including student teaching; and 12 units of electives.

Students who find the teaching credential objective unrealistic after diligently pursuing the Liberal Studies major to the point of entry into the University credential program, may at that point change to another major or complete a B.A. in Liberal Studies by satisfying the academic emphasis on the curriculum display below. Applications for or changes of major into the Liberal Studies major will be discouraged from any student who does not have a genuine intent and the minimum scholastic standing (2.5 g.p.a.) for successfully completing the multiple subjects teaching credential program as constituted on this campus.

**CURRICULUM IN LIBERAL STUDIES**

**Freshman**

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<td>Algebra (Math 113)</td>
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<td>English Composition (Engl 114, 115)</td>
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<tr>
<td>Early Children's Literature (Engl 205) or Intermediate Children's Literature (Engl 209)</td>
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<td>Principles of Speech (Sp 200)</td>
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<tr>
<td>Cultural Anthropology (Ant 201)</td>
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<tr>
<td>American Government (Pol Sc 201)</td>
<td>3</td>
</tr>
<tr>
<td>General Psychology (Psy 201 or 202)</td>
<td>3</td>
</tr>
<tr>
<td>Crucial Issues in American Civilization (Hist 211)</td>
<td>3</td>
</tr>
<tr>
<td>Introduction to Sociology (Soc 105)</td>
<td>3</td>
</tr>
<tr>
<td>Music Theory (Mu 101)</td>
<td>3</td>
</tr>
<tr>
<td>Introduction to Art (Art 231)</td>
<td>3</td>
</tr>
<tr>
<td>Physical Education Activity</td>
<td>1</td>
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<tr>
<td><strong>Total (FWS)</strong></td>
<td>16 16 16</td>
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</table>

**Sophomore**

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Structure and Behavior of Matter (PSc 101, 102)</td>
<td>4 4</td>
</tr>
<tr>
<td>Introduction to the Solar System (Astr 101) or Physical Geology (Geol 201)</td>
<td>3</td>
</tr>
<tr>
<td>Grammar and Composition (Engl 307)</td>
<td>4</td>
</tr>
<tr>
<td>Introduction to Speech Correction (Sp 302) or Oral Interpretation (Sp 305) or Voice and Phonetics (Sp 306)</td>
<td>4</td>
</tr>
<tr>
<td>Global Geography (Geog 308)</td>
<td>3</td>
</tr>
<tr>
<td>American Democracy and World Affairs (Hist 206)</td>
<td>5</td>
</tr>
<tr>
<td>Survey of Economics (Econ 201)</td>
<td>3</td>
</tr>
<tr>
<td>Orientation to Art Materials (Art 232)</td>
<td>3</td>
</tr>
<tr>
<td>Fundamentals of Drawing (Art 201) or Orientation to Crafts (Art 233)</td>
<td>3</td>
</tr>
<tr>
<td>Music Appreciation (Mu 204) or Ethnic Music of the World (Mu 208)</td>
<td>3</td>
</tr>
<tr>
<td>Contemporary Ideas (Hum 270)</td>
<td>3</td>
</tr>
<tr>
<td>Children's Theater (Dr 347)</td>
<td>3</td>
</tr>
<tr>
<td>Drug Education (PE 305) or Health Education (PE 250)</td>
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<td><strong>Total (FWS)</strong></td>
<td>15 16 16</td>
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</table>
## Liberal Studies

### Junior—Academic

<table>
<thead>
<tr>
<th>Course Description</th>
<th>Units</th>
</tr>
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<tbody>
<tr>
<td>Modern Elementary Math (Math 327, 328, 329)</td>
<td>3</td>
</tr>
<tr>
<td>Human Ecology (Bio 301)</td>
<td>3</td>
</tr>
<tr>
<td>Earth and Space Science (PSc 303)</td>
<td>3</td>
</tr>
<tr>
<td>Literature (Engl 300-level)</td>
<td>4</td>
</tr>
<tr>
<td>Concepts in World Civilization (Hist 303)</td>
<td>4</td>
</tr>
<tr>
<td>Geography (from approved list)</td>
<td>3</td>
</tr>
<tr>
<td>Sociology (from approved list)</td>
<td>3</td>
</tr>
<tr>
<td>Political Science (from approved list)</td>
<td>3</td>
</tr>
<tr>
<td>Restricted elective from: Literature (Engl 300-400) or Speech Practices (Sp 406)</td>
<td>4</td>
</tr>
<tr>
<td>Music for Children (Mu 301)</td>
<td>3</td>
</tr>
<tr>
<td>Humanities and fine arts elective (from approved list)</td>
<td>3</td>
</tr>
<tr>
<td>Elective</td>
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</table>

### Junior—Credential

<table>
<thead>
<tr>
<th>Course Description</th>
<th>Units</th>
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<tbody>
<tr>
<td>Modern Elementary Math (Math 327, 328, 329)</td>
<td>3</td>
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<tr>
<td>Human Ecology (Bio 301)</td>
<td>3</td>
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<tr>
<td>Earth and Space Science (PSc 303)</td>
<td>3</td>
</tr>
<tr>
<td>Literature (Engl 300-level)</td>
<td>4</td>
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<tr>
<td>Learning Processes (Ed 335)</td>
<td>3</td>
</tr>
<tr>
<td>Music for Children (Mu 301)</td>
<td>3</td>
</tr>
<tr>
<td>Geography (from approved list)</td>
<td>3</td>
</tr>
<tr>
<td>Sociology (from approved list)</td>
<td>3</td>
</tr>
<tr>
<td>Humanities and fine arts elective (from approved list)</td>
<td>3</td>
</tr>
<tr>
<td>Curriculum and Methods in Elementary School Reading (Ed 434)</td>
<td>2</td>
</tr>
<tr>
<td>Instructional Processes (Ed 438)</td>
<td>3</td>
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<tr>
<td>Multicultural Education (Ed 301)</td>
<td>3</td>
</tr>
<tr>
<td>Political Science (from approved list)</td>
<td>3</td>
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</tbody>
</table>

### Senior—Academic

<table>
<thead>
<tr>
<th>Course Description</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restricted elective from: Topics in California History (Hist 385), American Art (Art 314), Non-Western Art (Art 316) or History of Music (Mu 404, 405, or 406)</td>
<td>2</td>
</tr>
<tr>
<td>Foreign Language</td>
<td>4</td>
</tr>
<tr>
<td>Selected Academics (an “emphasis” of 18 units including at least 12 units of upper division coursework must be acquired in each of at least two departments within the total degree program)</td>
<td>6</td>
</tr>
<tr>
<td>Senior Project (Hum 461)</td>
<td>3</td>
</tr>
<tr>
<td>Electives</td>
<td>16</td>
</tr>
</tbody>
</table>

### Senior—Credential

<table>
<thead>
<tr>
<th>Course Description</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>Restricted elective from: Topics in California History (Hist 385), American Art (Art 314), Non-Western Art (Art 316) or History of Music (Mu 404, 405, or 406)</td>
<td>2</td>
</tr>
<tr>
<td>Student Teaching (Ed 430, 440)</td>
<td>6</td>
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<tr>
<td>Organizing and Teaching Multiple Subjects (Ed 424)</td>
<td>3</td>
</tr>
<tr>
<td>Diagnosis, Prescription and Evaluation (Ed 436)</td>
<td>2</td>
</tr>
<tr>
<td>Senior Project Practicum (Ed 451)</td>
<td>3</td>
</tr>
<tr>
<td>Concepts in World Civilization (Hist 303)</td>
<td>4</td>
</tr>
<tr>
<td>Restricted elective from: Literature (Engl 300-400) or Speech Practices (Sp 406)</td>
<td>4</td>
</tr>
<tr>
<td>Electives</td>
<td>13</td>
</tr>
</tbody>
</table>
The Physical Education Department prepares both men and women as secondary school teachers in the field of physical education. Another function of the department is to provide both required and elective courses in physical education and recreation to meet the general education needs of all students. To supplement this general education, the department administers an extensive intramural sports program for all students of the University. In addition, a major in Recreation Administration offers an opportunity for students to prepare for employment in a variety of positions in the field of Recreation Administration.

Because of an ideal geographical location and outstanding physical education facilities, the University has become a center for workshops held by the health and physical organization of the State.

Extensive outdoor facilities include a number of turfed areas for physical education classes and intramural sports activities. A football stadium, regulation baseball diamond with permanent stands and quarter-mile track provide outstanding facilities for intercollegiate athletic teams. An additional track is available for instructional and intramural activities. Basketball, volleyball, handball, shuffleboard, tennis courts with outdoor lighting and a competitive swimming pool are used for instruction and student recreation.

The Physical Education Building provides excellent facilities for all phases of the total physical education and intercollegiate athletic program. The main gymnasium has a championship basketball court, three intramural basketball courts, several volleyball and badminton courts, a wrestling room weight training area and a human performance laboratory.

Crandall Gym also provides facilities for basketball, volleyball, badminton and gymnastics.

**CURRICULUM IN PHYSICAL EDUCATION**

<table>
<thead>
<tr>
<th>Freshman</th>
<th>F</th>
<th>W</th>
<th>S</th>
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</thead>
<tbody>
<tr>
<td>Freshman Composition (Engl 104, 105)</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Mathematics (Math 114)</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health Education (PE 250)</td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Professional activity series (PE 206-239)</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>The Physical Environment (PSc 101, 102)</td>
<td>4</td>
<td>4</td>
<td></td>
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<tr>
<td>General Zoology (Zoo 131)</td>
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<td></td>
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</tr>
<tr>
<td>Introduction to Physical Education (PE 270)</td>
<td>2</td>
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<td></td>
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<tr>
<td>History and Philosophy of Physical Education (PE 274)</td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td><em>Social Science elective</em></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Safety and First Aid (PE 280)</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Principles of Speech (Sp 200)</td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>American Government (PolS 201)</td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Electives and courses to complete major</td>
<td>3</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

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*Courses to be selected according to the General Education Requirements.*
## Physical Education

### Sophomore
- Elementary Probability and Statistics (Stat 211)................................. 3
- Statistical Methods (Stat 212)................................................................. 3
- Professional activity series (PE 206-239)........................................... 2
- General Psychology (Psy 201 or 202)..................................................... 3
- U.S. and World Affairs (Hist 205)........................................................... 3
- Growth of American Democracy (Hist 204) ......................................... 3
- Human Anatomy and Physiology (Zoo 237, 238, 239)............................. 3
- Nutrition (HE 210) .................................................................................. 3
- * Literature, philosophy, art ................................................................. 3
- Electives and courses to complete major ............................................... 8

### Junior
- Human Muscle Anatomy (Zoo 340)............................................................ 2
- Kinesiology (PE 302) ................................................................................ 3
- Physiology of Exercise (PE 303) ............................................................... 3
- Tests and Measurements (PE 319) ............................................................ 3
- * Literature or Philosophy ....................................................................... 3
- Electives and courses to complete major ............................................... 11

### Senior
- Adaptive Physical Education (PE 406)..................................................... 3
- Senior Project (PE 461, 462).................................................................... 2
- Organization and Administration of Health and Physical Education (PE 401).................. 3
- * Literature or Philosophy ....................................................................... 3
- Electives and courses to complete major ............................................... 12

### ATHLETIC COACHING OPTION
(Add courses below to basic curriculum)

<table>
<thead>
<tr>
<th>Sophomore</th>
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<th>Senior</th>
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</thead>
<tbody>
<tr>
<td>PE 252 Beginning Athletic Training .... (2)</td>
<td>PE 278, 290, 292, 294, 297, 298 Officiating (3)</td>
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</tr>
<tr>
<td>PE 340 Coaching Individual Sports ...... (2)</td>
<td>PE 410 Psychology of Coaching .......... (3)</td>
<td></td>
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<tr>
<td>PE 341 Coaching Team Sports ............ (2)</td>
<td>PE 437 Directed Field Work .......... (3)</td>
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<tr>
<td>† Coaching ................................................. (12)</td>
<td>Jour 312 Public Relations .......... (3)</td>
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</table>

### HEALTH EDUCATION OPTION
(Add courses below to basic curriculum)

<table>
<thead>
<tr>
<th>Freshman</th>
<th>Sophomore</th>
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<th>Senior</th>
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<tbody>
<tr>
<td>PE 254 School Health Program.......... (2)</td>
<td></td>
<td>Psy 301 Psychology of Personal Development................................. (3)</td>
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</tr>
<tr>
<td>CD 233 Pre-school Years................. (3)</td>
<td></td>
<td>Psy 303 Human Sexuality.................................................. (2)</td>
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<tr>
<td>Soc 206 Sociology of Family Life ........ (3)</td>
<td></td>
<td>HE 324 Management of Consumer Resources ................................ (3)</td>
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<tr>
<td>Bact 224 General Microbiology ........ (4)</td>
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<td>HE 415 Methods of Teaching Nutrition ....................... (3)</td>
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<tr>
<td>Sp 217 Essentials of Discussion ........ (4)</td>
<td></td>
<td>PE 405 Adm of Health Education .......... (2)</td>
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<tr>
<td>Bio 301 Human Ecology ................... (3)</td>
<td></td>
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</tbody>
</table>

* Courses to be selected according to the General Education Requirements.
† Coaching Theory courses to be recommended by advisor.

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**Physical Education**

**TEACHING OPTION**
*(Add courses below to basic curriculum)*

<table>
<thead>
<tr>
<th>Year</th>
<th>Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshman</td>
<td>PE 206–239 Professional Activity Series (2)</td>
</tr>
<tr>
<td>Sophomore</td>
<td>PE 228 Dance Fundamentals .......... (1)</td>
</tr>
<tr>
<td></td>
<td>PE 206–239 Professional Activity Series (4)</td>
</tr>
<tr>
<td></td>
<td>PE 174, 175, 176 Intramural Sports .......... (3)</td>
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<tr>
<td></td>
<td>PE 278, 290, 292, 294, 297, 298 Officiating (3)</td>
</tr>
<tr>
<td></td>
<td>PE 296 Organization and Planning Techniques ........................................ (3)</td>
</tr>
<tr>
<td>Junior</td>
<td>PE 332 Elementary School PE .......... (3)</td>
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<td>PE 371, 373, 379 Teaching Sports .......... (6)</td>
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<td></td>
<td>PE 375 or 377 Teaching Team and Individual Sports ...................... (3)</td>
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<td></td>
<td>PE 381 or 383 Dance Theory .......... (3)</td>
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<td></td>
<td>PE 424 Organization and Teaching PE .......... (3)</td>
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<tr>
<td>Senior</td>
<td>PE 440 Activity Supervision .......... (3)</td>
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</table>

**CURRICULUM IN RECREATION ADMINISTRATION**

<table>
<thead>
<tr>
<th>Year</th>
<th>Courses</th>
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<tbody>
<tr>
<td>Freshman</td>
<td>Introduction to Recreation (Rec 101) .......... 3</td>
</tr>
<tr>
<td></td>
<td>Principles of Recreation Leadership (Rec 105) .......... 3</td>
</tr>
<tr>
<td></td>
<td>Introduction to Natural Resources Management (NRM 101) .......... 3</td>
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<tr>
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<td>Recreation Systems and Management (NRM 112) .......... 3</td>
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<tr>
<td></td>
<td>Natural History (Bio 127) .......... 3</td>
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<tr>
<td></td>
<td>Mathematics for General Education (Math 100) .......... 3</td>
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<tr>
<td></td>
<td>Freshman Composition (Engl 104) .......... 3</td>
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<td></td>
<td>Principles of Speech (Sp 200) .......... 3</td>
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<td></td>
<td>General Psychology (Psy 202) .......... 3</td>
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<td></td>
<td>* Social Science Elective .......... 3</td>
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<td></td>
<td>* Physical Science Elective .......... 3</td>
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<tr>
<td></td>
<td>Health Education (PE 250) .......... 2</td>
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<td></td>
<td>Safety and First Aid (PE 280) .......... 2</td>
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<td></td>
<td>Physical Education Activity (PE 100–180) .......... 111</td>
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<td>Electives .......... 3</td>
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<td>16 15 15</td>
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<tr>
<td>Sophomore</td>
<td>Community Recreation (Rec 126) .......... 3</td>
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<td>Intramural Sports (PE 260) .......... 3</td>
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<td>Senior Life Saving (PE 143) .......... 1</td>
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<td>Water Safety (PE 284) .......... 1</td>
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<td>Program Planning for Recreation (Rec 210) .......... 3</td>
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<td>Orientation to Art Materials (Art 232) .......... 3</td>
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<td>Orientation to Crafts (Art 233) .......... 3</td>
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<td>Stagecraft (Dr 322) .......... 2</td>
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<td>Children's Drama (Dr 347) .......... 3</td>
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<td>American Government (Pol Sc 201) .......... 3</td>
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<td>* Natural Sciences Elective .......... 3</td>
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<td>Introduction to Dance (PE 244) .......... 3</td>
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<td>15 15 15</td>
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<tr>
<td>Junior</td>
<td>Elementary School Physical Education (PE 332) .......... 3</td>
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<td>American Minorities (Soc 316) .......... 3</td>
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<td></td>
<td>Administration of Camping and Outdoor Education (Rec 337, 338) .......... 3</td>
</tr>
<tr>
<td></td>
<td>Administration of Recreation Programs for Special Groups (Rec 352) .......... 3</td>
</tr>
<tr>
<td></td>
<td>Administration of Recreation (Rec 324, 325) .......... 3</td>
</tr>
</tbody>
</table>

*To be selected with advisor's approval in accordance with general education requirement.*
### CURRICULUM FOR THE MASTER OF SCIENCE DEGREE

(For University requirements see the Graduate Studies Announcement)

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td><strong>Required:</strong></td>
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</tr>
<tr>
<td>PE 502 Advanced Seminar in Problems</td>
<td>3</td>
</tr>
<tr>
<td>PE 513 Evaluation of Current Studies</td>
<td>3</td>
</tr>
<tr>
<td>PE 517 Research Methods</td>
<td>3</td>
</tr>
<tr>
<td>PE 523 Motor Learning</td>
<td>3</td>
</tr>
<tr>
<td><strong>Select 6 units with adviser approval from the following:</strong></td>
<td></td>
</tr>
<tr>
<td>PE 512 Critical Health Issues</td>
<td>3</td>
</tr>
<tr>
<td>PE 522 Mechanical Analysis of Sport</td>
<td>3</td>
</tr>
<tr>
<td>PE 523 Administration of Co-Curricular Activities</td>
<td>3</td>
</tr>
<tr>
<td>PE 530 Advanced Physiology of Exercise</td>
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</tr>
<tr>
<td><strong>Additional Physical Education electives:</strong></td>
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</tr>
<tr>
<td>A minimum of twelve (12) additional graduate level units must be taken in Physical Education</td>
<td></td>
</tr>
<tr>
<td><strong>Electives:</strong></td>
<td></td>
</tr>
<tr>
<td>A maximum of fifteen (15) units may be taken outside of the Physical Education Department in 300, 400, and 500 level courses. Up to twelve (12) units may be taken at the 300, 400 level.</td>
<td>15</td>
</tr>
<tr>
<td><strong>For more detailed information or advisement, students should communicate with the Coordinator of Graduate Studies for Physical Education.</strong></td>
<td></td>
</tr>
<tr>
<td>See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Physical Education and other subjects.</td>
<td></td>
</tr>
</tbody>
</table>

*To be selected with advisor's approval in accordance with general education requirement.*
The Psychology program is designed to acquaint students with the facts, theories, and contemporary trends in psychology. The application of psychological principles to existing personal, social, and technological problems, is emphasized throughout the department courses. Attention is placed upon individual student development of a more coherent and meaningful understanding of himself and of his interactions with others and with his environment.

The Psychology Department contributes to the overall academic community through its participation in the general education program, as a source of electives for the various major areas, and as a resource for increased self-awareness and development.
School of Science
and Mathematics
The School of Science and Mathematics offers curricula leading to the Bachelor of Science degree in Biochemistry, Biological Sciences, Chemistry, Computer Science, Environmental and Systematic Biology, Mathematics, Microbiology, Physical Science, Physics, and Statistics. Graduate programs are offered leading to the Master of Science degree in Biological Sciences, Chemistry, Computer Science, and Mathematics. The Reserve Officer Training Corps (ROTC) program is made available to all students of the university through the Military Science Department.

Courses offered by the School of Science and Mathematics meet the needs of several groups of students:

1. Students working toward Bachelor of Science, or Master of Science degrees with majors in science and mathematics.
2. Students from all majors who need to meet the requirements in General Education. These courses are required so that every graduate will be better prepared to be a participating citizen and a productive member of the State, nation, and world.
3. Students in Agriculture and Natural Resources, Architecture and Environmental Design, Business, Communicative Arts and Humanities, Engineering and Technology, Human Development and Education, Science and Mathematics and Social Sciences who require competency in subjects which support, complement, or are closely related to their areas of specialization.
4. Students planning to become elementary, secondary, or community college teachers, who need background in science and mathematics.
5. Students who need science and mathematics background in predentistry, premedicine (and allied fields) and preveterinary science. A Health Professions Guidance and Evaluation Committee is prepared to advise, assist, and evaluate all students, regardless of major who plan to enter the health professions.

The School of Science and Mathematics and the School of Human Development and Education cooperate to recommend candidates for the California Teaching Credential with majors in Biological Sciences, Mathematics, and Physical Science.
The department offers complete undergraduate programs leading to Bachelor of Science degrees in Biological Sciences, Environmental and Systematic Biology, and Microbiology. For superior students, a graduate program is available leading to the Master of Science degree. In addition, a variety of courses is offered to satisfy biology requirements in other academic majors.

The department is housed in modern facilities equipped with up-to-date instrumentation. Cal Poly's geographical setting offers unusual opportunities for studying representative plants and animals of both Northern and Southern California. Graduates of the various programs enter fields in teaching; medical and biological laboratory technology; public health; wildlife management; agriculture; industry; and private, state and national park and forest services. A significant number enter graduate or professional schools for advanced study of botany, entomology, microbiology, plant pathology, zoology, marine sciences, veterinary science, medicine and dentistry. The department offers courses required for preprofessional training in medicine and paramedical fields. In the teaching area, all state requirements may be met for an academic major in biological sciences leading to credentials in secondary teaching.

**CURRICULUM IN BIOLOGICAL SCIENCES**

With the several curricular concentrations described below, this degree offers students a broad education in biology. It is suitable for preprofessional preparation in the bio-medical fields, as a base for work toward post-baccalaureate studies and for technical competency in the concentrations offered. A list of courses for the various concentration is available in the department office.

**Curricular Concentrations**

**Anatomy-Physiology**

This concentration is designed for students who are interested in zoology with an emphasis in the structure and function of animals. Preprofessional students of the health sciences would select this concentration.

**Biology**

The general biology program is designed for the student who wants the broadest possible training.

**Botany**

Plant structure, physiology, ecology, diseases and classification are the basis for courses leading to competency required for persons desiring positions as botanists.
### Biological Sciences

**Marine Biology**
Students in this concentration may look forward to occupational and professional work in the rapidly expanding field of oceanographic studies and enterprises.

**Plant Pathology-Entomology**
Students are trained to recognize, evaluate and solve plant disease and insect problems. They may be employed as technicians in research or extension service, or may continue their studies at the graduate level.

### Freshman

<table>
<thead>
<tr>
<th>Course Description</th>
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<tbody>
<tr>
<td>General Botany (Bot 121, 122, 123) or General Zoology</td>
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<td>Organic Chemistry (Chem 226)</td>
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<td>English Composition (Engl 114, 115)</td>
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<td>² College Algebra and Trigonometry (Math 120)</td>
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### Sophomore

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<td>General Bacteriology (Bact 221)</td>
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<td>College Physics (Phys 121, 122, 123)</td>
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<tbody>
<tr>
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<td>Genetics (Bio 303)</td>
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<td>Advanced Composition (Engl 218 or 300)</td>
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<td>American Government (Pol Sc 201)</td>
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<td>* Literature or Philosophy</td>
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<td>* Humanities</td>
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<tr>
<td>Senior Project (Bio 461)</td>
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<tr>
<td>Biochemistry (Chem 328)</td>
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<td>General Entomology (Ent 326)</td>
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### Senior

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<th>Course Description</th>
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<tbody>
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<td>General Physiology (Bio 431)</td>
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<tr>
<td>Senior Project (Bio 462)</td>
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<tr>
<td>Undergraduate Seminar (Bio 463)</td>
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<tr>
<td>General Cytology (Bio 423)</td>
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<tr>
<td>Growth of American Democracy (Hist 204)</td>
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<td>U.S. in World Affairs (Hist 205)</td>
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¹ Chem 124, 125 will substitute for Chem 121 and 122.
² Math 118–119 will substitute, or Math 141 and any additional course in CSc, Math, or Stat.
* To be selected in accordance with the General Education requirement.
** Of the total elective units 18–23 shall be chosen in a field of concentration in the Biological Sciences with the approval of the adviser.
CURRICULUM IN ENVIRONMENTAL AND SYSTEMATIC BIOLOGY

The four year program in Environmental and Systematic Biology leads to a Bachelor of Science Degree. Emphasis is placed on providing the student with training in the identification and understanding of living organisms which form the human environment, and their relationship to each other and to mankind. An environmental or systematic biologist can look toward employment with government agencies and private industries which are involved with the environment—agriculture, forestry, wildlife management, parks and recreation, and environmental monitoring agencies, or may enter the educational field. The requirements of the degree program provide the basics for a wide range of job opportunities.

<table>
<thead>
<tr>
<th>Freshman</th>
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<tr>
<td>General Zoology (Zoo 131, 132, 133)</td>
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<td>* General Inorganic Chemistry (Chem 121, 122)</td>
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<td>Organic Chemistry (Chem 226)</td>
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<td>English Composition (Engl 114, 115)</td>
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<td>** College Algebra and Trigonometry (Math 120)</td>
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<td>Elementary Probability and Statistics (Stat 211)</td>
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<td>Fortran Programming (CSc 101)</td>
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<td>Soils (SS 121)</td>
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<td>General Botany (Bot 121, 122, 123)</td>
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<td>Field Botany (Bot 333)</td>
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<td>*** Introductory Physics (Phys 104)</td>
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<td>Physical Geography (Geog 250)</td>
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<tbody>
<tr>
<td>Genetics (Bio 303)</td>
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<td>Evolution (Bio 313)</td>
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<td>General Ecology (Bio 325)</td>
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<td>Plant Ecology (Bot 326)</td>
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<td>General Entomology (Ent 326)</td>
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<tr>
<td>Vertebrate Field Zoology (Zoo 329)</td>
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<tr>
<td>Principles of Speech (Sp 200)</td>
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<tr>
<td>American Government (PolS 201)</td>
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<tr>
<td>Growth of American Democracy (Hist 204)</td>
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<tr>
<td>General Physiology (Bio 431)</td>
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<td>Animal Behavior (Zoo 437)</td>
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</table>

* Chem 124, 125 will substitute. Chem 126 and Chem 328 are additionally recommended for students planning postgraduate training.

** Math 118, 119 will substitute, or Math 141 and any additional course.

*** Phys 121, 122, 123 are recommended substitutes for students planning postgraduate training.

† Of the total elective units, 6 must be selected from each of two specified lists; additional information available from the department.
Curriculum in Microbiology

The undergraduate program leading to the Bachelor of Science Degree in Microbiology is the study of microorganisms such as bacteria, viruses, algae, protozoa, and fungi. Special emphases are placed on their structure and function as well as their interactions with each other and with human beings.

Curricular Options

Medical Technology

This option prepares students specifically for careers in medically-oriented fields: Immunology, medical bacteriology, medical mycology, virology, parasitology, hematology, and genetics.

Microbiology

This option provides students with modern concepts in biology as well as practical skills. Graduates are prepared to enter into positions in teaching, biomedical and other research areas, industry, public health, and into advanced degree programs.

Freshman

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>General Zoology (Zoo 131, 132) or General Botany</td>
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<tr>
<td>General Inorganic Chemistry (Chem 121, 122, 126)</td>
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<tr>
<td>College Algebra and Trigonometry (Math 120)</td>
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<td>English Composition (Engl 114, 115)</td>
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<td>American Government (PolS 201)</td>
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<td>Social Sciences</td>
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Sophomore

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<tr>
<td>General Botany (Bot 121, 122) or General Zoology</td>
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<tr>
<td>* Organic Chemistry (Chem 226)</td>
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<td>General Bacteriology (Bact 221)</td>
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<td>General Microbiology (Bact 224)</td>
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<td>College Physics (Phys 121, 122, 123)</td>
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Junior

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<td>Biochemistry (Chem 371)</td>
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<td>Genetics (Bio 303)</td>
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<td>General Physiology (Bio 431)</td>
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<td>General Virology (Bact 402)</td>
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<td>Parasitology (Zoo 425)</td>
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* Chem 316 will substitute for Chem 226.
Biological Sciences

Senior
Serology and Immunology (Zoo 426) ........................................... 4
Medical Microbiology (Bact 423) ........................................... 4
Senior Project (Bio 461) .................................................. 2
Literature or philosophy .................................................... 3
Electives and courses to complete major .................................. 10

W S
4 4

MEDICAL LABORATORY TECHNOLOGY OPTION
(Add Courses Below to Microbiology Curriculum)

Sophomore
Bio 321 Biological Instrumentation ... (3)
Chem 335–6 Quantitative Physiological chemistry .................... (7)
Bact 430 Medical Mycology ........... (4)
Zoo 428 Hematology ................ (4)
Bio 304 Advanced Genetics (2) or El 131 Introduction to Electric Circuits .......... (2)
Bio 253 Microtechnique or *El 132 Introduction to Semiconductor Devices .......... (2)
Bio 304 Advanced Genetics (2) or *El 132 Introduction to Semiconductor Devices .......... (2)
Chem 274 Chemistry of Drugs and Zoo 412 Introduction to Clinical Pathology .......... (3)
Poisons .................................................. (3)

Junior and Senior Years
Bact 433 Industrial Microbiology ...... (4)
Bact 421 Food Microbiology .......... (4)
Bact 424 Bacterial Cytology & Physiology ........................ (4)
Bact 436 Microbial Ecology .......... (4)
Bio 423 General Cytology .......... (4)
Bio 463 Undergraduate Seminar .......... (2)
Chem 372 Biochemistry .......... (4)
Chem 373 Advanced Biochemistry .......... (4)
Approved electives .......... (7)

MICROBIOLOGY OPTION
(Add Courses Below to Microbiology Curriculum)

Junior and Senior Years
Bact 333 Industrial Microbiology ...... (4)
Bact 421 Food Microbiology .......... (4)
Bact 424 Bacterial Cytology & Physiology ........................ (4)
Bact 436 Microbial Ecology .......... (4)
Bio 423 General Cytology .......... (4)
Bio 463 Undergraduate Seminar .......... (2)
Chem 372 Biochemistry .......... (4)
Chem 373 Advanced Biochemistry .......... (4)
Approved electives .......... (7)

CURRICULUM FOR THE MASTER OF SCIENCE DEGREE
(For University requirements see the Graduate Studies Announcement)

Two approaches to the M.S. Degree in Biological Sciences are possible, one involving only course work and a comprehensive examination, the other involving course work and a thesis. At least 22 units of the minimum required 45 units must be at the 500 (graduate) level. All units selected must be acceptable for graduate credit. For further information, students should communicate with the head of the Biological Sciences Department.

Courses in the biological sciences selected from 300, 400 and 500 level courses. At least three units each selected from courses having three of the following prefixes: Bact, Bio, Bot, Cons, Ent, Zoo ............................................. 45
Seminar in Biology (Bio 590) .............................................. 3
Thesis (Bio 599) or additional course work with comprehensive examination .......... 9
Electives from 300, 400 and 500 level courses .......................... 6

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Bacteriology, Biology, Botany, Conservation, Entomology, Zoology and other subjects.

* El 314 will substitute for El 131 and El 32.
The Chemistry Department serves all schools of the University by providing scientific background. The department also contributes to the general education of all students by giving them a thorough foundation in the method and factual content of chemical science and the role it plays in society. The chemistry and biochemistry curricula lead to the bachelor of science degree. Graduate work is offered leading to the master of science degree in chemistry. The Chemistry and Physics Departments jointly administer a degree program in Physical Sciences for the student who intends to be a secondary school teacher in one or more of the physical sciences.

Chemistry is the branch of science which deals with the composition and changes in composition of all substances. It is a description of the world at the atomic and molecular level. A science with a scope this broad offers many fields of specialization. Chemists analyze and synthesize such products as plastics, fibers, drugs, dyes and rocket fuels. The petroleum, textile, fertilizer, pharmaceutical, paint, paper and metal industries employ large numbers of chemists for quality control and development of new products. The occupational objectives of the curricula in chemistry are to qualify students for entry at the bachelor's level into positions in government service and industry and to help prepare teachers of the physical sciences. The curriculum in chemistry prepares the student to work at the bachelor's level as an organic, analytical, physical, or inorganic chemist. In addition, graduates have entered medical, dental, veterinary, pharmacy, medical technology, and graduate schools. Courses are taught in modern laboratories making use of the latest scientific instruments.

The Chemistry Department is fully approved and accredited by the American Chemical Society. Students who wish to be recommended for certification by the American Chemical Society must complete Ger 301 and 302, Scientific German or Russian (ForL 101 and 102, Foreign Language) and pass an examination demonstrating the ability to read scientific German or Russian. Use and application of German or Russian scientific literature is to be made in chemistry courses taken during the third and fourth year of the program and in the literature search for the Senior Project.

The master of science program is designed to develop professional competence for productive employment in industry, government and education. The student desiring to enter this program should complete an undergraduate major in chemistry or biochemistry with evidence of superior scholarship.

Graduate courses are offered which help to complete the requirements for the master of science degree in chemistry, and for teaching credentials. Proper selection of electives in the curriculum in biochemistry permits specialization in nutritional, food, feed, pesticide, fertilizer or clinical chemistry. Students find employment in the laboratories of those companies devoted to the processing of food products and the production of agricultural and pharmaceutical chemicals. Positions for which the student may qualify include vitamin assay biochemist, food and drug chemist, meat technologist, fertilizer chemist, insecticide residue analyst and public health chemist.

It is recommended that the high school student planning to major in chemistry or biochemistry include at least two semesters of chemistry in high school. Students enrolling in General Chemistry or General Inorganic Chemistry are required to pass Chem 106, or the equivalent, or have the recommendation of their faculty adviser.
## CURRICULUM IN CHEMISTRY

### Freshman

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<td>English Composition (Engl 114)</td>
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<td><strong>Oral or written communication</strong></td>
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<td>Analytic Geometry and Calculus (Math 141, 142, 143 or Math 131, 132, 133)</td>
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<tr>
<td><strong>Physical Education</strong></td>
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<tr>
<td>Biological Sciences (Bio 101, Bot 121, or Zoo 131)</td>
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<tr>
<td>Electives</td>
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<td><strong>Total</strong></td>
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### Sophomore

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Quantitative Analysis (Chem 331)</td>
<td>4</td>
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<tr>
<td>Organic Chemistry (Chem 316, 317, 318)</td>
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<tr>
<td>General Physics (Phys 131, 132, 133)</td>
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<tr>
<td>Mathematics (Math 241, 242) or Statistics or Computer Science</td>
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<td>Chemical Literature (Chem 253)</td>
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<td><strong>Social Sciences Electives</strong></td>
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<tr>
<td>Electives</td>
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### Junior

<table>
<thead>
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<tbody>
<tr>
<td><em>Approved Chemistry Elective</em></td>
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<tr>
<td>Physical Chemistry (Chem 305, 306, 307)</td>
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<tr>
<td>Physical Chemistry Laboratory (Chem 355, 356)</td>
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<td>Physics Elective (200 and above)</td>
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<td>American Government (Pol Sc 201)</td>
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<tr>
<td><strong>Social Sciences Elective</strong></td>
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### Senior

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Instrumental Analysis (Chem 439)</td>
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<td>Senior Project (Chem 461)</td>
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<td>Inorganic Chemistry (Chem 481)</td>
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<tr>
<td>Undergraduate Seminar (Chem 459)</td>
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<tr>
<td><em>Approved Chemistry elective</em></td>
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<tr>
<td>Growth of American Democracy (Hist 204)</td>
<td>3</td>
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<tr>
<td>U.S. in World Affairs (Hist 205)</td>
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<tr>
<td>Literature or Philosophy</td>
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<td><strong>Total</strong></td>
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### CURRICULUM FOR MASTER OF SCIENCE DEGREE IN CHEMISTRY

(For University requirements see the Graduate Studies Announcement)

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Graduate courses in chemistry (500 level)</td>
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<tr>
<td>Graduate Seminar (Chem 590)</td>
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<td>Thesis (Chem 599)</td>
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<tr>
<td>Additional courses at 300, 400 or 500 level</td>
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<tr>
<td>Six units must be from outside the chemistry department.</td>
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**Units**

† To be selected in accordance with the General Education requirement.


197
## CURRICULUM IN BIOCHEMISTRY

### Freshman

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>General Chemistry (Chem 121, 122, 126 or 124, 125, 126)</td>
<td>4</td>
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<tr>
<td>English Composition (Engl 114)</td>
<td>4</td>
</tr>
<tr>
<td>Oral or Written Communication</td>
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<tr>
<td>Technical Calculus (Math 131)</td>
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<tr>
<td>Mathematics (Math 132 or CSc 101 and Stat 211)</td>
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<tr>
<td>College Physics (Phys 121, 122)</td>
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<td>Life Science (Bot 121, Zoo 131, or Bact 221)</td>
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<td>Life Science elective</td>
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<td>† Physical Education</td>
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<td>Electives</td>
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### Sophomore

<table>
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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Quantitative Analysis (Chem 331)</td>
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<tr>
<td>Organic Chemistry (Chem 316, 317)</td>
<td>4</td>
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<tr>
<td>* Chemistry elective</td>
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<tr>
<td>College Physics (Phys 123)</td>
<td>4</td>
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<tr>
<td>† Literature or Philosophy</td>
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<td>American Government (PolS 201)</td>
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<tr>
<td>† Humanities elective</td>
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<td>Life science</td>
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<td>Electives</td>
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### Junior

<table>
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<th>Course</th>
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<tbody>
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<td>General Biochemistry (Chem 371, 372, 373)</td>
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<tr>
<td>** Biophysical Chemistry (Chem 301, 302)</td>
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<td>Growth of American Democracy (Hist 204)</td>
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<tr>
<td>U.S. in World Affairs (Hist 205)</td>
<td>3</td>
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<tr>
<td>† Social Science elective</td>
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<tr>
<td>Electives</td>
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### Senior

<table>
<thead>
<tr>
<th>Course</th>
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</thead>
<tbody>
<tr>
<td>* Chemistry elective</td>
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<tr>
<td>Senior Project (Chem 461)</td>
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<tr>
<td>Undergraduate Seminar (Chem 459)</td>
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<td>Electives</td>
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See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Chemistry and other subjects.

* Chem 156, 252, 300 and 400 level courses (except 328).

** Chem 305, 306, 355 will substitute.
The department offers four-year programs which lead to the Bachelor of Science degree in Computer Science and to the Bachelor of Science degree in Statistics. The Master of Science degree in Computer Science is also offered. Courses in computer technology and probability and statistics, designed to fulfill the needs of the university as a whole, are also provided. Graduate-level courses are offered in computer science and statistical fields. Computer science courses offered by the department comprise those dealing with programming languages, computer organization, system software, and applications of computers. Statistics courses include probability theory, applications of statistical procedures, and the mathematical models on which the statistical methods are based.

The degree programs in computer science are designed to give professional training so that the student can make a significant contribution to the employer on graduation. Applications of the digital computer to a wide variety of situations are emphasized, and a thorough knowledge of computer systems is gained by developing facility in a variety of languages through which one communicates with computers, by study of programs which translate and compile such languages, and by “hands-on” involvement with programs which control the internal operation of computer systems. Such a broad and thorough undergraduate training is likewise good preparation for graduate study. Graduates in computer science are eagerly sought by the exciting and dynamic computer industry for positions as program analysts, systems engineers, applications programmers, and sales representatives. Access to modern computing equipment is afforded through the university’s computer center, which conducts both educational and administrative applications and through minicomputer, microprocessor and graphics laboratories. In addition, students have access to both batch and interactive facilities maintained by the state university system.

The curriculum in statistics has an unusual emphasis on applications and on the use of the computer in statistical analysis of data. Students are expected to specialize in a field of application of their own choosing, and a significant number of elective courses are selected by the student to accomplish this. The statistics program prepares students for positions in industry and for graduate work in statistics. The department maintains for student use a calculating machine laboratory equipped with modern electrical and electronic calculators.

A student chapter of the Association for Computing Machinery is sponsored by the department. This active student organization supplements the department’s activities in supplying vital contact with expert professional personnel from business and industry.
<table>
<thead>
<tr>
<th>Course</th>
<th>Freshman</th>
<th>Sophomore</th>
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<th>Senior</th>
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<tr>
<td>Fortran Programming (CSc 101)</td>
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<td>Fundamentals of Computer Science (CSc 118)</td>
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<td>Boolean Algebra (CSc 218)</td>
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<tr>
<td>Analytic Geometry &amp; Calculus (Math 141, 142, 143)</td>
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<td>Modern Logic (Phil 222)</td>
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<td>Life Science</td>
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<td>General Chemistry (Chem 124)</td>
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<td>Principles of Accounting (Actg 221)</td>
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<td>Digital Computer Symbolic Programming (CSc 222)</td>
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<td>Digital Computer Architecture (CSc 304)</td>
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<td>Numerical Linear Analysis (CSc 331)</td>
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<td>Linear Programming (CSc 219)</td>
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<td>Analytic Geometry &amp; Calculus (Math 241)</td>
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<td>Differential Equations (Math 242)</td>
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<td>Statistical Analysis (Stat 321, 322)</td>
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<td>General Physics (Phys 131, 133)</td>
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<td>Data Structures (CSc 345)</td>
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<td>Programming Languages (CSc 351)</td>
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<td>Compilers &amp; Interpreters (CSc 352)</td>
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<td>Numerical Nonlinear Analysis (CSc 332)</td>
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<td>Principles of Economics (Econ 211, 212)</td>
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<td>Growth of American Democracy (Hist 204)</td>
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<td>General Psychology (Psy 202)</td>
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<td>U.S. in World Affairs (Hist 205)</td>
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<td><strong>Computer Science Electives</strong></td>
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**To satisfy general education natural science requirement.**
*To satisfy general education requirements.*

***Complete two of the following sequences:***

(a) ET 334, 438, EL 313, 305
(b) CSc 333, 431, Math 318, 319
(c) CSc 340, 445, Mgt 321, 322
(d) CSs 319, 350, 419 and IE 430
(e) Stat 323, 330, 423, and Bio 442 or IE 425

---

200
### Computer Science

<table>
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<th>Course Description</th>
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<tbody>
<tr>
<td>Report Writing (Engl 218)</td>
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<tr>
<td>Senior Project (CSc 461, 462)</td>
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<tr>
<td>Principles of Speech (Sp 200)</td>
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<td>Undergraduate Seminar (CSc 463)</td>
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<tr>
<td><strong>Computer Science Electives</strong></td>
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### CURRICULUM IN STATISTICS

#### Freshman

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<tr>
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<td>Fortran Programming (CSc 101)</td>
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<td>Report or Technical Writing (Engl 218 or 219)</td>
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<td>General Biology (Bio 101)</td>
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#### Sophomore

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<tbody>
<tr>
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<td>Differential Equations (Math 242)</td>
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<td>Statistical Analysis (Stat 321)</td>
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<td>Principles of Economics (Econ 211, 212)</td>
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<td>Genetics (Bio 303)</td>
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#### Junior

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<tbody>
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<td>American Government (Pol Sc 201)</td>
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<td>Growth of American Democracy (Hist 204)</td>
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<td>Statistical Analysis (Stat 322, 323)</td>
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<td>Statistical Uses of Computers (Stat 330)</td>
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<td>Numerical Linear Analysis (CSc 331)</td>
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<tr>
<td>Linear Programming (CSc 219)</td>
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<td>Linear Algebra (Math 312, 313)</td>
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#### Senior

<table>
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<th>Course Description</th>
<th>F</th>
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<tbody>
<tr>
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<td>Undergraduate Seminar (Stat 463)</td>
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<tr>
<td>U.S. in World Affairs (Hist 205)</td>
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<td>Probability Theory and Math. Statistics (Stat 425, 426, 427)</td>
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<td>Design of Experiments (Stat 423)</td>
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<td>* Humanities</td>
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<td>* Social Science</td>
<td></td>
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<td>3</td>
</tr>
<tr>
<td>Sampling Theory (Stat 421)</td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Systems Analysis (CSc 350)</td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>** Electives</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>17</td>
<td>17</td>
</tr>
</tbody>
</table>

* To be selected in accordance with the General Education Requirements.
** At least 15 units must be selected with the approval of the advisor in one field in which statistics is applied.
## CURRICULUM FOR MASTER OF SCIENCE DEGREE IN COMPUTER SCIENCE

(For University requirements see the Graduate Studies Announcement)

### I. Required:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSc 560</td>
<td>Practicum in Computer Science</td>
<td>5</td>
</tr>
<tr>
<td>CSc 590</td>
<td>Seminar in Computer Science</td>
<td>3</td>
</tr>
</tbody>
</table>

### II. Complete two of the following sequences:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSc 519, 520</td>
<td>Computer Modeling and Simulation</td>
<td>8</td>
</tr>
<tr>
<td>CSc 531, 532, 533</td>
<td>Numerical Analysis</td>
<td>9</td>
</tr>
<tr>
<td>CSc 541, 542</td>
<td>Information Processing</td>
<td>8</td>
</tr>
<tr>
<td>CSc 551, 552</td>
<td>Computer Systems and Software</td>
<td>8</td>
</tr>
<tr>
<td>Engr 520, 521, 522</td>
<td>Analog Computation and Simulation, Digital Systems, Computation Systems</td>
<td>10 to 19</td>
</tr>
</tbody>
</table>

### III. Select, with approval of adviser, 15 units additional 300, 400, or 500 level courses related to Computer Science

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>15</td>
</tr>
</tbody>
</table>

### IV. CSc 599 Thesis, or additional course work with comprehensive examination

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>4 to 6</td>
</tr>
</tbody>
</table>

Total units: 45
MATHEMATICS DEPARTMENT
Department Head, Charles J. Hanks

| Sabah Al-hadad     | Alan W. Holz             | Keith R. Milliken         |
| Alfred M. Bachman  | Kempton L. Huehn         | Paul F. Murphy           |
| Bernard W. Banks   | Rex L. Hutton            | Dina N. Ng               |
| Estelle L. Basor   | Boyd Walker Johnson      | Thomas D. O’Neil         |
| Herbert A. Dekleine| W. Boyd Judd             | Chester H. Scott         |
| James E. Delany    | Euel W. Kennedy          | Howard Steinberg         |
| Gary M. Epstein    | Martin T. Lang           | Henry B. Strickmeier     |
| Gerald P. Farrell  | Paul S. Lansman          | Raymond D. Terry         |
| Jack E. Girolo     | George C. Laumann        | Neal R. Townsend         |
| D. Edward Glassco  | George M. Lewis          | John Van Eps             |
| Stuart Goldenberg  | John J. Lowry            | Ralph M. Warten          |
| Harvey C. Greenwald| George R. Mach           | Stephen T. Weinstein     |
| Thomas E. Hale     | Jean M. McDill           | Patrick O. Wheatley      |
| Adelaide T. Harmon  | George H. McMeen         | Robert S. Wolf           |
| Charles T. Haskell | Allen D. Miller          |                           |

The Mathematics Department offers a complete program of university work leading to a bachelor of science degree in mathematics with options in applied mathematics, finite mathematics, and mathematics teaching. The department also offers mathematics courses needed in all other curricula for developing vocational and professional proficiency and for general education. The occupational flavor generated by these close interdepartmental relations increases both the usefulness of and the demand for the graduates who complete one of the degrees in mathematics.

High school students planning a mathematics major should have at least three, preferably four years of high school mathematics, and two years of science.

A program of study which leads to a Master of Science degree in mathematics with specializations in mathematics teaching and in applied mathematics is offered. A graduate in the mathematics teaching specialization of this program will be qualified for community college teaching positions or, with the proper credential, for teaching positions in secondary schools. A graduate in the applied mathematics specialization will be qualified for advanced positions in industry, business, civil service, college teaching, or other scientific endeavors.

CURRICULUM IN MATHEMATICS
Curricular Options

Applied Mathematics

This option is designed for students desiring a broad exposure to those fields of mathematics which have been, and continue to be, most useful to the development of physical sciences and engineering. This option will furnish the mathematics a student should have, who seeks to enter employment in industry or government as a support mathematician for production, research, and development. In addition, this option will provide adequate mathematical foundation for that student contemplating the pursuit of an advanced degree in Mathematics.

Finite Mathematics

This option is designed for students in this rapidly growing branch of mathematics that has many applications in business and management sciences, resources allocation, and traffic flow. A student in computer science, industrial engineering, business, and in related fields will find many topics of interest in this option. Emphasis will be on mathematical model building and applications.
Mathematics

Mathematics Teaching

The Mathematics Teaching Option is designed primarily to prepare the student for a teaching career, in junior and senior high schools. With additional courses as prescribed by the education department, the student completing this option can obtain a California single subject teaching credential in mathematics. This option also provides the student with a desirable undergraduate foundation for the master of science degree in the mathematics teaching specialization, a degree required for teaching service in community colleges and also appropriate for secondary school mathematics teachers.

Freshman

<table>
<thead>
<tr>
<th>Course</th>
<th>F</th>
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<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analytic Geometry and Calculus (Math 141, 142, 143)</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Fortran Programming (CSc 101)</td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>** Physics (Phys 131, 132)</td>
<td>4</td>
<td>4</td>
<td></td>
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<tr>
<td>English Composition (Engl 114, 115)</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>* Physical Education</td>
<td>2</td>
<td>1</td>
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<tr>
<td>Electives and courses to complete major</td>
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<tr>
<td>** Total</td>
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Sophomore

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<tbody>
<tr>
<td>Analytic Geometry and Calculus (Math 241)</td>
<td>4</td>
<td></td>
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<tr>
<td>Computer Principles and Programming (CSc 221)</td>
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<td>3</td>
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<tr>
<td>Differential Equations (Math 242)</td>
<td>4</td>
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<tr>
<td>Methods of Proof in Mathematics (Math 248)</td>
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<td>3</td>
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<tr>
<td>Modern Algebra (Math 381)</td>
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<td></td>
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<tr>
<td>Statistical Analysis (Stat 321)</td>
<td></td>
<td>3</td>
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</tr>
<tr>
<td>** Physics (Phys 133)</td>
<td>4</td>
<td></td>
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</tr>
<tr>
<td>* Social Sciences</td>
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<td>3</td>
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<tr>
<td>* Oral and written expression</td>
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<td>Electives and courses to complete major</td>
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<td>** Total</td>
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Junior

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<tr>
<th>Course</th>
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</thead>
<tbody>
<tr>
<td>Linear Algebra (Math 312)</td>
<td>4</td>
<td></td>
<td></td>
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<tr>
<td>* Literature or Philosophy</td>
<td></td>
<td>3</td>
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<tr>
<td>* Humanities</td>
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<td>3</td>
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</tr>
<tr>
<td>* Biological Sciences</td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>* Natural Sciences (except Physics)</td>
<td></td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>* Social Sciences</td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>American Government (Pol Sc 201)</td>
<td></td>
<td>3</td>
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<tr>
<td>Growth of American Democracy (Hist 204)</td>
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<tr>
<td>Electives and courses to complete major</td>
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<tr>
<td>** Total</td>
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</table>

Senior

<table>
<thead>
<tr>
<th>Course</th>
<th>F</th>
<th>W</th>
<th>S</th>
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<tbody>
<tr>
<td>Undergraduate Seminar (Math 459)</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Senior Project (Math 461, 462)</td>
<td>2</td>
<td>2</td>
<td></td>
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<tr>
<td>* Literature or Philosophy</td>
<td>3</td>
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<tr>
<td>U.S. in World Affairs (Hist 205)</td>
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<tr>
<td>Electives and courses to complete major</td>
<td>8</td>
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</tr>
<tr>
<td>** Total</td>
<td>16</td>
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</tbody>
</table>

** Teaching option majors may substitute Phys. 121, 122, 123.
* To be selected in accordance with the General Education requirement.
Math 304 Vector Analysis .................... (4)  
Math 319 Partial Differential Equations ....................................................... (3)  
Math 332, 333 Numerical Analysis............. (6)  
Math 336 Combinatorial Mathematics (3)  
Math 408 Complex Variables..................................................... (4)  
Math 412 Advanced Calculus .......... (3)  
Math 413 Advanced Calculus .......... (3)  

FINITE MATHEMATICS OPTION
(Add Courses Below to Mathematics Curriculum)  
Junior and Senior Years
CSc 331 Numerical Linear Analysis ........................................... (3)  
Math 318 Advanced Engineering Mathematics ........................................... (4)  
Math 335 Graph Theory........................ (3)  
Math 336 Combinatorial Mathematics (3)  
Math 431-2 Mathematical Optimization ....................................................... (6)  
Math 437 Game Theory ........................................... (3)  
Stat 425 Probability Theory and Applications I .................................................. (3)  
CSc 219 Linear Programming............. (3)  
CSc 419 Mathematical Programming.. (3)  

MATHEMATICS TEACHING OPTION
(Add Courses Below to Mathematics Curriculum)
Junior and Senior Years
Math 341 Theory of Numbers ............ (3)  
Math 382 Modern Algebra ................. (4)  
Math 403 Secondary School Math ...... (3)  
Math 442 College Geometry ............... (3)  
Math 443 Non Euclidian Geometry... (3)  
Math 444 Projective Geometry .......... (3)  
Math 456 Concepts of Analysis............. (3)  
Math 424 Org. & Tchng. Math............. (3)  
Stat 322 Statistical Analysis .................. (3)  
CSc 410 Comp. Fund Educ. or CSc 414 Comp. Assisted Inst. ............. (3)  

CURRICULUM FOR THE MASTER OF SCIENCE DEGREE IN MATHEMATICS
With Specializations in Mathematics Teaching and in Applied Mathematics
(For University requirements see the Graduate Studies Announcement)

I. Required Math 506, 508, 515 .......................................................... 9

* II. 15 units of 500 level courses selected according to specialization.......................... 15

III. Select 12 units from any 300, 400, 500 courses having the prefixes, Math, CSc, Stat., approved by the advising committee ..................................................... 12

** IV. Elect 9 additional units with approval of adviser..................................................... 9

V. Satisfactory complete a terminal written and oral examination; or complete Math 596, Graduate Thesis, for 6 units of credit under III........................................... 45

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Computer Science, Mathematics, Statistics, and other subjects.

* For specialization in Mathematics Teaching: Math 580 and 509, Math 510 or 511 and 6 additional units selected from Math 505, 507, 510, 511, 580. For specialization in Applied Mathematics: Math 580, 593 and 9 additional units selected from: Math 512, 513, 516, 518, CSc 531.

** For specialization in Applied Mathematics, these units to be selected in one area other than mathematics, statistics, and computer science (physics, engineering, economics, chemistry, etc.) Exceptions may be made for candidates with an approved Bachelor’s or higher degree in a field other than mathematics, computer science or statistics.
MILITARY SCIENCE DEPARTMENT
Department Head, Lt. Colonel Robert W. McKee
Major Willis L. Manley  Captain Bobby T. Lum Ho
Major Harvey D. Dangerfield  Captain John Trahey

PURPOSE
The Military Science Department conducts a program of instruction which develops the mental and physical qualifications of graduates in preparation for positions of leadership within the military and/or civilian communities. Both men and women students may enroll for full academic elective credit without incurring any military service obligation. Courses complement all major areas of study by broadening the student's basic education. The curriculum includes both military leadership and management courses, and courses which provide an awareness of the heritage of the U.S. Military; the Army's role in national defense and world affairs; motivational techniques and the psychology of group dynamics. Students desiring to attain a commission as a Second Lieutenant in the U.S. Army upon graduation pursue the entire Military Science/ROTC (Reserve Office Training Corps) Program. To be eligible for participation in ROTC, a student must be a regularly enrolled student at this university, have sufficient time remaining as a university student to permit completion of the advanced courses (third and fourth academic years) prior to reaching the 28th birthday, and be physically qualified. Medical acceptability for the basic course (first and second academic years) requires a statement from the student's physician that the individual is medically fit to participate in the ROTC program, a program not more strenuous than a college physical education program. ROTC scholarships are available which provide full tuition, books, supplies, and an allowance of $100 per month for the duration of the scholarship. Non-scholarship ROTC cadets also receive an allowance of $100 per month while enrolled in the Advanced Course.

EQUIPMENT AND UNIFORMS
All necessary equipment, uniforms and text books for participation in the Military Science/ROTC Program are furnished to the student by the United States Government free of charge. Title to this property, other than expendable items, remains with the government. Students entering into active commissioned service after graduation are granted a special $300 uniform allowance.

FOUR YEAR PROGRAM
The four year elective ROTC program is a progressive course of instruction divided into a two year basic course and a two year Advanced Course.

Students with previous military service, or with Junior ROTC credit or ROTC credit from another institution, may be granted advanced standing in the course. Students who will complete degree requirements in three academic years may enroll in first year and second year ROTC courses concurrently and complete the four-year program in three years.

During the third and fourth academic years students are permitted to apply credit for Military Science related academic courses toward ROTC Program requirements. These academic courses must be in a field outside the student's major academic discipline, and account for six quarter units during the two-year period.

Students who elect to enter the Advanced Course of ROTC instruction are paid $100 per month while enrolled. The only obligation connected with the receipt of this subsistence allowance is the willingness by the student to accept a reserve commission of Second Lieutenant if it is offered upon graduation and to serve a period of three years on active duty as a commissioned officer, if called.

Four year program students are required to attend summer training camp for a six week period following completion of their third year. The government furnishes all uniforms, equipment, room, board, and medical care for students at camp. Additionally, each student is paid at the rate of one half a Second Lieutenant's pay and is provided a transportation allowance from and to home. No university credit is accrued for the advanced summer camp.
TWO YEAR PROGRAM

The opportunity offered by ROTC training is available in a special program to transfer students and to currently enrolled college students who were unable to participate in the four year ROTC program.

To qualify for the two year program, the student must complete a special basic ROTC summer camp of six weeks duration. Students normally attend basic camp between their second and third academic years. Transfer students must complete the camp during the summer immediately prior to their matriculation at this university. It is important that potential transfer students who plan to participate in the two year ROTC program make their intentions known directly to the Head, Military Science Department, no later than 1 March of the year they plan to register at the university even though this date may precede the date of their final acceptance by the university.

The government will provide transportation allowance to and from basic summer camp, and the rate of pay as an Army Private. All equipment, uniforms, room, board and medical care are furnished free while at camp. The basic summer camp is in addition to the advanced summer camp which must be taken at the end of the third academic year as part of the Advanced Course. No university credit is accrued for the basic summer camp.

Upon successful completion of the basic summer camp, the student is admitted directly into the Advanced ROTC course in September during registration at the university. The student is entitled then to the advanced course subsistence allowance and all other privileges of Advanced Course standing as enumerated above under the four year program.

MODULAR PROGRAM

Basic Course students are offered an alternative to the courses of instruction for which academic elective credit is given. The Modular Program may be substituted for the Four Year Program Basic Course, and is based on practical application through activity participation rather than the academic curriculum. A variety of skill and adventure modules, for which no elective credit units accrue, are offered and may be pursued solely or in combination with the academic curriculum to qualify for entry directly into the Advanced ROTC Course. Cadets so qualifying for the Advanced Course receive the subsistence allowance and all other privileges of advanced course standing as enumerated above under the four year program. Students desiring to participate in the Modular Program do so by contacting the enrollment officer of the Military Science Department.

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Military Science and other subjects.
The Physics Department serves all schools of the University by offering courses which provide the scientific foundations for work taken by students in their major fields. The department also contributes to the general education of all students by increasing their understanding of the process of scientific discovery, of the nature of the physical universe, and of the potential impact of science on society. The department offers curricula in physics and in physical sciences leading to the bachelor of science degree.

The department's goal in training physics majors is to prepare them for entry into positions as physicists, to prepare them for further training as physics teachers, especially at the community college or more advanced levels, or to give them a strong foundation in science that will enable them to enter other related professions. The program prepares students for possible further formal education in graduate school. Graduates are engaged in many fields and industries, including computers, electronics, aerospace, energy production and utilization, and the development of material resources and products. To prepare physics majors effectively for employment, the department provides a comprehensive laboratory program, with facilities which include specialized laboratories in electrical measurements, optics, solid state physics, nuclear physics, and reactor physics, including a subcritical nuclear reactor assembly. Student activities include a chapter of the national Society of Physics Students and a chapter of the national physics honor society, Sigma Pi Sigma.

It is suggested that the high school student planning to major in physics include in his or her high school program as much as possible of the following: six semesters of college preparatory mathematics, two of physics and two of chemistry.

The Bachelor of Science in Physical Science is a degree major designed primarily to provide undergraduate preparation for the student who intends to be a secondary school teacher of one or more of the physical sciences. It may also serve students who plan to enter another field in which a physical science background would be useful, but students intending to do graduate study in either chemistry or physics should elect a chemistry or physics major. Students planning to qualify for a teaching credential in physical science should plan their electives to include the education courses indicated. The Physical Science degree program is administered jointly by the Chemistry and Physics Departments.
<table>
<thead>
<tr>
<th>CURRICULUM IN PHYSICAL SCIENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Freshman</strong></td>
</tr>
<tr>
<td>* Chemistry (Chem 121, 122, 226 or 316) .........</td>
</tr>
<tr>
<td>* Physics (Phys 131, 132 or 121, 122) ............</td>
</tr>
<tr>
<td>Analytic Geometry and Calculus (Math 141,2,3 or 131,2,3)</td>
</tr>
<tr>
<td>English Composition (Engl 114) ....................</td>
</tr>
<tr>
<td>† Literature ......................................</td>
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<tr>
<td>† Literature or Philosophy .......................</td>
</tr>
<tr>
<td>† Humanities elective ............................</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

| **Sophomore**                 |
| * Chemistry (Chem 126 and 328 or 371) ............ | 4 4  |
| * Physics (Phys 133 and 210 or 211 or 123, 124) | 4 4  |
| Approved Physics elective ....................... | 3  |
| Mathematics, Computer Science, or Statistics electives | 4 4  |
| Fortran Programming (CSc 101) .................... | 2  |
| Physical Geology (Geol 201) ...................... | 3  |
| American Government (Pol Sc 201) ............... | 3  |
| Principles of Speech (Sp 200) ................... | 3  |
| Growth of American Democracy (Hist 204) ........ | 3  |
| U.S. in World Affairs (Hist 205) ............... | 3  |
| Drug Education (PE 305) ........................ | 2  |
| † Physical Education ............................ | 1  |
|                                               | 16 15 16 |

| **Junior**                   |
| Chemistry (Chem 301 or 305) ............... | 3  |
| Astronomy (Astr 301 or 302) ............... | 3  |
| † Biological Sciences electives .......... | 4 4 4 |
| ** Approved Chemistry elective ............ | 4  |
| Approved Astronomy and/or Earth Sciences electives | 4  |
| Approved Physical Science 300 or 400 level electives | 3 3  |
| Advanced Composition (Engl 300) ............ | 3  |
| † Social Science elective ................. | 3  |
| Electives toward credential requirements: |
| Learning Process (Ed 335) .................... | 3  |
| Reading Methods (Ed 434) .................... | 2  |
| Instructional Processes (Ed 438) .......... | 3  |
| Multicultural Education (Ed 301) .......... | 3  |
|                                               | 16 16 17 |

| **Senior**                    |
| Senior Project (Chem, Phys, or PSc 461) .... | 2  |
| Approved Physical Sciences 300- or 400-level elective (Prospective teachers take Org and Tchg Phys Sci (PSc 424) | 3  |
| Approved Physics 300- or 400-level elective .......... | 3  |
| † Social Science elective .......... | 3  |
| Elective ....................................... | 2 3 6 |
| Electives toward credential requirements: |
| Diagnosis, Prescription, and Eval. (Ed 436) .......... | 2  |
| Student Teaching (Ed 430, 440) ................ | 6 12 |
| Methods of Teaching Reading (Ed 435) ............ | 3  |
|                                               | 15 15 15 |

* A choice of the Phys 121-2-3-4 sequence or Chem 226 or 328 restricts the physics and Chemistry electives available to the student later in this program.
† To be selected in accordance with the General Education requirement.
* A choice of the Phys 121-2-3-4 sequence or Chem 226 or 328 restricts the physics and chemistry electives available to the student later in this program.
† To be selected in accordance with the General Education requirement.
** Chosen from Chem. 274, 302, 305, 317, 331, 332, 341, 344, 372.
# CURRICULUM IN PHYSICS

## Freshman

<table>
<thead>
<tr>
<th>Course</th>
<th>F</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Biological Sciences (Bio 101, Bot 121, or Zoo 131)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>† Written communication (Engl 104, 105, 218 or 114, 115)</td>
<td>3</td>
<td>3</td>
<td>3</td>
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<tr>
<td>* Physical Education</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Analytic Geometry and Calculus (Math 141, 142, 143)</td>
<td>4</td>
<td>4</td>
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<tr>
<td>General Chemistry (Chem 121, 122)</td>
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<tr>
<td>Organic Chemistry (Chem 226)</td>
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<tr>
<td>General Physics (Phys 131, 132)</td>
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<tr>
<td>Introduction to Physics (Phys 100)</td>
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## Sophomore

<table>
<thead>
<tr>
<th>Course</th>
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<th>S</th>
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</thead>
<tbody>
<tr>
<td>Economics (Econ 201 or 211)</td>
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</tr>
<tr>
<td>Analytic Geometry and Calculus (Math 241)</td>
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<td>Differential Equations (Math 242)</td>
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<td>Fortran Programming (CSc 101)</td>
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<td>Advanced Engineering Math (Math 318)</td>
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<td>General Physics (Phys 133, 134)</td>
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<td>Modern Physics (Phys 211)</td>
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<td>Instruction to Nuclear Physics (Phys 213)</td>
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<td>Introductory Nuclear Physics Laboratory (Phys 243)</td>
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## Junior

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<td>Partial Differential Equations (Math 319)</td>
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<td>Vector Analysis (Math 304)</td>
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<td>Analytic Mechanics (Phys 302, 303)</td>
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<td>Solid State Physics (Phys 406)</td>
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<td>Solid State Physics Laboratory (Phys 456)</td>
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<td>Quantum Mechanics (Phys 405)</td>
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<td>Quantum Physics Laboratory (Phys 341, 342)</td>
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<td>Physical Optics (Phys 323)</td>
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<td>Undergraduate Seminar (Phys 363)</td>
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## Senior

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<tbody>
<tr>
<td>American Government (Pol Sc 201)</td>
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<td>Growth of American Democracy (Hist 204)</td>
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<tr>
<td>U.S. in World Affairs (Hist 205)</td>
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<tr>
<td>* Social Sciences</td>
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<tr>
<td>Electricity and Magnetism (Phys 408, 409)</td>
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<td>Senior Project (Phys 461, 462)</td>
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</table>

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Physics and Physical Science and other subjects.

† If requirement is satisfied with 114, 115, an additional unit of general education must be taken.

* To be selected in accordance with the General Education requirement.
DIVISION OF SOCIAL SCIENCES
Warren W. DeLey, Associate Dean

The Division of Social Sciences has two primary objectives. The first is education leading to the degrees of Bachelor of Arts in Political Science or Bachelor of Science in Social Sciences. A second is service to students throughout the University, providing courses which satisfy general education requirements and elective options in support of major degree work.

The Division is organized into the Political Science Department and the Social Sciences Department (which offers courses in anthropology, geography, social science, and sociology). Faculty members within the Division are selected on the basis of academic qualifications and professional experience, as well as outstanding teaching ability.

Students in the Division prepare for a wide range of careers in various areas of the public and private sector. In addition, many enter graduate schools to pursue further specialized studies. A pre-law advisement service is available to all University students.

A variety of occupational concentrations is available within each of the two major programs. Students are also given the option of choosing among certain concentrations in several disciplines outside the Division.
The Political Science Department offers undergraduate instruction leading to the degree of Bachelor of Arts in Political Science. With a concern for theoretical principles as well as practical application, the degree requirements include both a common body of material and several curricular concentrations as listed below. These concentrations focus the training within the degree program toward career opportunities in government and other public agencies.

In addition to the offerings available for those who wish to major in Political Science, the Department provides students in all curricula within the University with an understanding of the operations of local, state, and national government and the processes by which the individual and community interact in the several levels of government.

Through the required and elective courses, the Department seeks to expand each student's comprehension of the political process, to develop those skills and attitudes which are essential for effective citizenship, and to prepare each Cal Poly graduate for intelligent and responsible political behavior.

CURRICULAR CONCENTRATIONS

Administration
This concentration is designed to prepare students for careers in administrative work in government and related agencies and to prepare students to enter graduate studies in the field of administration.

International Affairs
This concentration is designed to prepare students for careers in government and related agencies which deal in the many problems in international affairs and to prepare students to enter graduate studies in the field of international relations.

Pre-Law
This concentration is designed to prepare students for careers in the several fields of law. Some students who complete this concentration may seek admission to accredited law schools to continue their preparation for the law profession. Others may seek careers in law-related professions such as law enforcement, probation, corrections and legal assistance.

Teaching
This concentration is designed to prepare students for careers as elementary school teachers and for careers as social studies teachers in junior high schools and high schools.

Urban Studies
This concentration is designed to prepare students for careers in broad fields of planning within government and related agencies and to prepare students to enter advanced studies in the field of city and regional planning.

Concentrations outside the Political Science Department are also offered as follows: Corrections, Ethnic Studies, or Social Services (Social Services Department); Management, Accounting, Industrial Relations, Management Information Systems, International Trade and Development (School of Business).
# CURRICULUM IN POLITICAL SCIENCE

## Freshman

<table>
<thead>
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<th>Course</th>
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<td>Freshman Composition (Engl 114, 115)</td>
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<tr>
<td>National and California Government (Pol Sc 101, 102)</td>
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<td>Introduction to Political Science (Pol Sc 110)</td>
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<tr>
<td>Introduction to International Relations (Pol Sc 105)</td>
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<tr>
<td>Introduction to Sociology (Soc 105)</td>
<td>3</td>
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<tr>
<td>United States History (Hist 201, 202)</td>
<td>4</td>
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<tr>
<td>U.S. in World Affairs (Hist 205)</td>
<td>3</td>
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<tr>
<td>Elementary Probability and Statistics (Stat 211)</td>
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<tr>
<td>Principles of Speech (Sp 200)</td>
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<tr>
<td>Health Education (PE 250)</td>
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<td>* Electives and courses to complete major</td>
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## Sophomore

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Cultural Anthropology (Ant 201)</td>
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<tr>
<td>Principles of Economics (Econ 211, 212)</td>
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<tr>
<td>General Psychology (Psy 202)</td>
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<tr>
<td>Comparative Government (Pol Sc 202)</td>
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<tr>
<td>Introduction to Public Administration (PolS 214)</td>
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<tr>
<td>Basic Political Analysis (Pol Sc 203)</td>
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<td>Basic Concepts of Political Thought (Pol Sc 204)</td>
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## Junior

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<tr>
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<tbody>
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<td>American Political Process (Pol Sc 302)</td>
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<td>Political Thought (Pol Sc 306 or 307)</td>
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<td>International Politics (Pol Sc 312)</td>
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<td>Admin. Theory and Behavior (Pol Sc 318)</td>
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<tr>
<td>American Constitutional Law (Pol Sc 321)</td>
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<td>Protection of Civil Liberties (Pol Sc 322)</td>
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<td>Political Geography (Geog 305)</td>
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<td>Legislative Processes (Pol Sc 335)</td>
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<td>* Electives and courses to complete major</td>
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## Senior

<table>
<thead>
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<th>Course</th>
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<tbody>
<tr>
<td>Contemporary U.S. Foreign Policy (Pol Sc 411)</td>
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<tr>
<td>American Presidency (Pol Sc 442)</td>
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<tr>
<td>Municipal Government (Pol Sc 403)</td>
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<td>Senior Project (Pol Sc 461, 462)</td>
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<tr>
<td>Undergraduate Seminar (Pol Sc 463)</td>
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<td>Biological sciences elective</td>
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<td>Philosophy elective</td>
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<td>Physical science elective</td>
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<td>* Electives and courses to complete major</td>
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</table>

See COURSES OF INSTRUCTION section of this catalog for description of courses in Political Science and other subjects.

* 27 elective units must be chosen in the field of concentration including 18 units at the 300–400 level. Concentration lists available at the department office.

* 27 elective units must be chosen in the field of concentration including 18 units at the 300–400 level. Concentration lists available at the department office.
The Social Sciences Department serves all of the schools of the campus in providing general education for citizenship. In general, the department seeks to provide the student with a better understanding of the society in which he lives, to develop in the student those skills and attitudes which are prerequisites for effective citizenship, and to prepare and encourage the individual toward intelligent and responsible social action.

The occupational objectives of the department are to train students for those numerous entry jobs in civil service, business, industry, and social welfare which require a bachelor's degree with a major in the social sciences, and to train those who expect to teach the social studies in elementary or secondary schools.

Students with majors in fields other than the social sciences may select courses which will aid in qualifying them for a variety of civil service positions.

The department offers the degree of Bachelor of Science in Social Sciences. This degree allows the student to choose among four concentrations leading to different careers. The department also offers graduate courses which permit the student to qualify for a Master of Arts Degree in Education with a concentration in the field of social sciences.

**CURRICULAR CONCENTRATIONS**

**Corrections**

This concentration is designed to prepare students for careers in law enforcement, corrections, detention, probation and parole.

**Ethnic Studies**

This concentration is designed to prepare students for careers in community programs in human relations, in agencies implementing public policies in fair employment, housing, education, health, and welfare, and to prepare students to enter graduate programs in related disciplines.

**Social Sciences (Teaching)**

With proper selection of electives, this concentration leads to preparation for elementary or secondary teaching on completion of the fifth year. It also provides the student with a broad background for entry positions in business.

**Social Services**

By providing instruction in the social services area, this concentration prepares students to enter such fields as social work, corrections, probation, or parole.

Concentrations outside the Social Sciences Department are also offered as follows: International Affairs or Urban Studies (Political Science Department); Industrial Relations, Management, or International Trade and Development (School of Business).
# Social Sciences

## CURRICULUM IN SOCIAL SCIENCES

### Freshman

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<th>Course</th>
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<td>English Composition (Engl 114, 115)</td>
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<tr>
<td>National and California Government (Pol Sc 101, 102)</td>
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<td>Introduction to International Relations (Pol Sc 105)</td>
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<td>United States History (Hist 201, 202)</td>
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<td>Human Geography (Geog 150)</td>
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<tr>
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<td>Cultural Anthropology (Ant 201)</td>
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<td>World Prehistory (Ant 202)</td>
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<td>U.S. in World Affairs (Hist 205)</td>
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<td>Principles of Speech (Sp 200)</td>
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<td>General Psychology (Psy 202)</td>
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<td>Physical Anthropology (Ant 203)</td>
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<td>Physical Geography (Geog 250)</td>
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<tr>
<td>Comparative Government (Pol Sc 202)</td>
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<td>Political Science at 300–400 level</td>
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<td>History at 300–400 level</td>
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<td>Geography at 300–400 level</td>
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<td>Physical Sciences elective</td>
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<th>Course</th>
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<tbody>
<tr>
<td>Senior Project (Soc Sc 460)</td>
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<tr>
<td>Undergraduate Seminar (Soc Sc 463)</td>
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<tr>
<td>Anthropology at 300–400 level</td>
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<td>Sociology at 300–400 level</td>
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<tr>
<td>Economics at 300–400 level</td>
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<td>Literature elective</td>
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</table>

See COURSES OF INSTRUCTION sections of this catalog for descriptions of courses in Anthropology, Geography, Social Sciences, Sociology and other subjects.

* 27 of the elective units must be chosen with the approval of the adviser in a field of concentration.
Courses of Instruction
## SCHOOLS, DEPARTMENTS AND COURSE PREFIXES

### SCHOOL OF AGRICULTURE AND NATURAL RESOURCES
- Agricultural Education ........................................ Ag Ed
- Agricultural Engineering .......................................... AE, MarE
- Agricultural Management ....................................... AM
- Agriculture ....................................................... Ag
- Animal Science ................................................ A Sci
- Crop Science ................................................ CrSc, FrSc, VgSc
- Dairy and Poultry Science ........................................ DH, DM, PI
- Food Industries ................................................... FI
- Natural Resources Management ........................... NRM
- Ornamental Horticulture ....................................... OH
- Soil Science...................................................... SS
- Veterinary Science .............................................. VS

### SCHOOL OF ARCHITECTURE AND ENVIRONMENTAL DESIGN
- Architecture ................................................... Arch, ArcE, CRP, Cstr, EDes, LA

### SCHOOL OF BUSINESS
- Accounting ...................................................... Actg
- Business Administration ..................................... Bus, FPM, Mktg
- Economics ....................................................... Econ
- Management ...................................................... Mgt, IR

### SCHOOL OF COMMUNICATIVE ARTS AND HUMANITIES
- Art ................................................................. Art
- English ............................................................. Engl
- Foreign Languages ............................................... ForL, Fr, Ger, Span
- Graphic Communications ....................................... GrC
- History ............................................................. Hist
- Humanities ............................................................ Hum
- Journalism .......................................................... Jour
- Music ............................................................... Mu
- Philosophy ........................................................... Phil
- Speech Communication .......................................... Sp, Dr

### SCHOOL OF ENGINEERING AND TECHNOLOGY
- Aeronautical Engineering ....................................... Aero
- Civil Engineering .................................................. CE
- Electronic and Electrical Engineering .................... EL, EE
- Engineering ........................................................ Engr
- Engineering Technology ........................................ ET, MP, Weld
- Environmental Engineering .................................... EnvE
- Industrial Engineering .......................................... IE
- Industrial Technology ............................................ IT
- Mechanical Engineering ........................................ ME
- Metallurgical Engineering ..................................... Met

### SCHOOL OF HUMAN DEVELOPMENT AND EDUCATION
- Child Development............................................... CD
- Education .......................................................... Ed
- Ethnic Studies ..................................................... Eth S
- Home Economics ................................................ HE
- Physical Education ............................................... PE, PEM, PEW, Rec
- Psychology ........................................................ Psy
SCHOOL OF SCIENCE AND MATHEMATICS

Biological Sciences .................................. Bact, Bio, Bot, Cons, Ent, Zoo
Chemistry ............................................. Chem
Computer Science and Statistics ..................... CSc, Stat
Mathematics ............................................ Math
Military Science ........................................ MSc
Physics ................................................. Astr, Geol, Phys, PSc

DIVISION OF SOCIAL SCIENCES

Political Science ...................................... Pol S
Social Sciences ....................................... Ant, Geog, Soc S, Soc, Lib

COURSE DESCRIPTIONS

Courses are listed alphabetically by prefix. Descriptions of experimental courses (designated by X following the course number) will be found in the quarterly class schedule, which is sold in El Corral University Store.

Course Numbering System

The numbering system used is a three-digit system. Courses are generally numbered according to the plan shown below.

010–099 Non-degree credit or short courses.
100–299 Courses taught primarily in the freshman and sophomore years.
300–399 Courses primarily for advanced undergraduate students, generally bearing no graduate degree credit.
400–499 Courses for advanced undergraduates and graduate students.
500–599 Graduate courses.
600–699 Courses for professional advancement within a special field and do not carry credit for degree requirements in any of the curricula.

Prerequisites

Prerequisites indicate recommended preparation. Course prerequisites cited in this catalog are intended to inform the student of any previous work needed for the course. Eligibility of students who do not meet the stated prerequisites is determined by their academic advisers and the appropriate instructor.

ACCOUNTING

Actg 131, 132 Basic Accounting (3) (3)
A study of accounting to show how records are kept, their uses and limitations. For the student who needs a general knowledge of accounting. Not applicable for credit toward major in business administration. 2 lectures. 1 two-hour laboratory.

Actg 200 Special Problems for Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, maximum of 2 units per quarter. Prerequisite: Consent of department head.

Actg 221, 222 Principles of Accounting (4) (4)
Principles and practices of fundamental accounting theory. 4 lectures.

Actg 223 Cost Accounting and Analysis (4)
Accounting for cost control applicable to production, distribution, and service enterprises. Analysis and interpretation of financial statements. 4 lectures. Prerequisite: Actg 132 or 222.

Actg 301 Managerial Accounting (4)
Relationship of accounting to business operations and analysis. Analysis and application of accounting principles and procedures to business organizations. 4 lectures. Prerequisite: Actg 222.

Actg 304 Tax Accounting (4)
Federal and state income taxation of individuals. 4 lectures. Prerequisite: Actg 131 or 221
Accounting

Actg 305  Tax Accounting (4)
Federal and state income taxation of corporations, partnerships, estates and trusts. Federal and state gift and death taxes. 4 lectures. Prerequisite: Actg 132 or 222 and 304.

Actg 321, 322  Intermediate Accounting (4)
Conventional financial accounting: theory, problems and contemporary issues. 4 lectures. Prerequisite: Actg 222.

Actg 323  Advanced Accounting (4)
Accounting theory and practice relating to partnerships, special sales procedures, foreign branches and subsidiaries, fiduciaries and non-profit organizations. 4 lectures. Prerequisite: Actg 322.

Actg 400  Special Problems for Advanced Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, maximum of 2 units per quarter. Prerequisite: Senior standing or consent of instructor.

Actg 402  Advanced Cost Accounting (4)
Process and standard costs; overhead costs, budgeting. Use of cost accounting data in economic analyses and managerial control. 4 lectures. Prerequisite: Actg 223 or 301.

Actg 403  Governmental Accounting (4)
Accounting for governmental and non-profit organizations. Use of accounting information to control and achieve objectives of the programs involved. 4 lectures. Prerequisite: Actg 222.

Actg 417  Controllership (4)
Function, organization, and responsibilities of the controllership in the business environment. Integration of the accounting function into the corporate organization; role and relationships of the controllership in the corporation. 4 lectures. Prerequisite: Actg 322, senior standing.

Actg 421  Business Combinations (4)
Authoritative accounting methods and their applications for business combinations including mergers and consolidations. Consideration of related problems and financial reporting requirements. 4 lectures. Prerequisite: Actg 323 and Bus 207 or consent of instructor.

Actg 430  Internship (4–8)
Placement as an employee in a business firm approved by the department head. Periodic written progress reports required. Collateral reading correlated with the work experience. Credit/No Credit grading. Prerequisite: Approval of department head.

Actg 431  Professional Accounting (4)
Development of the accounting profession. Past, present and future. Emphasis on contemporary issues confronting the professional accountant and his social and ethical responsibilities and opportunities. 4 lectures. Prerequisite: Actg 322 or consent of instructor.

Actg 446  Auditing (4)
Professional auditing: theory, philosophy and problems. 4 lectures. Prerequisite: Actg 322. Bus 321 is recommended.

Actg 460  Senior Project (2)
Selection and completion under faculty supervision of a project typical of problems graduates must solve in their field of employment. Required minimum of 60 hours. Formal report required. Prerequisite: Bus 419.

Actg 468  Income Determination and Measurement (4)
Role of the accounting process in income determination and the measurement of income. A conceptual approach. Development of a historical perspective, evaluation of contemporary issues. 4 lectures. Prerequisite: Actg 322, senior standing, and consent of instructor.
Actg 470  Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

Actg 500  Individual Study (1–3)
Advanced study planned and completed under direction of departmental faculty member. Open only to graduate students demonstrating ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head.

Actg 501  Accounting for Planning and Control (4)
Application of accounting to management planning, control and information systems. Case and problem analysis in budgetary control, standard and direct costing, decentralized profit control, inter-division transfer, and long-range planning. 4 lectures. Prerequisite: Actg 510 or equivalent.

Actg 510  Foundations in Accounting (4)
Principles and practices of fundamental accounting. Introduction to cost accounting and financial statement analysis. 4 lectures. Prerequisite: Graduate standing.

AERONAUTICAL ENGINEERING

Aero 101  Aircraft and Missile Fundamentals (3)
Fundamentals of aircraft and missile systems. Field trips conducted to existing departmental laboratories permit students to operate, and to see in operation, equipment used by aeronautical engineers. Not for aeronautical engineering majors. 3 lectures.

Aero 102  Introduction to General Aviation (3)
Fundamentals of aerodynamics and principles of flight. Introduction to power systems and instrumentation used by general aviation aircraft. Principles of air navigation. Interpretation of weather data, uses of flight computer, applicable Federal Aviation Regulations, subjects covered in the private pilot’s examination. Not acceptable as a technical elective for engineering students. Not open for credit to Aeronautical Engineering students. 3 lectures.

Aero 121, 122, 123  Aerospace Fundamentals (2) (2) (2)
Introduction to the engineering profession including the aeronautical and aerospace fields. Engineering approach to problem-solving and analysis of data obtained from experiments. Basic nomenclature and design criteria used in the aerospace industry. Applications to basic problems in the field. 2 laboratories.

Aero 200  Special Problems for Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of department head.

Aero 202  Mechanics of Materials (5)
Stresses, strains, deflections due to axial, torsional, and flexural loading. Statically indeterminate members and columns. Mohr’s Circle, column buckling. Emphasis on problem-solving. May not be substituted for Aero 207. 4 lectures, 1 laboratory. Prerequisite: ME 205 or equivalent.

Aero 207  Strength of Materials (5)
Stresses, strains, and their relations applied to axial, torsional, and flexural loads. Statically indeterminate axial members, beams, and shafts. Material properties, load classification and stability of columns. 5 lectures. Prerequisite: ME 211.

Aero 208, 209  Strength of Materials (3) (3)
Stresses, strains and their relations applied to axial, torsional and flexural loads. Statically indeterminate axial members, beams and shafts. Columns, dynamic loads, repeated loads. Tension, compression, bending, shear, and torsion tests. Use of the SR-4 strain rosette for
Aeronautical Engineering
determining principal strains. Aero 208: 3 lectures; Aero 209: 2 lectures, 1 laboratory. Prerequisite: ME 211.

Aero 229  Strength of Materials Laboratory (1)

Aero 240  Additional Engineering Laboratory (1–2)
Total credit limited to four units, with not more than two units in any one quarter. 1 or 2 laboratories.

Aero 301, 302, 303  Aerothermodynamics (5) (5) (5)
Properties and characteristics of fluids, fluid statics and dynamics, the thermodynamic relations, laminar and turbulent subsonic flows as applied to flight vehicles. Introduction to heat transfer. 5 lectures. fall; 4 lectures, 1 laboratory, winter and spring. Prerequisite: ME 211, Math 242.

Aero 306  Aerodynamics (5)

Aero 322  Analog Computer Techniques (4)
The solution of typical problems and dynamics that an aeronautical engineer might encounter by use of analog computer techniques. 2 lectures, 2 laboratories. Prerequisite: Math 241.

Aero 324  Stress Analysis (4)
Truss analysis; torsion of space frames and box beams. Shear and bending of straight and curved beams. Moment and product of inertia; Mohr's circle. Normal and shear stresses for beam bending about non-principal axes; the shear center. Beam columns under various loading and support conditions. Laboratory projects dealing with aerospace structures. 3 lectures, 1 laboratory. Prerequisite: Math 242, Aero 207, 229.

Aero 400  Special Problems for Advanced Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

Aero 401, 402  Propulsion Systems (4) (3)
Power plant types, components, characteristics, and requirements. Principles of thrust and energy utilization. Thermodynamic processes and performance of turboprop, turboshaft, turbofan, turbo jet, ramjet, and rocket engines. 401: 3 lectures, 1 laboratory. 402: 3 lectures. Prerequisite: Aero 404.

Aero 403  Rocket Propulsion (3)

Aero 404  Gas Dynamics (4)
Fundamental theory of one dimensional gas dynamics: Isentropic flow, flow in converging-diverging nozzles, shock propagation, normal and oblique shock theory, Prandtl-Meyer expansions, Fanno line flow, and measurement methods. 4 lectures. Prerequisite: Aero 303.

Aero 406  Introduction to Boundary-Layer Theory (3)
Concept of the boundary-layer. Boundary-layer equations, the similarity concept, fundamental similarity solutions, the thermal boundary-layer. 3 lectures. Prerequisite: Aero 303 or equivalent.
Aero 407 Aerospace Science (3)

History of aviation, rocketry, and space flights; fundamentals, descriptions of propulsion of flight vehicles, trajectories and orbital mechanics, aerodynamics, re-entry, pyrotechnics, nucleons, electrical power for guidance, telecommunication; aerospace environment, flight vehicles, spacecraft, and sounding rockets. 3 lectures. Prerequisite: Junior standing.

Aero 408 Advanced Flight Vehicle Structural Analysis (4)

Deformation of determinate and indeterminate structures. Virtual work. Dummy load method, Maxwell-Betti reciprocal theorem, Castigliano's theorem. Introduction to matrix methods. 3 lectures, 1 laboratory. Prerequisite: Aero 324, Math 318.

Aero 409 Flight Testing (3)

Flight test instrumentation, obtaining of data and methods of data reduction for determining aircraft and engine performance, aircraft stability and control and structural integrity. 3 lectures. Prerequisite: Aero 306.

Aero 410 Potential Flow Theory (3)

Introduction to potential flow and its application to aerodynamics. Potential flow over two and three dimensional bodies. Potential flow theory. Development of the Blasius force theorems and Prandtl lifting theory. 3 lectures. Prerequisite: Aero 303.

Aero 411 Space Technology (3)

Motion of a body in the central force field. Space vehicle trajectories, guidance systems, power generators for interplanetary travel, structural loading, and principles of space vehicle design. 3 lectures. Prerequisite: Aero 303.

Aero 414 Theory of Elasticity (3)

Analysis of stress, strain, plane stress, plane strain. Compatibility equations, strain energy methods. Problems in extension, torsion, and flexure. 3 lectures. Prerequisite: Aero 324.

Aero 415 Aerodynamics of Stability and Control (4)

Equations of motion of the airplane in six degrees of freedom and the aerodynamic forces involved. Static longitudinal and directional stability. Lateral motion and control. Dynamic longitudinal stability. 3 lectures, 1 laboratory. Prerequisite: Aero 306.

Aero 416 Unconventional Aircraft (3)

Introduction to analysis of rotary wing aircraft, VTOL, STOL, and lifting body vehicles. Types of flight control mechanism. Performance and stability of vehicles. 3 lectures. Prerequisite: Aero 306.

Aero 417 Structural Dynamics (4)

Effect of vibration and transient loads on aircraft structural elements. Dynamic load factors, support, motion, damping, and natural frequencies of multi-dimensional structures. 4 lectures. Prerequisite: ME 316.

Aero 418 Aeroelasticity (3)

Analysis of the aeroelastic problems of divergence, control reversal, flutter, and transient response including related topics in vibrations and structures. 3 lectures. Prerequisite: Aero 306, 408.

Aero 444, 445 Flight Vehicle Design Laboratory (4) (4)

Preliminary layout of a typical transport aircraft and a space vehicle using design and calculation techniques developed in previous aeronautical engineering courses. Design of selected component structures and preparation of necessary drawings. 2 lectures, 2 laboratories.

Aero 457 Aeronautical Engineering Laboratory (3)

Use of laboratory instruments to develop the technique of obtaining engineering measurements, special assigned problems in the field of aeronautics. 1 lecture, 2 laboratories. Prerequisite: Aero 303.
Ag Education

Aero 461, 462  Senior Project (2)  (2)
Selection and completion of a project which is typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time. Prerequisite: Senior standing.

Aero 463  Undergraduate Seminar (2)
Studies and technical developments in the field of Aeronautical Engineering. 2 meetings. Prerequisite: Senior standing.

Aero 470  Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

Aero 471  Selected Advanced Laboratory (1–3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. One to three laboratories. Prerequisite: Consent of instructor.

AGRICULTURAL EDUCATION

Ag Ed 202  Introduction to Agricultural Education (2)
Overview of agricultural education programs including goals and purposes. Kinds of classes and types of programs. Qualifications essential to success in teaching agriculture. Planned program of studies to meet requirement for teaching. 2 lectures.

Ag Ed 303  F.F.A. Programs and Activities (2)
Implementation processes and operational procedures for conducting an F.F.A. Chapter activities program appropriate to community, school and student needs. F.F.A. leadership training, proficiency awards, foundation programs and educational field days. 2 activities. Prerequisite: AgEd 202 or permission of instructor.

Ag Ed 339  Supervised Agricultural Experiences (2)
Supervised observation and participation in public school and/or agricultural industry. Exposure to processes and procedures for supervising rural youth organizations and occupational experience programs. 2 activities. Prerequisite: AgEd 202 and consent of instructor.

Ag Ed 424  Organizing and Teaching Agriculture (3)
Determining course objectives, content, and calendar for use by the teacher in classroom, shop and field instruction while assigned to community schools. Concurrent with student teaching. 3 activities. Prerequisite: AgEd 438.

Ag Ed 438  Instructional Processes in Agricultural Education (3)
Preparation for student teaching in agriculture. Orientation to classroom situation. Development of plans for teaching including daily lessons and unit plans; utilization of source information and resources. Class demonstration in teaching procedures; analysis and evaluation. 1 lecture, 2 activities.

Ag Ed 440  Student Teaching in Agricultural Education (6–12)
Off-campus assignment to a selected cooperating public school. Participation in all phases of agriculture teacher duties and activities including departmental organization and administration. Prior approval and appointment necessary. Total limited to 18 units.

Ag Ed 441  Student Teaching Practicum (2)
Problems encountered and practices applied during student teaching. Methods, procedures and materials adapted for use by the teacher concurrent with student teaching. 2 activities. Prerequisite: Consent of instructor.

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Ag Ed 470  Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

Ag Ed 471  Selected Advanced Laboratory (1-3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1-3 laboratories. Prerequisite: Consent of instructor.

Ag Ed 520  Program Development in Agricultural Education (3)
Development of up-to-date approaches to a total integrated program based on occupational opportunities and community needs. Philosophy, organization and administration of agricultural education programs. Development in such areas as curriculum, supervised occupational experience, Future Farmers of America, and summer programs. 3 lectures.

Ag Ed 522  Instructional Programs in Agricultural Mechanics (3)
Organizing the vocational agriculture mechanics curriculum and determining course content. Student demonstrations and presentations; evaluation and analysis. 1 lecture, 2 laboratories.

Ag Ed 523  Adult and Continuing Education in Agriculture (2)

Ag Ed 580  Special Problems in Agricultural Education (1-3)
Individual study of modern issues and problems conducted through research, planning and development. Field problems and in-service study in agricultural industry encouraged. Final written report to be submitted. Total credit limited to nine units with not more than three units in any one quarter. Prior approval of instructor required.

Ag Ed 621 (A-Z)  Technical Agricultural Developments (1-3)
Group study of new technological and scientific agricultural and related occupations. Provided through such activities as workshops, special meetings and assignments. Prior departmental approval necessary.

Ag Ed 631 (A-Z)  Professional Conference in Agriculture (1-3)
A series of lectures, seminars and/or workshops concerning agricultural education conducted by specialists in the field. New developments in teaching and methodology at various levels of instruction; assessment of innovations and procedures. For the professional improvement of vocational educators.

AGRICULTURAL ENGINEERING

AE 121  Agricultural Mechanics (2)
Identification and use of tools and materials; tool sharpening and care; concrete mixes and materials; simple electric wiring; metal work; pipe fitting; basic woodworking; estimating quantities and costs. 1 lecture, 1 laboratory.

AE 122  Agricultural Mechanics (2)
Design, construction and repair of production equipment for livestock, dairy and poultry equipment. 1 lecture, 1 laboratory. Prerequisite: AE 121 or demonstrated equivalent ability.

AE 128  Agricultural Mechanics (3)
Introduction to agricultural engineering and mechanized agriculture. Properties and marketing information on agricultural construction materials. Laboratory skills development in wood, metal, and concrete. 2 lectures, 1 laboratory. Prerequisite: High school drafting and algebra.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
<th>Credits</th>
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<tbody>
<tr>
<td>AE 130</td>
<td>Irrigation Practices (2)</td>
<td>Application of good irrigation practices on the farm. Choice and evaluation of methods; soil, water, and plant relationships; when and how much water to apply; water measurement; water quality and drainage; elements and operation of irrigation systems. 1 lecture, 1 laboratory. Prerequisite: SS 121, Math 103</td>
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<tr>
<td>AE 131</td>
<td>Agricultural Surveying (2)</td>
<td>Introduction to basic surveying techniques as applied to agriculture. Keeping field notes; land measurement by tape; differential and profile leveling; contour and plane table mapping; land surveying and identification; fundamentals of land grading. 1 lecture, 1 laboratory. Prerequisite: Math 103.</td>
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<tr>
<td>AE 133</td>
<td>Agricultural Drafting (3)</td>
<td>A basic course in technical drawing oriented toward working drawings of farm shop projects. Freehand sketching and instrument techniques. Multiview projection and pictorial drawings. 1 lecture, 2 laboratories. Prerequisite: Mechanized Agriculture major or consent of instructor.</td>
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<tr>
<td>AE 134</td>
<td>Agricultural Electrification (3)</td>
<td>Fundamentals of electric wiring and code regulations; selection, installation and maintenance of electric motors. Emphasis on practical applications. 2 lectures, 1 laboratory. Prerequisite: Math 103 or 113.</td>
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<tr>
<td>AE 141</td>
<td>Agricultural Tractors and Equipment Skills (3)</td>
<td>Operational skills in the selection and matching of agricultural and utility industrial equipment. Supervised operational practice in the field. 2 lectures, 1 laboratory.</td>
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<tr>
<td>AE 143</td>
<td>Power and Machinery (4)</td>
<td>Performance of tractors and machinery. Evaluation of tillage, planting, and harvesting operations. Analysis and development of optimum mechanical systems. 3 lectures, 1 laboratory. Prerequisite: Math 115 or equivalent.</td>
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<tr>
<td>AE 200</td>
<td>Special Problems for Undergraduates (1-2)</td>
<td>Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of department head.</td>
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<tr>
<td>AE 231</td>
<td>Agricultural Building Construction (3)</td>
<td>Development of practical skills in carpentry and light construction. Selection of materials. Agricultural buildings repaired, constructed, or modified during laboratory periods. 1 lecture, 2 laboratories. Prerequisite: AE 128 or consent of instructor.</td>
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<tr>
<td>AE 232</td>
<td>Agricultural Structures Planning (3)</td>
<td>Environmental factors affecting crop storage structures and annual housing. Insulation, heating, ventilation, water supply, and waste disposal. Functional planning of production systems. 2 lectures, 1 laboratory. Prerequisite: Phys 132 and college drafting.</td>
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<tr>
<td>AE 234</td>
<td>Agricultural Power Transmission (3)</td>
<td>Elements of the transmission, measurement and utilization of power in agriculture. Problem solution, engineering reports, graphical studies, pumping machinery and engine cycles. 2 lectures, 1 laboratory. Prerequisite: AE 142, Math 115, Phys 121.</td>
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</tr>
</tbody>
</table>
AE 236  Principles of Irrigation (4)
Land grading design, operation, management, and evaluation of irrigation methods. 3 lectures, 1 laboratory. Prerequisite: Math 141, AE 237.

AE 237  Engineering Surveying (2)
Selection, care and use of tapes, levels and transits. Keeping field notes; land measurements by tape; differential and profile leveling; and the plotting of profiles. Introduction to the transit; field operation; introduction to traverses. 1 lecture, 1 field period. Prerequisite: Math 115 or equivalent; college drafting.

AE 238  Engineering Surveying (2)
Use of the transit: traverses, coordinates, triangulation, area and balanced survey calculations. Cross sections, landgrading, and volumes. Topographic and contour by stadia-transit mapping. 1 lecture, 1 field period. Prerequisite: AE 237.

AE 239  Engineering Surveying (2)
Parabolic curves, circular curves, cross sectioning, setting slope stakes, measuring earth volume, cuts and fills as applied to road beds, public land surveys, photogrammetry. 1 lecture, 1 field period. Prerequisite: AE 238.

AE 240  Agricultural Engineering Laboratory (1-2)
Total credit limited to 4 units with no more than 2 units in any one quarter. 1 or 2 laboratories.

AE 301  Closed Circuit Hydraulics (3)
Proper selection and maintenance of machine components using standardized design procedures and manufacturer's design literature. 2 lectures, 1 laboratory. Prerequisite: AE 234 or 312.

AE 302  Agricultural Waste Management (3)
Scope of the agricultural pollution problem; standard methods of measuring pollution; water quality; nutrient budget studies; management of animal wastes; management of pollution by crop residue, fertilizers, herbicides, and pesticides; legal and political aspects of pollution. 3 lectures. Prerequisite: Chem 122, junior standing.

AE 312  Hydraulics (4)
Static and dynamic characteristics of liquids, flow in open and closed channels, uniform and non-uniform flow, flow measurement, pumps. 3 lectures, 1 laboratory. Prerequisite: Phys 132, ME 211.

AE 315  Hydrology (3)
Collection, organization and use of precipitation and runoff data, flood frequency and economics of structures, stream gauging and use of hydrograph, principles of groundwater management and flood routing. 3 lectures. Prerequisite: Math 141.

AE 320  International Agricultural Mechanization (3)
Agricultural mechanization abroad. Farm machinery design in Europe and Japan. Traditional farming methods and tools in tropics. Problems of agricultural mechanization in developing countries. Agricultural engineering education, research and extension in various developed and developing countries. 3 lectures. Prerequisite: AE 142 or 143.

AE 321  Agricultural Equipment Industry Management (4)
Management and operation of the farm equipment industry. Study of sales, service, parts and product education policies on manufacturer, distributor and dealer level. 3 lectures, 1 laboratory. Prerequisite: AE 142.

AE 322  Principles of Agricultural Machinery (3)
Principles and evaluation of agricultural power units and machines. Soil-equipment mechanics and tractor-implement combinations. 2 lectures, 1 laboratory. Prerequisite: AE 142, 343.
AE 323  Agricultural Products Handling (3)
The application of product handling techniques and equipment to the processing of agricul-
tural commodities. 2 lectures, 1 laboratory. Prerequisite: Phys 123 or consent of instructor.

AE 324  Principles of Agricultural Electrification (4)
Power distribution and DC and AC circuit fundamentals. Principles of wiring layout. 
Materials, code regulations, and electrical measurements applicable to various agricultural 
uses. 3 lectures, 1 laboratory. Prerequisite: AE 134, Phys 123.

AE 326  Off-the-Road Locomotion (3)
Sources and systems for supplying power to off-the-highway vehicles. Theory of traction, 
soil equipment mechanics, prime mover and implement combinations. 2 lectures, 1 laboratory. 
Prerequisite: AE 143, ME 211, 302.

AE 327  Agricultural Process Engineering (3)
Thermodynamics and mass transfer principles applied to air, water, air-water mixtures, 
drying, heating, refrigeration, fluid flow, size reduction, fan laws and materials handling. 2 
lectures, 1 laboratory. Prerequisite: AE 312 and ME 302.

AE 328  Multiple Use Water Management (4)
Water occurrence, quality and measurement. Water conservation and treatment. Multiple 
use of water in private, local, state and federal projects. 3 lectures, 1 laboratory. Prerequisite: 
AE 131, 345.

AE 331  Irrigation Theory (3)
Plant-water-soil relations concerning evapo-transpiration, plant stress, soil moisture defi-
ciency, frequency and depth of irrigation, salinity, soil-water relations, saturated and unsat-
furated flow, soil aeration, infiltration, and drainage. 3 lectures. Prerequisite: SS 121, Math 
141.

AE 332  Agricultural Buildings (4)
Selection of buildings, storage units, and related equipment for production agriculture. 
Environmental factors affecting crop storage and animal housing. Farmstead layouts. Working 
drawings and cost estimates. 3 lectures, 1 laboratory. Prerequisite: AE 133, 231, 343.

AE 333  Engineering Properties of Agricultural Materials (3)
Principles of analyzing the mechanical, electrical, thermal, rheological and optical character-
istics of agricultural materials. 2 lectures, 1 laboratory. Prerequisite: Aero 208, Phys 133.

AE 335  Agricultural Power (3)
Principles of spark ignition and compression ignition engines, including liquefied petroleum 
gas equipment, and related accessories. Service, trouble-shooting and repair procedures of 
engines and transmissions. 2 lectures, 1 laboratory.

AE 336  Agricultural Power Analysis (3)
Selection and application of internal combustion engines. Theory of combustion, fuels, and 
lubricants; power and its measurement. Factors affecting horsepower output and engine effi-
ciency. Advanced power transmission, electrical systems. 2 lectures, 1 laboratory. Prerequisite: 
AE 335, Phys 123.

AE 337  Landscape Irrigation (3)
Design of landscape irrigation systems including soil factors, hydraulics, site information, 
selection of system components, back flow prevention, plumbing codes and cost estimating. 
2 lectures, 1 laboratory. Prerequisite: SS 121 or consent of instructor.

AE 338  Dynamic Measurement (3)
Engineering measurements and basic instrumentation. Transducers, signal processors, output 
devices and controls used in agricultural engineering. 2 lectures, 1 laboratory. Prerequisite: 
EE 201.
AE 339 Agricultural Mechanics Skills (2)
Advanced shop skills. Carpentry, electricity, plumbing, surveying, power mechanics, tractor equipment operation and maintenance. 1 lecture, 1 laboratory. Prerequisite: Junior standing.

AE 340 Irrigation Water Management (4)
Soil-plant-water relationships, consumptive use rates and irrigation schedules, water quality, salinity and drainage; evaluations of irrigation methods, water rights and irrigation institutions. Flow of water in pipes and canals, water measurement, wells, and pumps. 3 lectures, 1 laboratory. Prerequisite: SS 121.

AE 341 Gasoline Engine Diagnosis (3)
Use of modern engine testing equipment in the evaluation of engine components and accessories such as: cylinder condition, ignition systems, electrical systems, and fuel systems. 2 lectures, 1 laboratory. Prerequisite: AE 335 or equivalent.

AE 342 Diesel Fuel Systems (3)
Use of modern test and service equipment in evaluating and servicing diesel fuel systems. 2 lectures, 1 laboratory. Prerequisite: AE 335 or equivalent.

AE 343 Project Analysis (4)
Analysis of projects for structural design, applied elements of statics, dynamics, strength of materials, fabrication, and fasteners. 3 lectures, 1 laboratory. Prerequisite: AE 133 or equivalent, Math 115, Phys 121.

AE 344 Agricultural Equipment Projects (3)
Construction of special agricultural equipment related to any agricultural enterprise. 1 lecture, 2 laboratories. Prerequisite: AE 343.

AE 345 Aerial Photogrammetry (3)
Object recognition, three-dimensional equipment, and interpretation. Print alignment, stereoscopic viewing, scales, elevation determination, and application. Familiarization with geological, agricultural, land and crop management, engineering surveys, construction data, topographic detail, drainage elevation and control. Color photo techniques and uses for pest and disease location and control. 2 lectures, 1 laboratory. Prerequisite: Math 103 or 114.

AE 346 Emission Control (3)
Pollution control devices as found on common agricultural vehicles, light duty trucks and related automotive applications. Local and Federal regulations governing engine emissions. Preparation for state pollution device licensee test. 2 lectures, 1 laboratory. Prerequisite: AE 341 or equivalent.

AE 392 Wells and Pumps (3)
Ground water resources, drilling methods, and development of wells. Pumps and their uses in agricultural applications. Selection of pumping systems for different water sources. Design of domestic water systems. Water quality standards and water conditioning. 2 lectures, 1 laboratory. Prerequisite: AE 340 or consent of instructor.

AE 400 Special Problems for Advanced Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems in agriculture. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of department head.

AE 403 Agricultural Systems Engineering (3)
Engineering principles combined with mathematical optimization techniques to evaluate parameters in agricultural production and processing systems. 3 lectures. Prerequisite: IE 414, Math 242, Engr 251, Stat 321.

AE 414 Irrigation and Drainage Engineering (4)
Design of farm and project irrigation and drainage systems. Influence of soils, crops, climate, and costs on the frequency, rate, and duration of economical water delivery. Pipeline and ditch distribution systems; reservoirs, pumps, and drains; economics of systems and components. 3
Ag Engineering

lectures, 1 laboratory. Prerequisite: AE 236, 312, 331.

AE 421 Equipment Engineering (4)
Design and construction of specialized agricultural equipment. 2 lectures, 2 laboratories. Prerequisite: Aero 209, ME 212, Weld 142.

AE 422 Equipment Engineering (3)
Analysis and design of equipment with emphasis on man-machine-plant-automata relationships and concepts. 2 lectures, 1 laboratory. Prerequisite: AE 421.

AE 425 Utility-Industrial Equipment (4)
Cost analysis of utility and industrial equipment with emphasis on management, selection, operation and maintenance. Evaluation of performance of bulldozers, earth-moving equipment, cranes, air compressors and rigging. 3 lectures, 1 laboratory. Prerequisite: Actg 131.

AE 433 Agricultural Structures Design (4)
Structural analysis and design of agricultural service and processing buildings. Emphasis on use of wood and metals in light construction. 3 lectures, 1 laboratory. Prerequisite: AE 232, Aero 209.

AE 435 Drainage (3)
Flow of water in porous media; intrinsic permeability and hydraulic conductivity; flow nets; wells and ground water; design of sub-surface drains. 2 lectures, 1 laboratory. Prerequisite: AE 312, 331, or 340 and approval of instructor.

AE 437 Conservation Engineering (4)
Engineering and management practices to conserve soil and water resources. Check dams, terraces and water storage dams; strip and cover cropping, contour tillage; applications of soil mechanics, hydraulics, and hydrology to design of erosion control structures; flow nets, tractive force hydraulics, and geology. 3 lectures, 1 laboratory. Prerequisite: AE 312, 315.

AE 445 Remote Sensing (3)
Nature of electromagnetic radiation as it relates to sensing systems, effects of atmosphere on radiation transfer, electro-optical remote sensing, imaging and non-imaging sensors, microwave remote sensors, remote sensor data systems, and ground investigations in support of remote sensing. 2 lectures, 1 laboratory. Prerequisite: AE 345.

AE 461, 462 Senior Project (2) (2)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

AE 463 Undergraduate Seminar (2)
Group discussion of current agricultural engineering topics presented by individual members of the class. Topics or papers presented by guest speakers. Placement opportunities and requirements. 2 lectures.

AE 470 Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

AE 471 Selected Advanced Laboratory (1–3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. One to three laboratories. Prerequisite: Consent of instructor.

AE 500 Individual Study (1–3)
Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Graduate standing and consent of instructor.
AE 521 Engineering of Agricultural Equipment (4)
Machinery analyzed from the mechanical, operational, and economic standpoint. Emphasis on optimum harvesting systems. 3 lectures, 1 laboratory. Prerequisite: Graduate standing, AE 322 or consent of instructor.

AE 522 Agricultural Processes Engineering (4)
Engineering principles involved in handling, conditioning and storage of agricultural products. Advanced practical analysis and design of agricultural systems from harvest to utilization. 3 lectures, 1 laboratory. Prerequisite: Graduate standing, AE 323 or consent of instructor.

AE 533 Advanced Irrigation System Design (4)
Design, evaluation and operation of irrigation systems. Current advancements in equipment and theory. 3 lectures, 1 laboratory. Prerequisite: Graduate standing, AE 340 or consent of instructor.

AE 581 Graduate Seminar in Agricultural Engineering (3)
Group study of current engineering problems and recent developments as they relate to agriculture. Problem identification, statement and research methodology are emphasized in problem solution. 3 seminars.

AE 599 Engineering Report (2) (2) (5)
Directed study with limited supervision of important, practical engineering problem-solving. Preparation of a comprehensive report. Total credit limited to 9 units with maximum of 5 units per quarter. Prerequisite: consent of instructor.

AGRICULTURAL MANAGEMENT

AM 101 Introduction to Agricultural Management (3)
Survey of Agricultural Businesses; introduction and orientation to the Agricultural Management Department and the University; careers in public and private agricultural businesses and service agencies; changes and growth of agriculture, with emphasis on California. 3 lectures.

AM 102 Introduction to Agricultural Economics (3)
Introduction to the economic aspects of agricultural management. The role of agricultural resources in economic growth. Survey of trade, policy, and marketing activities of agriculture. 3 lectures.

AM 132 Farm Records and Management (4)
Farm recordkeeping for income tax purposes and study of farm business, measures of farm profits, factors affecting farm profits, reorganization of an actual farm. May not be substituted for AM 321 or 322. 3 lectures, 1 2-hour laboratory. To be taken by technical students.

AM 133 Farm Management Problems (5)
Crop and livestock enterprise costing, equipment costing and efficiency, determination of most profitable crop combinations, most profitable application of inputs, labor management, government price programs. May not be substituted for AM 413, 415, 416. 3 lectures, 2 two-hour laboratories. Prerequisite: AM 132. To be taken by technical students.

AM 140 Calculator Operation for Agriculture (1)
Evolution, application, and costs of calculator type machines. Basic calculator procedures, practices, and techniques needed to work agriculturally related statistical problems. 1 activity.

AM 200 Special Problems for Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of department head.
AM 201 Agricultural Business Sales and Service (3)

Growth and opportunities in agricultural sales. Factors involved in developing sales program for the farm operation. Application of successful selling principles and practices in providing farm operators with agricultural materials, supplies, equipment and services. Consideration given to sales and service for farm related businesses and non-agricultural customers. Selling aspects involved in marketing of farm products by farm related businesses. 3 lectures.

AM 203 Agricultural Business Organization (3)

Development, types and forms of farm related businesses. Agricultural businesses considered from standpoint of primary functions, services and problems including such factors as business organization, records, information, location, production, business with banks, labor and government. Emphasis on California farm related industries. 3 lectures.

AM 212 Agricultural Economics (3)

Changes in agriculture and agricultural production in response to changing economic conditions. Optimum methods of agricultural production. Impact of technological change. Evaluating market structure and price formulating factors for agricultural products and inputs. 3 lectures. Prerequisite: Econ 211.

AM 213 Agricultural Economic Analysis (4)

Role of price in the economy, the firm as a decision-making unit, the production function, single input-output analysis, substitution relationships, products combinations, risk analysis, consumption and market demand influence, population and technological changes. 4 lectures. Prerequisite: AM 212.

AM 230 General Agricultural Management (3)

Agricultural business growth, opportunities, functions and services, organization and operation. Emphasis on California agricultural businesses and industries. A general course for non-Agricultural Management majors. 3 lectures.

AM 250 Computer Application to Agriculture (2)

Use of "library" programs available for agriculture and auxiliary equipment available at commercial computer centers. Automated record keeping systems. Statistical and other computer programs applied to agricultural problems. 2 activities.

AM 300 Successful California Farms (2)

Visits to successful California farms involving many types of farming. Study of farm resources and organization, techniques of operation, yields, problems. Different regions visited on different trips. Total credit limited to 4 units.

AM 301 Agricultural Marketing (3)

Application of economic principles to the marketing of agricultural commodities. Market channels with emphasis on futures trading, market information, storage, and transportation. Implications of the foreign market to agriculture with emphasis on the effect on California production. 3 lectures. Prerequisite: Econ 201 or 211.

AM 302 Agricultural Cooperative Organization and Management (3)

Purpose, types and organization of cooperatives. Emphasis on California agricultural cooperatives, their characteristics, operation and problems. 2 lectures, 1 two-hour laboratory.

AM 303 Agricultural Management Research Methods (3)

History and concepts of research methodology and data presentation in Agricultural Management. The scientific method and its application to problems in the field. Selection of methodology compatible with the problem. Overview of research from conceptualization to finalized report. 3 lectures.

AM 305 Agricultural Resources (3)

Survey of agricultural production areas of United States from standpoint of physical resource, markets, economic advantages, and problems. Appraisal of area problem from standpoint of land economic principles. 3 lectures. Prerequisite: Econ 201 or 211.
AM 307  World Agricultural Resources (3)
World agricultural production areas with emphasis on natural and human resources, existing production, economic implications, population growth and potential food supply. 3 lectures. Prerequisite: Econ 201 or 211.

AM 308  Farm Group and Commodity Organizations (2)
Survey of farmers' efforts to study and seek solutions to individual and industrywide problems through organized group effort. Major farm organizations, policies and services to members. 2 lectures.

AM 310  Agricultural Credit and Finance (3)
Credit management of agricultural businesses in production, processing, and distribution of agricultural products and services. Financial procedures and problems in agribusiness. 3 lectures. Prerequisite: One quarter of accounting or permission of the instructor.

AM 312  Agricultural Business Management and Government Policy (3)
Agricultural business policy, objectives and formulation, resource allocation and production adjustments; government subsidies, acreage controls, storage, crop insurance, forward prices, consumer subsidies, economic, social and political influences. 3 lectures. Prerequisite: Econ 211.

AM 314  Fair Management (3)
Principles and procedures in organizing, managing and promoting fairs. Emphasis on California and Western fairs. Career opportunities, programs and problems in fair management and growth of fairs in America. A two-day field trip is included to a county or district fair. 3 lectures.

AM 315  Land Economics (3)
Supply of land, population pressure on land, input-output relations affecting land use, economic returns, land values, development and investment costs, locational factors, conservation, institutional factors, leasing, land use planning, taxation, public regulations. 3 lectures. Prerequisite: Econ 201 or 211.

AM 317  Agriculture—Consumer Relationships (2)
Basic facts, public opinion and ways of developing greater understanding of agriculture, its nature, characteristics, problems and relationship to non-farm persons. Consumer education programs and procedures. 2 lectures.

AM 318  Agricultural Trade Policies (3)
Analysis of American trade policies and their relationship to agriculture. International trade pacts and their influence on agricultural production and marketing. 3 lectures. Prerequisite: Econ 201 or 211, AM 301.

AM 321  Farm Records (4)
Fundamentals of record keeping, kinds of records, inventory, depreciation, cash and accrued basis of income tax reporting, balance sheet, operating statement, analysis of statements. 3 lectures, 1 2-hour laboratory. Prerequisite: Econ 201 or 211.

AM 322  Principles of Farm Management (4)
The role of farm management, types of farming, problems of leasing and buying a farm, labor problems, measures of profits, factors affecting profits, budgeting of laboratory farms, independent analysis of farm for term report. 3 lectures, 1 2-hour laboratory. Prerequisite: AM 321 or Actg 221 and 222.

AM 323  Advanced Agricultural Business Managerial Accounting (4)
Agricultural business management with primary emphasis on cost accounting procedures, policy formation, financial, fiscal and material resources management. Includes budgets, business statements and other planning and control procedures. Agricultural business insurance, taxation, office management, and related phases in management of the agricultural business firm. 3 lectures, 1 two-hour laboratory. Prerequisite: Actg 222 and AM 213 or consent of instructor.
AM 324 Agricultural Property Management and Sales (4)
Land economic, legal and real estate principles in the investment, development, leasing, mortgaging and transferring of agricultural real estate. 3 lectures, 1 two-hour laboratory.

AM 325 California Agriculture (3)
Agricultural regions of California considered from standpoint of physical resources, crops and livestock, size, tenure, water problems, relation to urban areas, land development. 2 lectures, 1 2-hour laboratory. Prerequisite: Econ 201 or 211.

AM 326 Farm Appraisal (4)
Methods of farm appraisal, use of county records, appraisal practice on different types of farms, discussions with professional appraisers. 3 lectures, 1 2-hour laboratory. Prerequisite: Econ 211 and Junior standing.

AM 336 Commodity Markets in Agricultural Business (3)
Commodity market history, performance, and use in management of agricultural business. Techniques of analysis, hedging, speculation with applications to the agricultural business firm. 2 lectures, 1 two-hour laboratory. Prerequisite: AM 212 or permission of instructor.

AM 400 Special Problems for Advanced Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of department head.

AM 401 Agricultural Labor Relations and Personnel Management (4)
Agricultural labor trends and problems as determined by changes occurring in farming and farm related industries. Labor-management relations in agriculture; principles and procedures in organizing and managing the agricultural business personnel program. 4 lectures. Prerequisite: Senior standing.

AM 404 Agricultural Marketing Management (3)
Marketing management applied to agricultural and food industries. Development and functions of middlemen systems. Marketing mix decisions, product development, pricing, channels of distribution, and advertising. Marketing planning, control, and analysis. 3 lectures. Prerequisite: AM 301.

AM 405 Agricultural Marketing Research Methods (3)
Collecting, tabulating and analyzing data for use in market research and sales. Techniques for determining market potential. Surveys, trends, correlation, market factor derivation, test marketing. Routing techniques, sampling procedures. 3 lectures. Prerequisite: AM 250, Stat 211.

AM 406 Agricultural Business Communication (3)
Principles, methods and materials for communicating ideas, information and skills to management, staff members, stockholders, customers and general public. Agricultural business public relations programs. Organization and presentation of surveys, studies, reports and publications. 2 lectures, 1 two-hour laboratory. Prerequisite: AM 405, or consent of instructor.

AM 408 Advanced Agricultural Economic Analysis (3)
Application of optimization and managerial economic methods to the solution of agricultural management problems. Use of mini-max principles, capital budgeting, game and decision theory, and model development in agriculture. Consideration of choice of model on the results of a study. 3 lectures. Prerequisite: AM 213, Stat 212.

AM 409 California Agricultural Law (3)
Legal structures, property taxation, condemnations, laws affecting cooperatives and other farm and farm related agricultural businesses. 3 lectures. Prerequisite: Bus 207 and senior standing.
Ag Management

AM 413 Crop Management Problems (3)
Crop enterprise costing procedure, analysis of rotation systems, labor problems, irrigation plans, determination of most profitable rates of fertilization and irrigation, marketing crops, land development costs, effect of shifting cropping plan. 3 lectures. Prerequisite: AM 322.

AM 415 Livestock Management Problems (3)
Costing procedure for animal enterprises, types of beef operations compared, feed lot management problems, determination of most profitable feed rations, livestock marketing procedure, effect of feed resource changes on organization and profits. 3 lectures. Prerequisite: AM 322.

AM 416 Dairy Management Problems (3)
Dairy enterprise costing procedure, relation of cropping plan to dairy organization, analysis of feed resource costs, determination of most profitable feed rations, costs and problems of shifting from grade B to grade A dairy, most profitable culling. 3 lectures. Prerequisite: AM 322.

AM 421 Agricultural Business Operations Analysis (4)
Principles and procedures in agricultural business operations analysis and research. Evaluation of programs and problems to achieve optimal decisions. Production and financial data, statistics, pricing, costs, inventories, production level, and plant expansion or contraction. 3 lectures, 1 two-hour laboratory. Prerequisite: AM 213, Stat 212.

AM 427 Agricultural Estate Planning (4)
Principles and procedures in agriculture estate planning and conservation. Determining agriculture estate assets, taxes, property valuation, property transfers, beneficiaries and needs, gifts, insurance, business estate, employee estate, wills, trusts, and administration of trusts and estates. 3 lectures, 1 activity period. Prerequisite: AM 324.

AM 431 Large Farm Accounting (4)
Application of commercial accounting process to large farm accounting problems. Special emphasis will be given to the problem of devising and executing an accounting system that will give necessary details on specific enterprises for analysis and control. 3 lectures, 1 two-hour laboratory. Prerequisite: Actg 131, 132.

AM 433 Agricultural Price Analysis (3)
Application of statistical tools for price analysis. Emphasis on price making process for specific agricultural commodities. Utilization of market reports and production estimate data in price forecasting and analysis. 2 lectures, 1 2-hour laboratory. Prerequisite: Stat 212 and AM 250.

AM 435 Linear Programming in Agriculture (3)
Application of linear programming to modern commercial agriculture; assumptions and data requirements; graphic and simplex solutions; modification of basic assumptions to avoid program restrictions; price and resource mapping; preparation, coding and solutions of models simulating current problems. 2 lectures, 1 2-hour laboratory. Prerequisite: AM 250.

AM 440 Field Studies in Agricultural Management (2)
California commercial agricultural businesses. Visitation to selected industries. Organization, operation, services and problems considered. One week in field and one week laboratory analysis and evaluation of data obtained on the trip. Prerequisite: Senior standing or consent of instructor.

AM 461, 462 Senior Project (2) (2)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time. Prerequisite: AM 303.
Agriculture

AM 463 Undergraduate Seminar (2)
Student presentation and leadership; group participation under faculty supervision on new agricultural business developments. 2 lectures.

AM 470 Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

AM 471 Selected Advanced Laboratory (1-3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. One to three laboratories. Prerequisite: Consent of instructor.

AM 510 World Agricultural Development (3)
Special problems of agricultural development in selected emerging nations; the role of government policies in directing development. 3 lectures. Prerequisite: AM 307.

AM 515 International Agri-Business Marketing (3)
Problems and techniques of U.S. international marketing. Sales promotion, advertising, and market research for agricultural commodities. Tools, equipment, and supplies for agriculture in the developing countries. 3 lectures. Prerequisite: AM 301, AM 307 or consent of instructor.

AM 516 Communication for Change in Developing Countries (3)
Analysis of literature, techniques and procedures for planning and carrying out agricultural information programs in developing countries. Current relevant information for foreign agricultural producers. 3 lectures. Prerequisite: AM 307.

AM 581 Graduate Seminar in Agricultural Management (3)
Group study of current problems; current trends and characteristics of agricultural business and industry; development and analysis methods in the field; opportunities and requirements for establishing production or farm-related businesses, 3 lecture-discussions.

Agriculture

Ag 301 Agriculture and American Life (3)
Relationship of agriculture and natural resources to man and his society. Impact of soil, water, and land uses on animal and crop production within the United States. Relative importance of resources used and commodities produced. Not open to students with majors in agriculture and natural resources. 3 lectures. Prerequisite: Junior standing.

Ag 339 Internship in Agriculture (12)
The selected student will spend up to 12 weeks with an approved agricultural firm engaged in production or related business. Time will be spent applying and developing production and managerial skills and abilities. One unit of credit may be allowed for each full week of completed and reported internship. Prerequisite: Consent of instructor.

Ag 461, 462 Senior Project (2) (2)
Selection and completion of a project under faculty supervision. Projects typical of problems graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

Ag 463 Undergraduate Seminar (2)
Group discussion of current agricultural education topics presented by individual class members. Topics or papers presented by guest speakers. Placement opportunities and requirements. 2 lectures.

Ag 500 Individual Study (1-3)
Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent...
work. Enrollment by petition. Prerequisite: Consent of department head, graduate adviser and supervising faculty member.

**ANIMAL SCIENCE**

A Sci 101  **Feeds and Feeding (4)**

Simple use of food nutrients. Identification and classification of feeds for each class of livestock. The digestion and utilization of feeds. Feeding standards and computation of simple rations for livestock. Economy in feeding and purchasing feeds by nutritive values. 3 lectures, 1 laboratory.

A Sci 111  **Market Beef Production (3)**

Breeds, market classes, and grades of beef cattle. Selection of feeder cattle. Management practices in purchasing and fattening cattle using farm grown feeds. Study of cattle feeding operations carried on at the college. Marketing of beef cattle. 3 lectures. Prerequisite: A Sci 101.

A Sci 112  **Elements of Swine Production (3)**

History, development and importance of swine industry. Types, breeds, market classes and grades of swine. Basic principles and practice of swine feeding and management. 3 lectures.

A Sci 113  **Elements of Sheep Production (3)**

Survey of the types of sheep operations in California. Breed study, market classes, and grades identification. Commercial fattening of lambs in dry lot and irrigated pasture programs. Calendar of operations for the various types of sheep enterprises. 3 lectures.

A Sci 131  **Basic Equitation (3)**

Grooming, saddling, bridling, mounting, seat and hands. Horsemanship both under saddle and bareback. Basic care of the horse. Study of types of horse gear and equipment. Designed to teach basic riding to students with no previous experience. Advanced sign-up with instructor required. 1 lecture, 2 laboratories.

A Sci 200  **Special Problems for Undergraduates (1–2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of department head.

A Sci 211  **Commercial Beef Management (3)**

Care and management of a breeding herd of commercial cattle in California. Range and farm lands suited to beef production. Factors affecting cost of production. Improvement of breeding herd. Trends in the industry. 3 lectures. Prerequisite: A Sci 101, 111.

A Sci 212  **Swine Management (3)**

Management practices involved in commercial and purebred swine enterprises. Methods of production and marketing, performance testing programs and carcass evaluation techniques. Nutritional requirements, rations, diseases and parasites, facilities and equipment. 3 lectures. Prerequisite: A Sci 101, 112.

A Sci 213  **Sheep Management (3)**

Detailed study of managerial practices for both commercial and purebred sheep enterprises. Performance testing and carcass evaluation techniques. The preparation and merchandising of the wool clip. Introduction to wool processing. 3 lectures. Prerequisite: A Sci 101, 113.

A Sci 226  **Livestock Evaluation (3)**

Utilization of objective and subjective estimation measures in establishing economic worth of domestic animals of the three meat animal species and horses. 1 lecture, 2 laboratories.

A Sci 229  **Range Management (4)**

Characteristics of rangeland, identification of range plants, management practices to maintain range resources and increase production of forage and livestock. 3 lectures, 1 laboratory. Prerequisite: SS 121, A Sci 111 or 230, a botany or crops science course.
Animal Science

A Sci 230 General Animal Science (4)
For non-animal science majors. Selection, feeding, and management of sheep, swine, and cattle, and their uses on California farms. 3 lectures, 1 laboratory.

A Sci 232 Elements of Horse Management (4)

A Sci 234 Horseshoeing (2)
Fundamentals of horseshoeing, anatomy and physiology of the horse's foot, pastern, and legs. Trimming feet, fitting and nailing shoes. Normal shoeing, corrective shoeing. 1 lecture, 1 laboratory combined.

A Sci 238 Applied Beef Cattle Practices (2)
Application of operational practices in the purchasing, management, and marketing of beef cattle. Equipment, preventive veterinary practices, live animal evaluation, performance records, carcass evaluation, and ranch evaluation. 1 lecture, 1 activity.

A Sci 242 Applied Swine Management Practices (2)
Application of operational practices in the management and merchandising of swine. Housing and equipment, routine veterinary practices, live animal evaluation, performance evaluations, farrowing and post-farrowing practices, and carcass appraisal. 1 lecture, 1 activity.

A Sci 243 Applied Sheep Management Practices (2)
Flock management; sheep handling techniques; breed evaluation; preparation for exhibition; internal and external parasite control; tagging, shearing, foot trimming; selection; culling and identification. Marking techniques. Wool grading and judging. Market lamb and carcass evaluation. 1 lecture, 1 activity.

A Sci 302 Applied Animal Nutrition (3)
Feedstuff evaluation and analysis. Advancements in feedstuff evaluation and application to ration formulation. Principles and practices in livestock ration formulation. Linear programming principles as applied to computer formulated rations. 2 lectures, 1 laboratory. Prerequisite: A Sci 101, Chem 226.

A Sci 304 Animal Breeding (3)
Application of genetics to the improvement of farm animals. Improving production through a study of mating systems including outbreeding, inbreeding, selection techniques, performance testing and evaluating, herd records, indexing and progeny testing. Setting up and organizing improved breeding programs using modern technique and equipment. 3 lectures. Prerequisite: Bio 303.

A Sci 323 Beef Husbandry (4)
Purebred cattle business including selection of foundation stock, herd bulls; breeding programs; pedigrees; facilities and equipment; feeding breeding herd, sale cattle, show cattle; marketing purebred cattle; and general management problems. 3 lectures, 1 laboratory. Prerequisite: A Sci 101, 211.

A Sci 332 Range Technology (4)
A Sci 333 Horse Husbandry (4)


A Sci 334 Feed Mill Operation (4)

Study of general operation of a feed mill including a survey of the industry, buying, storing, grinding, weighing, mixing, packaging, handling, and delivery of formula feeds. Also a study of flow of materials, preventive maintenance and safety in a mill. 3 lectures, 1 laboratory. Prerequisite: A Sci 101.

A Sci 335 Range Livestock Economics (3)

Economic structure of the range livestock industry; economics of rangeland use; factors affecting income and costs of range operations; ranchland values; capital and credit for range enterprises; range conservation relationships with ranch operators. 3 lectures. Prerequisite: Junior standing and A Sci 229.

A Sci 400 Special Problems for Advanced Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Prior permission of department head.

A Sci 401 Reproductive Physiology (4)

Intensive study of reproductive efficiency of farm animals. Anatomy and physiological factors involved in reproduction. Male and female systems, pregnancy, estrual behavior, semen collection and evaluation, artificial insemination, pregnancy testing, and hormone therapy. 3 lectures, 1 laboratory. Prerequisite: VS 123.

A Sci 402 Animal Nutrition (4)

The metabolism of proteins, carbohydrates, fats, minerals, and vitamins. Relationship of proper nutrition to livestock production. 3 lectures, 1 laboratory. Prerequisite: A Sci 302, Chem 328.

A Sci 404 Applied Animal Genetics (3)

Genetic improvement of economic traits in farm animals. Application of advanced genetic concepts to animal improvements through analysis of performance data. 3 lectures, 1 laboratory. Prerequisite: A Sci 304.

A Sci 426 Live Animal and Carcass Evaluation Techniques (2)

Relationship between live meat animal evaluation and carcass evaluation. Visual appraisal techniques used in the evaluation and analysis of live meat-type animals related to the selection and grading techniques of carcasses. 2 laboratories. Prerequisite: A Sci 226, FI 212.

A Sci 434, 435 Specialized Horse Enterprises (3) (3)

Early schooling of the young horse through advanced training. Use of the snaffle bit, hackamore, half-breed and Spanish bits. Gentling and ground work. Training in collection, turning, backing, leads, trailer loading, rope work, cattle work. Advanced sign-up with instructor required. 1 lecture, 2 laboratories. Prerequisite: A Sci 333 or appropriate experience.

A Sci 461, 462 Senior Project (2) (2)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

A Sci 463 Undergraduate Seminar (2)

Major developments in the chosen field of the student. Discussion of new developments, policies, practices, and procedures. Each individual is responsible for the development and presentation of a topic in his chosen field. 2 lectures.
Architecture

A Sci 470 Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

A Sci 471 Selected Advanced Laboratory (1-3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. One to three laboratories. Prerequisite: Consent of instructor.

A Sci 580 Seminar in Animal Nutrition (3)
Current findings and problems in the field of animal nutrition. Effects of new experimental research on the livestock industry. 3 lectures.

A Sci 581 Graduate Seminar in Animal Production (3)
Current findings and research problems in the field and their application to the industry. 3 lectures.

ANTHROPOLOGY

Ant 201 Cultural Anthropology (3)
The meaning and significance of culture to human beings. Examination of how cultures differ in their impact on behavior. How cultures develop and change. 3 lectures.

Ant 202 World Prehistory (3)
The development of human cultures in both the Old and New Worlds from the earliest times until the dawn of history; cultural growth. 3 lectures.

Ant 203 Physical Anthropology (3)
Facts and problems of human evolution; fossil man; primate evolution and social behavior; human variation. 3 lectures.

Ant 301 Applied Anthropology (3)
Application of the basic concepts of anthropology to various cultural phenomena. Cross-cultural contact and culture change using the case-study approach. 3 lectures. Prerequisite: Ant 201.

Ant 310 California Archaeology (3)
The California Indians; field studies in locating, surveying, and analyzing aboriginal sites; excavation of a site; laboratory techniques for recording, preserving, and reporting of artifacts; relating observations and finds to the natural environment in which a site is located. Integrating knowledge of natural and social sciences to use of archaeology. 2 lectures, 1 laboratory.

Ant 341 Comparative Societies (3)
Comparative study of contemporary peoples and cultures representing the major cultural types. 3 lectures. Prerequisite: Ant 201.

Ant 401 Language and Culture (3)
Interrelation between language and other facets of culture. Development of linguistic theories as they apply to anthropology from early Indo-European grammarians through current trends. Speech in its social setting. 3 lectures. Prerequisite: Ant 201 or consent of instructor.

ARCHITECTURE

Arch 106 Materials of Construction (3)
The use and application of building materials, structural makeup of buildings. 3 lectures.

Arch 201 Encountering Architecture (3)
A concise history of Architecture, Landscape Architecture, and City Planning for non-architecture majors. 3 lectures.
Arch 213  Advanced Delineation (2)

Development of proficiency in architectural presentation. Projects and critiques. 2 laboratories. Prerequisite: EDes 112.

Arch 231, 232  Architectural Practice (3) (3)

Introduction to construction techniques and working drawings. Theory and application of laws and codes affecting buildings. Working drawings as communication instruments. 3 laboratories. Prerequisite: Arch 106 or consent of school.

Arch 234  Architectural Practice (6)

Covers material in Arch 231, 232. Primarily for transfer students. Partial credit may be granted. 6 laboratories. Prerequisite: Arch 106 or consent of school.

Arch 237, 238  Photographic Presentation (2) (2)

Photographic and presentation techniques applicable to architectural subjects. For students in the School of Architecture and Environmental Design. 1 lecture, 1 laboratory. Prerequisite: EDes 110, Art 220 or equivalent.

Arch 240  Additional Architectural Laboratory (1-2)

Total credit limited to 4 units with not more than 2 units in any one quarter. 1 or 2 laboratories.

Arch 241, 242, 243  Watercolor (1) (1) (1)

Outdoor sketching with watercolor. 1 laboratory. Prerequisite: Permission of instructor.

Arch 247  Form and Materials (2)

Design explorations with architectural ceramics, metals, plastics, wood and stone. Total credit limited to 6 units, not more than 2 units in any one quarter. 2 laboratories. Prerequisite: EDes 110, 111.

Arch 301  History of Non-Western Architecture (3)

Ancient American, Far Eastern and Central Asian periods of architecture; philosophies and conditions which influenced them. For architects and others. 3 lectures. Prerequisite: Junior standing in the University.

Arch 308, 309  Building Support Systems (3) (3)

Environmental systems and equipment available to the architect to make architectural spaces structurally, mechanically and esthetically functional. Engineering and design analysis, system comparisons, cost-benefit studies of building equipment. 3 lectures. Prerequisite: EDes 203, 250, Arch 232.

Arch 310  Introduction to Systematic Design Methods (3)

Architectural problem solving by means of systematic design methods. Use of decision making techniques as environmental design aids. 3 lectures. Prerequisite: Second year standing in School of Architecture and Environmental Design or permission of instructor.

Arch 311  Climatic Determinants of Building Design (2)

Influence of solar radiation and climatic conditions on siting and design of buildings. Architectural principles and energy conservation. 2 lectures. Prerequisite: Phys 132.

Arch 312  Home and Community Design (3)

For students not majoring in architecture. Historical development of the home and city and the effect of location, climate, social and technological factors on homes and cities. Considerations and design methodology; furniture, landscape, and relation of home to community environment. 3 lectures.

Arch 317, 318, 319  History of Architecture (3) (3) (3)

Periods of architecture; philosophies and conditions which influenced them. 3 lectures. May be taken out of sequence. Prerequisite: Engl 104.
Architecture

Arch 320  Color and Environment (2)
Theory and systemization of visible spectrum as it applies to architectural environment. Includes visual and psychological effects of color. Exercises pertain primarily to interior design. 1 lecture, 1 laboratory. Prerequisite: EDes 203.

Arch 324  Architectural Acoustics (3)
Design of architectural spaces for speech communication and music with particular reference to the distribution, absorption and perception of sound. Measurement of sound inside and outside building spaces. Constructional aspects of sound insulation. 2 lectures, 1 laboratory. Prerequisite: Phys 132, EDes 203.

Arch 325, 326  Architectural Lighting (2) (2)
Influence of natural and artificial lighting on the design of buildings with particular reference to the Daylight Factor concept, the characteristics of artificial light sources and the combination of natural and artificial light in permanent supplementary artificial lighting installations. 1 lecture, 1 activity. Prerequisite: Phys 133 or 137 and Junior standing.

Arch 341, 342, 343  Architectural Practice (2) (2) (2)

Arch 350  Computer Applications in Architecture (2)
Applications of computer systems to large-scale data processing, analysis, optimization and evaluation of design program elements. 1 lecture, 1 activity. Prerequisite: EDes 250.

Arch 351, 352, 353  Architectural Design (4) (5) (5)
Development of logical analysis and creative abilities through application of skills to the solution of architectural problems. 4 or 5 laboratories. Prerequisite: EDes 110, 203, ArcE 223, Arch 232.

Arch 358  Industrialized Buildings (2)
History, theory and application of factory fabricated building systems. Materials and techniques, creative design by such methods. 1 lecture, 1 laboratory. Prerequisite: Junior standing.

Arch 367  Sea Environment Architecture (3)
Introduction to fundamental concepts and requirements for sea habitats. Environmental factors of design, geographical, bathymetric and tectonic concepts. 3 lectures. Prerequisite: Third-year standing.

Arch 400  Special Problems for Advanced Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

Arch 404  Environmental Testing and Evaluation (3)
Evaluation and testing of buildings, neighborhoods, new towns, urban renewal and rehabilitation projects. Systematic analysis of in-use facilities as input data for programming new facilities. 2 lectures, 1 laboratory. Prerequisite: Fourth year standing or consent of instructor.

Arch 417, 418, 419  History of Architecture (2) (2) (2)
Arch 319 continued. Periods of architecture; philosophies and conditions which influenced them. 2 lectures. Prerequisite: Arch 319.

Arch 433  Construction Specifications (2)
Methods of developing construction specifications, their use and value. ASTM, Federal specifications, and manufacturer’s catalogs as informational sources. 1 lecture, 1 activity. Prerequisite: 4th year standing.
Arch 441, 442, 443  Professional Practice  (2)  (2)  (2)
Basic elements of architectural practice. Office organization, procedures, contracts, specifications, construction cost analyses and comprehensive client services. Professional ethics. 2 activities. Prerequisite: Arch 343 and fourth-year standing.

Arch 451  Architectural Design  (5)
Continuation of Arch 353. Problems of increasing architectural complexity with emphasis placed on comprehensive solutions. 5 laboratories. 15 units required, no more than 5 units per quarter. Prerequisite: Arch 343, Arch 353, ArcE 321, 322, 323.

Arch 458  Computer Graphics Applications in Architecture  (2)
Computer graphics techniques as they relate to applications in working drawings and design. 2 activities. Prerequisite: Math 143, EDes 250.

Arch 461, 462  Senior Project  (2)  (2)
Selection and completion of a comprehensive type project under faculty supervision. Problems will involve students' technical and creative skills. Construction encouraged. To be completed in two consecutive quarters. 120 hours minimum total time. Prerequisite: Arch 353.

Arch 465  Housing Seminar  (3)
Survey of urban housing in the industrial age; qualitative analysis of aspects of planning the individual unit and the position of housing units within the urban fabric; problems of housing rehabilitation; investigation of criteria for programming housing; examination of organizational forms of housing; housing needs in various population groups. 3 lectures. Prerequisite: Soc 313 and 4th year standing.

Arch 470  Selected Advanced Topics  (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

Arch 471  Selected Advanced Laboratory  (1–3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1–3 laboratories. Prerequisite: Consent of instructor.

Arch 501  Environmental Control Systems  (3)
Comparative analysis and evaluation of mechanical and electrical building systems in high-rise and special purpose low-rise buildings. 3 seminars. Prerequisite: graduate standing or consent of instructor.

Arch 502  Building Construction and Performance  (3)
Comparative analysis of the performance of selected systems of building construction with particular emphasis on nonstructural functions. 3 seminars. Prerequisite: graduate standing or consent of instructor.

Arch 510, 511  Systematic Design Methods  (3)  (3)
Application of systematic, step-by-step procedures to rational and intuitive judgmental tasks. Methods for formulation, idea production, evaluation, and testing applied to planning, testing, design information systems, communication between designer and client, user participation in design, and other current topics. 3 lectures. Prerequisite: graduate standing or consent of instructor.

Arch 523  Urban Design Analysis  (3)
Analysis of cities based on visual design excellence. Compositional qualities of form, space, light, materials and color. Spatial sequencing and imageability qualities. 1 lecture, 2 laboratories. Prerequisite: Graduate standing or consent of instructor.
Architectural Engineering

Arch 531 Habitability (3)
Habitability standards and concepts significant for architectural design and practice. Behavioral analysis of habitats, facilities and urban systems. Design and development of structures and systems responsive to human needs. Habitability and environmental specifications, human factors, human engineering, behavioral sciences. 3 lectures. Prerequisite: Graduate standing or consent of instructor.

Arch 532 Environmental Research and Development (3)
Roles of research in environmental design analysis. Approaches to research, hypothesis testing, data banks, and information systems for design. Use of research findings in various decision-making systems. 3 lectures. Prerequisite: Graduate standing or consent of instructor.

Arch 533 Architectural Programming (3)
Fundamentals of professional process as prescribed by law and ethics. Product design as determined by architectural implications of user needs and building systems. A search for parameters. 3 seminars. Prerequisite: graduate standing or consent of instructor.

Arch 540 Environmental and Regulatory Agencies (3)
Regulatory agencies and environmental laws. Parameters limiting to the design professions. Comparisons of project proposals with environmental acceptance. 3 seminars. Prerequisite: graduate standing or consent of instructor.

Arch 551 Architectural Design (6)
Professional initiative and responsibility in integrating architectural design theory and practice with fields influencing the total environment. Building types considered as the coordinating factor. Total credit limited to 12 units with not more than 6 units in any one quarter. 6 laboratories. Prerequisite: Graduate standing.

Arch 561 Advanced Design (6)
Continuation of Arch 551. Advanced studies integrating architectural design theory and practice with fields influencing the shaping of the total environment. 12 units required, no more than 6 units per quarter. 6 laboratories.

Arch 563 Professional Seminar (2)
Problems and topics in the field of the architectural profession. Seminar drawn upon expertise of visiting professionals in addition to topics presented by regular faculty and students. 2 meetings. Prerequisite: Graduate standing.

Arch 580 Seminar in Theory of Architecture (3)
Directed group study of selected topics in the theory of architecture for graduate students. Class schedule will list specific topics selected. May be repeated to 9 units. 3 meetings. Prerequisite: Consent of instructor.

Arch 590 Seminar in Design Analysis (3)
Directed group study of methods of analysis of architectural subjects. Class schedule will list specific area of focus. May be repeated to 9 units. 3 meetings. Prerequisite: Consent of instructor.

Arch 599 Thesis Project (2) (7)
Completion of a project embodying original research and/or demonstrating individual creative ability in an area of environmental design. Prerequisite: Consent of graduate adviser, consent of graduate committee. Arch design 561 (12 units).

ARCHITECTURAL ENGINEERING

ArcE 221, 222, 223 Structures (3) (3) (3)
ArcE 224  Structures (3-9)

ArcE 240  Additional Engineering Laboratory (1-2)
Total credit limited to 4 units with not more than 2 units in any one quarter. 1 or 2 laboratories.

ArcE 301  Stress Analysis Laboratory (1)
Test and analysis of structural materials. Analysis using strain gauges. Displacement measurements and photoelastic methods. 1 laboratory. Prerequisite: ArcE 223 or concurrent.

ArcE 302  Timber Design (3)
Analysis and design of timber structures subject to gravity and lateral loads with emphasis upon the detailed design of members and connections. 3 lectures. Prerequisite: concurrent enrollment in ArcE 361.

ArcE 303  Steel Design (3)
Analysis and design of steel structures subject to gravity and lateral loads with emphasis upon the detailed design of members and connections. 3 lectures. Prerequisite: concurrent enrollment in ArcE 362.

ArcE 304  Structural Analysis (3)
Analysis of statically determinate and indeterminate structures. Introduction to the principles of work-energy. 3 lectures. Prerequisite: EDes 250, ArcE 362. Concurrent enrollment in ArcE 363 required.

ArcE 311  Structures for Landscape Architects (3)
Basic principles of structures and design of landscape structures. 3 lectures. Prerequisite: LA 231.

ArcE 321, 322, 323  Structures (3) (3) (3)
Analysis and design of steel, timber, masonry and concrete structures for gravity and lateral loads. Limitations and potentials of the materials in relation to the design and construction process. For architecture and construction students. May be taken out of sequence. 3 lectures. Prerequisite: Arch 232, ArcE 223.

ArcE 356  Advanced Materials of Construction (3)
Materials behavior under stress-strain conditions. Examination of causes and effects. Wood, concrete, steel, aluminum, plastics, individually and combination. Relationships between microscopic and macroscopic structure and properties. 2 lectures, 1 laboratory. Prerequisite: Arch 106, ArcE 301.

ArcE 361, 362, 363  Design Analysis for Engineers (4) (4) (4)
Studies in building design, development of the structural concept based upon function, aesthetics, structural efficiency and code requirements. Methods of joinery and working drawings in masonry, timber and steel. 4 laboratories. Prerequisite: Arch 232, ArcE 223, EDes 203. Concurrent series enrollment in ArcE 302, 303, 304 required.

ArcE 400  Special Problems for Advanced Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

ArcE 407  Plastic Design of Steel Structures (3)
Theory of plastic design, structural engineering methods used to design steel frameworks with plastic theory. 3 lectures. Prerequisite: ArcE 303 or consent or instructor.
Architectural Engineering

ArcE 408  Prestressed Concrete (3)
Analysis and design of prestressed concrete beams, columns, slabs, composite sections and special problems in prestressed concrete. 3 lectures. Prerequisite: ArcE 323.

ArcE 409  Survey of Foundation Engineering (3)
Fundamentals of foundation engineering, evaluation of soil reports, principles of determination of bearing capacity, soil classification, selection of types of foundations, evaluation of expansive properties of foundation soils, discussion of basic laboratory tests. 3 lectures. Prerequisite: ArcE 223.

ArcE 411  Matrix Analysis of Structures (3)
Analysis of statically indeterminate structures by force and displacement methods, including programming for digital computer applications to beams, rigid frames, plane and space trusses, and other structures. 3 lectures. Prerequisite: ArcE 304.

ArcE 412  Dynamics of Framed Structures (3)

ArcE 413  Design of Concrete Plate and Shell Structures (3)
Design of concrete slabs, folded plates, barrel shells, hyperbolic shells and shells of revolution. Membrane theory for thin shells. 3 lectures. Prerequisite: ArcE 323 or 444.

ArcE 414  Precast Concrete (3)
Precast and prestressed concrete principles, materials and techniques of construction. Concrete mixes, forming, casting, finishing, curing and erection methods of precast concrete. Design potentials, aesthetics, cost and construction time as related to buildings and other structures. 3 lectures. Prerequisite: ArcE 323 or 444.

ArcE 415  Concrete Testing Laboratory (1)
Study of concrete mix design, physical properties of concrete, use of admixtures, concrete batching, concrete curing, testing of concrete and concrete specifications. Includes mix design, batching and physical testing of the designed mixes. 1 laboratory. Prerequisite: ArcE 323 or 304.

ArcE 421  Soil Mechanics (3)
Principles of soil mechanics, including rudiments of geology, soil classification, gravimetric and volumetric relations, compaction, methods and testing, shear strength of soil and strength theories. 2 lectures, 1 laboratory. Prerequisite: Math 241, Geol 201 or consent of instructor.

ArcE 422  Foundation Design (3)
Soil-bearing capacity and settlement characteristics of soils. Sizing and design of spread footings. Design and analysis of earth-retaining structures. 2 lectures, 1 laboratory. Prerequisite: ArcE 421.

ArcE 423  Advanced Foundation Design (3)
Design and analysis of beams on elastic foundations and mat foundations utilizing conventional and finite difference methods. Pile foundations and sheet pile retaining structures. Emphasis placed upon computer solutions. 2 lectures, 1 laboratory. Prerequisite: ArcE 422.

ArcE 431, 432, 433  Design Analysis for Engineers (2) (3) (2)
Design analysis of Architectural Engineering structures including problems in the application of thermodynamics, fluid statics, dynamics, flow in pipes and open channels, specifications, contracts, engineering economics, and engineering studies including feasibility and alternate problem analysis. 2 or 3 activities. Prerequisite: ArcE 363.
ArcE 444  Structural Design (5)
Design of reinforced concrete structures. Theory and application to building structural systems. 5 laboratories. Prerequisite: ArcE 301, 304 and 363.

ArcE 445  Structural Design (5)

ArcE 446  Structural Design (5)
Selected advanced topics with application to structures curved in space. Shells, arches and cables. 5 laboratories. Prerequisite: ArcE 445.

ArcE 461, 462  Senior Project (2)  (2)
Selection and completion of a comprehensive type project under faculty supervision. Problems to involve the students' technical and creative skills. Construction encouraged. To be completed in two consecutive quarters. 120 hours minimum total time. Prerequisite: ArcE 363.

ArcE 470  Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

ArcE 471  Selected Advanced Laboratory (1–3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1–3 laboratories. Prerequisite: Consent of instructor.

ArcE 481, 482  Advanced Materials Testing Laboratory (1)  (1)
Advanced laboratory work in testing and analysis of structural materials, structural components and structural systems subject to static and seismic forces in the elastic and inelastic ranges. Scaled and non-scaled models in timber, steel, concrete and plastics. 1 laboratory. Prerequisite: ArcE 301 and 304 or 323.

ArcE 483  Seismic Design (3)
Introduction to dynamic response analysis of building structures with emphasis on earthquake ground motion. Earthquake resistant design of buildings in accordance with building codes. Application of computer programs and physical models for seismic design. 3 lectures. Prerequisite: ArcE 363.

ArcE 504  Finite Element Method for Building Structures (3)
Basic concepts of equilibrium and compatibility; stiffness and flexibility properties of various types of finite elements. Development and application of displacement and force methods. Elastic stability and dynamic response of buildings to earthquake, wind, and moving loads. Use of finite-element computer programs. 3 lectures. Prerequisite: Math 242, ArcE 411, or permission of instructor.

ArcE 505  Numerical Methods in Structural Engineering (3)
Basic concepts in numerical methods: Finite differences, successive approximations, iterative and relaxation procedures. Applications to building and bridge structures: Analysis of beams, columns, frames, arches, plates and shear walls under static, impact and dynamic loadings. 3 lectures. Prerequisite: ArcE 411, or permission of instructor.

ART

Art 121 Introduction to Photography (2)
A non-laboratory course on the basics of photography for the individual who wishes to improve photographic technique. Cameras, camera handling, films, composition, lighting, and camera accessories. 2 lectures.
Art

Art 200 Special Problems for Undergraduates (1-2)
Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of instructor.

Art 201 Fundamentals of Drawing (3)
Analysis and practice in functional drawing, basic design, and study of form. Development of individual techniques. 3 activity periods.

Art 202 Intermediate Drawing (3)
Development of additional drawing techniques with emphasis on form and composition. 3 activities. Prerequisite: Art 201.

Art 205 Applied Color and Design (3)
Study of lines, planes, masses, textures, color, and aspects of space as elements in the structure of the visual arts. 3 activity periods. Prerequisite: Art 201.

Art 211, 212 Art History (4) (4)
Analytical and chronological study of significant art and artists in western civilization. Emphasis upon painting, sculpture and related visual arts. 4 lectures.

Art 220 Basic Photography (3)
Fundamental techniques in black and white photography. Mechanics of cameras and equipment, optics, composition, filters, subject content, developing, printing, and mounting. Understanding photographic principles, producing a quality print, print presentation. 2 lectures, 1 laboratory.

Art 221, 222, 223 Design Fundamentals (3) (3) (3)
Exploration of basic graphic design theory and practice. Two dimensional concepts, three dimensional concepts, and color concepts introduced in sequence. 3 activities.

Art 231 Introduction to Art (3)
Designed to further understanding of painting, sculpture and graphic arts. Development of vocabulary and useful criteria for evaluation. 3 lectures.

Art 232 Orientation to Art Materials (3)
Manipulation and experimentation with a wide variety of art media and techniques. Evaluation of expressive and design qualities in group and individual projects. 3 activity periods.

Art 233 Orientation to Crafts (3)
Basic experiences in three dimensional processes in contemporary crafts with clay, metal, wood and other materials. Creative statement and development of personal design concepts. 3 activity periods.

Art 248 Metals (3)
Introduction to non-ferrous metal techniques; including design, cutting, forming, soldering, forging and casting, with esthetic principles applied to craftsmanship. 3 activities.

Art 249 Ceramics (3)
Introduction to ceramic processes with emphasis on design and the use of the potter's wheel. 3 activities.

Art 254 Wood (3)
Familiarization with wood and tool processes. Development of personal creative statement. Traditional and modern design concepts and techniques with contemporary forms. Use of hardwoods and tropical woods. 3 activities. Prerequisite: Art 233.

Art 255 Functions of Design (2)
Survey of design in areas pertinent to the environment; Lecture-discussion related to current design trends. Involvement of the individual in his environment. 2 lectures.
Art 314  American Art (2)
Development of art in any one or more of the ethnic groups or cultures within the western hemisphere. Course will bear a descriptive subtitle. 2 lectures. May be repeated to a total of 6 units. Prerequisite: Art 211, 212 or permission of the instructor.

Art 315  Contemporary Art (3)
Artists and art movements of the modern era with an emphasis on the 20th century. 3 lectures. Prerequisite: Junior or senior standing.

Art 316  Non-Western Art (2)
Development of art in any one or more of the non-western ethnic groups or cultures. Course will bear a descriptive subtitle. 2 lectures. May be repeated to a total of 6 units. Prerequisite: Art 211 or 212 or permission of the instructor.

Art 322  Advanced Photography (3)
Advanced black and white photography. Use of large and small format cameras, sensitometry, studio lighting, transparencies, retouching, copying, visual interpretation and communication. 2 lectures, 1 laboratory. Prerequisite: Art 220.

Art 324, 325, 326  Intermediate Crafts (2) (2) (2)
Further development of craft techniques in clay, metal, leather, wood, and other craft materials. Skill development, material handling, and current methods of applied design. 2 activities. Prerequisite: Art 233, or consent of instructor.

Art 328  Glassblowing (3)
Techniques in offhand glassblowing leading toward individual creative statement through mastery of fine craftsmanship. Design, history, forming processes, and development of tools and equipment. 3 activities. Prerequisite: Art 205, 233, or consent of instructor.

Art 331, 332, 333  Graphic Design (3) (3) (3)
Investigation and experimentation in art structure, color and design. Relation of aesthetic concepts to practical two and three dimensional problems in advertising, packaging, display and exhibits. Lettering skill will be emphasized. 3 laboratories. Prerequisite: Art 223 or permission of the instructor.

Art 336  Display and Exhibition Design (2)
Applied principles of handling materials for display and design of exhibitions. Actual gallery experience including planning, publicity, and set-up of shows. 1 lecture, 1 laboratory.

Art 340, 341  Painting Techniques (2) (2)
Physical characteristics of painting media, creative understanding of pictorial space and color. Sequence courses. 2 laboratories. Prerequisite: Art 205, or consent of instructor.

Art 344, 345  Advanced Drawing (3) (3)
Development of advanced methods and techniques in the study of form and structure. Emphasis on problem solving. 3 activities. Prerequisite: Art 202, 221.

Art 346, 347  Sculpture (3) (3)
Elements of three dimensional form through the exploration of sculptural techniques. Technical problems in modeling, casting, carving, welding, and other techniques of assembly. Sequence courses. 3 activities.

Art 348  Metalsmithing (3)
Experience in design and creation of jewelry, small sculpture and hollowware. Classroom work in copper, brass, silver and gold includes cutting, forming, joining, embellishing and casting techniques. Total credit limited to 6 units. 3 activities. Prerequisite: Art 248 or consent of instructor.
Art 349 Ceramics (3)
Ceramic materials and processes; design, slab, coil and wheel forming, glazing; related instruction and evaluation. Total credit limited to 6 units. 3 activities. Prerequisite: Art 249 or consent of instructor.

Art 354 Intermediate Wood (3)
Continued skill development with tools of the artisan. Bent lamination, reconstituted wood and other experimental techniques may be developed. Individual design statement expected. Total credit limited to 6 units. 3 activities. Prerequisite: Art 254.

Art 355 Printmaking (3)
Major intaglio processes for fine art prints. Technical surveys, expressive principles, history, and production. 3 activities. Prerequisite: Art 201, 205, 232 or consent of instructor.

Art 386 Professional Practice in Art (2)
Professional practices in the art and design field, legal and ethical questions, taxes, contracts, fees and copyrights. Current job opportunities, resume and portfolio preparation with visiting professionals. 2 activities. Prerequisite: Advanced standing in major or consent of the instructor.

Art 400 Special Problems for Advanced Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Senior standing and consent of instructor.

Art 421 Curriculum and Instructional Procedures in Art (3)
Content, organization and scope of art curriculum in elementary and secondary schools. Evaluation of teaching approaches and procedures that encourage creativity in the arts. 3 lectures.

Art 428 Color Photography (3)
Fundamental techniques in color photography. Theory of color, exposing and processing color transparencies and color negatives. Color printing, finishing, and mounting. 2 lectures, 1 laboratory. Prerequisite: Art 322.

Art 431, 432, 433 Advanced Graphic Design (3) (3) (3)
Laboratory problems in practical advertising design with emphasis on mass media, page layout, and related areas. Contemporary trends in graphic design. 3 laboratories. Prerequisite: Art 333 or permission of the instructor.

Art 434 Documentary Films (3)
Basic techniques in visual communication using the motion picture medium. Cameras, film, film processing, and editing. Filming of current news events for TV and documentary films. Script writing and directing for education and feature films. 2 lectures, 1 laboratory. Prerequisite: Art 220.

Art 435 History of Crafts (3)
Survey of craftsmen and craft movements of the modern era with emphasis on the twentieth century. 3 lectures. Prerequisite: Art 212, 315 or consent of instructor.

Art 438 Creative Feature Photography (4)
Use of basic and advanced techniques in achievement of creative effects in black and white photography. Techniques include high contrast, solarization, bas-relief, texture screens. 2 lectures. 2 laboratories. Prerequisite: Art 322.

Art 439 Creative Color Photography (4)
Multi-media presentation, using color slides, music and narration. Contemporary creative photography techniques applied, creative seeing, self-expression/interpretation and communication. 2 lectures, 2 laboratories. Prerequisite: Art 428 or consent of instructor.
Art 448 Advanced Metalsmithing (3)
Development of design concepts, projects, and skills to a high level of competency. Total credit limited to 9 units. 3 activities. Prerequisite: Art 248, 348 and consent of instructor.

Art 449 Advanced Ceramics (3)
Advanced clay construction, decorating, glazing and firing with emphasis on the use of the potter's wheel. Development of appropriate design. Ceramic theory as a basis for criticism. Total credit limited to 9 units. 3 activities. Prerequisite: Art 349.

Art 450, 451 Advanced Specialized Crafts (3) (3)
Advanced concentration in skill development in one of the following areas: Leather, glass, wood, plastics, jewelry, casting. Course will bear a descriptive subtitle, 3 activities. Prerequisite: Any 300-level Art course with same specialization, or consent of instructor.

Art 461, 462 Senior Project (2) (2)
Selection and completion of a project under faculty supervision. Minimum of 120 hours time. Results presented in a formal report. Prerequisite: Senior standing.

Art 463, 464 Undergraduate Seminar (2) (2)
Analysis of selected problems and topics for undergraduates. Prerequisite: Senior standing.

Art 470 Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

Art 471 Selected Advanced Laboratory (1-3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. One to three laboratories. Prerequisite: Consent of instructor.

Art 472 Studio Practices (3)
Problems and topics dealing with the practical aspects of establishing and maintaining a professional design studio. 2 lectures, 1 activity. Prerequisite: Art 300-400 level courses totaling 9 units, Art 386, or consent of instructor.

Art 480 Crafts Design/Production (5)
Design development and production of a series or edition of craft objects, after analysis of crafts history, esthetics, function, materials, processes and costs. 5 activities. Prerequisite: Senior standing and consent of instructor.

Art 481 Crafts Marketing (2)
Production costs, exhibitions and sales practices, appropriate and effective exposure and marketing of craft productions. Final evaluation reports include financial accounting and suggestions for improving design, production and marketing. 2 activities. Prerequisite: Art 480 or consent of instructor.

ASTRONOMY AND ASTROPHYSICS

Astr 101 Introduction to the Solar System (3)
Descriptive astronomical properties of the earth, moon, other planets and their satellites. Comets, asteroids and other members of the solar system. Theories of the formation of the solar system. Opportunities for telescope observations of the moon and planets. Not open to students who have completed or are taking Astr 301, 302 or Phys 132. 3 lectures.

Astr 102 Introduction to Stars and Galaxies (3)
Descriptive astronomical properties of the sun, stars, galaxies, and interstellar material. The expanding universe and cosmological models. Opportunities for telescope observations and star identification. Not open to students who have completed or are taking Astr 301, 302, or Phys 132. Astr 101 is not a prerequisite. 3 lectures.
Astronomy and Astrophysics

**Astr 301** The Solar System (3)
Quantitative and descriptive properties of the solar system including the physics of the planets, their satellites, comets and interplanetary media; possible origins of the solar system. 3 lectures. Prerequisite: Phys 132 or 123.

**Astr 302** Stars and Galaxies (3)
Quantitative and descriptive properties of the stars, galaxies and interstellar media; including stellar structure and evolution, structure and make-up of galaxies and cosmological models. 3 lectures. Prerequisite: Phys 132 or 123. Astr 301 is not a prerequisite.

**Astr 303** Cosmology and General Relativity (3)
Introduction to the basic ideas of general relativity. Einstein’s law of gravity, curved space and its application to relativistic models of the universe, black holes, and pulsars. Big Bang and Steady State theories of the expanding universe. Relevant observational evidence included. 3 lectures. Astr 302 is not a prerequisite: Prerequisite: Phys 133.

**Astr 351** Observational Astronomy (1)
Practical observing experience using stellar coordinate systems to locate and photograph celestial objects with the telescope. Topics of observational interest such as the lunar surface, planetary orbits, stellar magnitudes and stellar classification. 1 laboratory. Prerequisite or concurrent. Astr 301 or 302 or consent of instructor.

**BACTERIOLOGY**

**Bact 221** General Bacteriology (4)
Morphology, metabolism, classification and identification; bacteriology of air, soil, water, and foods with applications to industry, agriculture, medicine, and public health. 2 lectures, 2 laboratories. Prerequisite: One quarter of college chemistry and Bot 121 or Zoo 131.

**Bact 224** General Microbiology (4)
Functional anatomy, physiology, genetics, and ecobiology of prokaryotic and eukaryotic microorganisms. 2 lectures, 2 laboratories. Prerequisite: Bact 221 and organic chemistry (or equivalent).

**Bact 322** Dairy Bacteriology (4)
Advanced course for practical work demonstrating the domestic and industrial importance of microorganisms involved in milk and dairy products; milk, milk powders, fermented milks, evaporated and condensed milks, butter, cheese, cheese starters, and ice cream. 2 lectures, 2 laboratories. Prerequisite: Bact 221.

**Bact 333** Industrial Microbiology (4)
Industrial application of microorganisms in the production of chemicals related to the food and pharmaceutical industries; consideration of environmental sanitation in industrial processes. 2 lectures, 2 laboratories. Prerequisite: Bact 221, Chem 226.

**Bact 342** Sanitary Microbiology (4)
Principles of disease prevention and control. Water-, food-, and air-borne microbial contaminations and epidemiology of ensuing diseases. Laboratory techniques in detection and control of wastes and disease-causing microorganisms. 2 lectures, 2 laboratories. Prerequisite: Bact 221 or 224.

**Bact 402** General Virology (3)
Virus-host interactions. Structure and function of viruses as obligate intracellular parasites of microbes, plants, and animals. Epidemiology, pathogenesis, prophylaxis, chemotherapy, and manipulation of viruses which parasitize man. 3 lectures. Prerequisite: Bact 224. Recommended: One quarter of college biochemistry.
Biology

Bact 421 Food Microbiology (4)
Physiological activities of microorganisms involved in the preparation, preservation, deterioration and toxicity of foods and related products. Sanitary and public health implications. 2 lectures, 2 laboratories. Prerequisite: Bact 221. Recommended: Chem 226.

Bact 423 Medical Microbiology (4)
Microorganisms as agents of disease in man. Epidemiology, host-parasite relationships, and principles and procedures for laboratory diagnosis of human diseases. 2 lectures, 2 laboratories. Prerequisite: Bact 224. Recommended: Zoo 426.

Bact 424 Bacterial Cytology and Physiology (4)
Cellular structure and life processes of bacteria; chemical composition, growth and metabolism. General biological implications. 3 lectures, 1 laboratory. Prerequisite: Bact 221, Chem 226. Recommended: Chem 328.

Bact 430 Medical Mycology (4)
Morphology, physiology, infectivity, and immunogenicity of fungi pathogenic for man and other mammals. Host-parasite interactions. Demonstration and isolation of pathogenic fungi from clinical material. 2 lectures, 2 laboratories. Prerequisite: Bact 423.

Bact 436 Microbial Ecology (4)
Distribution and interrelationships of marine, fresh water, and terrestrial protists. Microorganisms as biological, biochemical, and geological agents and the role they play in the cycles of nature. 2 lectures, 2 laboratories. Prerequisite: Bact 221 or 224.

BIOLOGY

Bio 100 Agricultural Biology (3)
Basic biological principles applied to agriculture. This course may not be substituted for General Zoology or General Botany. 2 lectures, 1 demonstration and discussion hour. Not open to degree students for degree credit.

Bio 101 General Biology (3)
Principles of cellular biology, heredity, ecology, and evolution, with emphasis on their relationship to human affairs. Not open to students who have completed Bot 121 or Zoo 131. 3 lectures.

Bio 102 Plant Biology (3)
Structural and functional aspects of plants, with emphasis on seed producers. Not open to students who have completed Bot 121. 3 lectures. Prerequisite: Bio 101.

Bio 103 Animal Biology (3)
Structural and functional aspects of animals, with emphasis on man. Not open to students who have completed Zoo 131. 3 lectures. Prerequisite: Bio 101.

Bio 127 Natural History (3)
Scope of natural history; formation and identification of features in the physical environment; natural history survey of arachnids, myriapods, and insects. 1 lecture, 2 laboratories.

Bio 128 Natural History (3)
Natural history survey of the plant and animal kingdom; field study and identification of marine intertidal organisms. 1 lecture, 2 laboratories.

Bio 129 Natural History (3)
Principles of field biology and ecology; laboratory and field study of wildflowers, land communities, and freshwater communities; emphasis is on California natural history. 1 lecture, 2 laboratories. Prerequisite: Bio 128.
Biology

Bio 253 Orientation to the Health Professions (1)
Participation in hospital activities and mental health services. Intended for medically orient-
ed students. Total credit limited to 6 units with a maximum of 1 unit per quarter. Offered only
on Credit-No Credit basis. 1 activity. Prerequisite: Instructor's consent and one quarter of
college chemistry and Zoo 131.

Bio 255 Microtechnique (2)
Methods of preparing plant and animal tissues for microscopic study with emphasis on
paraffin embedding techniques and staining. 2 laboratories. Prerequisite: Bot 122 or Zoo 132.

Bio 301 Human Ecology (3)
Examination of the ways in which man is dependent on his environment, his ability to
modify it, and the results of such modification. 3 lectures. Prerequisite: One quarter of biologi-
cal science.

Bio 302 Human Inheritance (3)
Basic principles of human inheritance. Transmission of genetic traits, chromosomal anomal-
ies of humans, gene action, mutations and mutagenic agents, eugenics, and principles of genetic
counseling. 3 lectures. Prerequisite: One course in college biology (preferably Bio 101 or Zoo
131).

Bio 303 Genetics (3)
Principles of heredity and variation. 3 lectures. Prerequisite: one quarter of college biology
and one quarter of college mathematics.

Bio 304 Advanced Genetics (2)
Recent advances in genetics and cytogenetics. 2 lectures. Prerequisite: Bio 303.

Bio 311 Radiation Biology (3)
Review of production and characteristics of non-ionizing and ionizing radiation; interaction
and effect of radiation on living cells, tissues, organs, and organisms; introduction to use of
radioisotopes; radiation protection and dosimetry; impact of nuclear energy on the biological
world. 3 lectures. Prerequisite: Chem 122 or 124 and one of the following: Bio 101, Bot 121,
Zoo 131.

Bio 312 Radiation Laboratory Techniques (2)
Demonstrations and exercises in the use of radioisotopes and the operation of radiation
detecting instruments. 2 laboratories. Prerequisite: Bio 311 (may be taken concurrently).

Bio 315 Evolution (3)
Modern concepts of evolutionary mechanisms. 3 lectures. Prerequisite: Bio 303.

Bio 321 Biological Instrumentation (3)
Theory and operation of instruments commonly used in biological investigation. 1 lecture,
2 laboratories. Prerequisite: Bot 121, Zoo 131 or Bio 129.

Bio 325 General Ecology (3)
Study of the interrelationships between plants and animals and their environment in terres-
trial, marine, and freshwater situations. 2 lectures, 1 laboratory. Prerequisite: Bio 129 or both
Bot 122 and Zoo 132.

Bio 328 Marine Biology (4)
Biological and environmental studies of marine organisms, with emphasis on their economic
importance. 2 lectures, 2 laboratories. Prerequisite: Bio 129 or both Bio 122 and Zoo 133, or
consent of instructor.

Bio 331 Biosystematics (3)
Major principles of classification, taxonomy, speciation, and nomenclature. Designed pri-
marily for biology majors. Term report required. 2 lectures, 1 laboratory. Prerequisite: Ent 326,
Bio 129 or both Bot 123 and Zoo 133.
Bio 334  Freshwater Ecology (3)
Physical, chemical, and biological factors of freshwater environments as they relate to freshwater organisms. 2 lectures, 1 laboratory. Prerequisite: one year college biology, one quarter college chemistry.

Bio 342  Computer Applications in Biology (3)
Application, use and simple modification of computer programs for biological studies. 2 lectures, 1 laboratory. Prerequisite: CSc 221, Math 120 and Bio 325, Bot 322 or Zoo 432.

Bio 400  Special Problems for Advanced Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of the department head.

Bio 423  General Cytology (4)
Detailed study of the structure and function of animal and plant cells. 3 lectures, 1 laboratory. Prerequisite: Zoo 133 or Bot 123 and organic chemistry or biochemistry.

Bio 424  Organizing and Teaching Biological Sciences (3)
Objectives, content, techniques, material, and recent trends of successful instruction in secondary school biology. 3 lectures. Prerequisite: Evidence of satisfactory preparation in biology, botany, and zoology.

Bio 425  Basic Electron Microscopy I (3)
Biological applications of electron microscopy including techniques of specimen preparation, design of experiments, interpretation of results and limitations. 1 lecture, 2 laboratories. Prerequisite: Zoo 131, Bot 121, Bio 423 or consent of instructor.

Bio 426  Electron Microscopy II (4)
Advanced techniques and instrumentation including interpretation of electron micrographs, autoradiography negative staining, shadow casting, replication, and ultrastructural cytchemistry. 1 lecture, 3 laboratories. Prerequisite: Bio 425.

Bio 431  Physiology I: General (4)
The functioning, control, and integration of physiological phenomena at various levels from cell to organism. 2 lectures, 2 laboratories. Prerequisite: Chem 226; Bot 122 or Zoo 132.

Bio 437  Marine Resources (3)
Resource status of present and potential biological marine resources of the sea. Identification, life history, ecology, culture and economics of pertinent organisms. 3 lectures. Prerequisite: Bot 122 and Zoo 133.

Bio 442  Biometry (4)
Design of biological experiments with emphasis on sampling methods, data collection, measurement, and analysis of field and laboratory data. 3 lectures, 1 laboratory. Prerequisite: One year of biology and Stat 212 or 321.

Bio 461, 462  Senior Project (2) (2)
Projects are selected from typical problems which graduates may meet in areas of their future employment. Results are presented in both oral and written reports. Minimum 120 hours total time.

Bio 463  Undergraduate Seminar (2)
Study and discussion of recent developments in the field of biology. 2 meetings. Prerequisite: Senior standing.

Bio 470  Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 4 units. 1 to 3 lectures. Prerequisite: Consent of instructor.
Bio 471 Selected Advanced Laboratory (1–2)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topics selected. Total credit limited to 4 units. 1 to 2 laboratories. Prerequisite: Consent of instructor.

Bio 500 Individual Study (1–3)
Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Total credit limited to 4 units. Prerequisite: Graduate standing and consent of department head.

Bio 515 History of Biology (3)
Critical survey of the historical development of experimental designs for the solution of biological problems. 3 lectures. Prerequisite: Graduate standing.

Bio 524 Developmental Biology (3)
Developmental phenomena of higher and lower plants, vertebrate and invertebrate animals at the molecular, cellular, histological and organ levels. Each quarter will emphasize a different biological description. 3 units per quarter. May be repeated to a maximum of 9 units. 2 lectures, 1 laboratory. Prerequisite: Graduate standing and evidence of satisfactory preparation in biology.

Bio 527 Cell Physiology (4)
Functional organization of cells, their environment, and energy metabolism. Laboratory exercises in dynamic aspects of cell physiology. 2 lectures, 2 laboratories. Prerequisite: Graduate standing and Chem 328, Math 114, Bio 431.

Bio 542 Multivariate Biometry (4)
Design of biological experiments involving multivariate observations. Experimental design, sampling, computer analysis, and interpretation of results. 3 lectures, 1 laboratory. Prerequisite: Stat 313, Bio 442.

Bio 543 Morphometrics (3)
Biological phenomena from problem definition and field collection of data through multivariate analysis of data and presentation of results. 2 lectures, 1 laboratory, 2–4 weekend field trips. Prerequisite: Bio 542.

Bio 570 Selected Topics in Biology (1–3)
Directed group study of selected topics for graduate students. Class schedule will list topics for selection. Topic credit limited to 9 units. 1 to 3 lectures. Prerequisite: Graduate standing and evidence of satisfactory preparation in biology.

Bio 590 Seminar in Biology (1)
Problems and topics in advanced biology selected according to the interest and needs of the students enrolled. Maximum of 5 units. 1 activity. Prerequisite: Graduate standing and evidence of satisfactory preparation in biological sciences.

Bio 599 Thesis (3) (3) (3)
Individual research under the general supervision of the staff, leading to a graduate thesis of suitable quality. Prerequisite: Graduate standing and consent of instructor.

BOTANY

Bot 121 General Botany (4)
Introduction to structures and functions of seedbearing plants. 2 lectures, 2 laboratories.

Bot 122 General Botany (4)
Structure and relationships of plant groups from bacteria to angiosperms, emphasis on nonseedbearing plants of economic importance. 2 lectures, 2 laboratories. Prerequisite: Bot 121.
Bot 123 Introductory Plant Taxonomy (4)
Introduction to classification and identification of vascular plants, emphasizing the families of major economic importance; field and herbarium techniques. 2 lectures, 2 laboratories. Prerequisite: Bot 121.

Bot 238 Native Plant Materials (3)
Identification, habits of growth, cultural requirements and landscape use of native California plants suitable for landscape purposes. 2 lectures, 1 laboratory. Prerequisite: Bot 121.

Bot 322 Introductory Plant Physiology (4)
A consideration of the principal physiological processes of plants including water relations, mineral nutrition, photosynthesis, respiration, and growth of the plant. 3 lectures, 1 laboratory. Prerequisite: Bot 121 and Chem 226.

Bot 323 Plant Pathology (4)
Comprehensive study of the causes and effects of disease in plants. Designed to lead to an understanding of the science and modern control methods. 2 lectures, 2 laboratories. Prerequisite: Bot 122 or Bot 123.

Bot 324 Ornamental and Forest Pathology (4)
Causes and effects of diseases of important ornamental and forest plants, disease agents (life cycle, host range, environmental relationships), and modern approach to control. 2 lectures, 2 laboratories. Prerequisite: Bot 121.

Bot 325 Plant Nematology (4)
Plant parasitic nematodes, their morphology, classification, and the damage they cause plants, alone or in combination with other pathogens. 2 lectures, 2 laboratories. Prerequisite: Bot 323, Ent 326.

Bot 326 Plant Ecology (4)
Effects on plant growth and development of the following environmental factors: soil, water, temperature, light, atmosphere, topography, organisms, and fire. 3 lectures, 1 laboratory. Prerequisite: Bot 123.

Bot 333 Field Botany (3)
Field identification of native and introduced plants in nature; factors affecting California plant distribution and relationships. Emphasis on local species. Several extended field trips. 2 lectures, 1 laboratory. Prerequisite: One course in college level biology.

Bot 334 Morphology of Vascular Plants (4)
Phylogenetic relationships of the plant kingdom as illustrated by comparative morphology of the vascular plants including living and fossil forms. 2 lectures, 2 laboratories. Prerequisite: Bot 123.

Bot 335 Plant Anatomy (4)
Microscopic study of vascular plants dealing with the origin, development and structure of cells, tissues and organs. 2 lectures, 2 laboratories. Prerequisite: Bot 122.

Bot 337 Algology (4)
Classification of marine and fresh-water algae. Consideration of ecological, physiological and economic aspects. 2 lectures, 2 laboratories. Prerequisite: Bot 122.

Bot 343 Advanced Plant Taxonomy (3)
Systems of plant classification and principles on which they are based; use of morphology, cytogenetics, and ecology in classification; rules of botanical nomenclature. 2 lectures, 1 laboratory. Prerequisite: Bot 123.

Bot 425 Plant Virology (4)
Plant pathogenic viruses, their plant, insect, nematode and fungal host-pathogen relationships, symptom recognition, isolation and identification methods. 2 lectures, 2 laboratories. Prerequisite: Bot 323.
Bot 426 Mycology (4)
Comparative morphology and nuclear behavior of the fungi. A summary of the science with special attention given to forms important in agriculture, medicine and industry. 2 lectures, 2 laboratories. Prerequisite: Bot 122, Zoo 132, or consent of instructor.

Bot 431 Advanced Plant Pathology (4)
Methods, instruments, and materials used in diagnosis of plant diseases and in plant disease research. 2 lectures, 2 laboratories. Prerequisite: Bot 323 or 324.

BUSINESS

Bus 101 The Business Enterprise (4)
Orientation to the Business Administration program. Examination of the business enterprise, stressing its historical, environmental, and economic setting. Business organization and functions. 2 lectures, 2 recitations.

Bus 200 Special Problems for Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

Bus 201 Business Law Survey (3)
An overview of business law for other than Business majors. Similar in scope to Bus 207, but in less detail. Not acceptable for credit toward Business Administration degree. 3 lectures.

Bus 205 Consumer Law (2)
Concepts of legal and self-protection in the marketplace. Procedures to use administrative agencies and court system. Specific interest areas: landlord-tenant; sales and warranties; consumer protection groups; home, auto, insurance purchases, etc. 2 lectures.

Bus 207 Business Law (4)

Bus 400 Special Problems for Advanced Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Senior standing or consent of instructor.

Bus 404 Government Regulation of Business (4)
Development of legal controls of business in the context of a free enterprise system. Problems in constitutional and administrative law. Government control for the protection of the employer, employee, consumer, investor and the public at large. 4 lectures. Prerequisite: Bus 201 or 207.

Bus 419 Business Research (3)
Information gathering principles and techniques used in study and analysis of business activities. 3 lectures. Prerequisite: Mgt 413.

Bus 430 Internship (4–8)
Placement as an employee in a business firm approved by the department head. Periodic written progress reports required. Collateral reading correlated with the work experience. Credit/No Credit grading. Prerequisite: Approval of the department head.

Bus 460 Senior Project (2)
Selection and completion under faculty supervision of an investigative project typical of problems graduates must solve in their career field entry positions. Required minimum of 60 hours. Analytical, formal report is required. Prerequisite: Bus 419.
Chemistry

Bus 470 Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

Bus 500 Independent Study (1-3)
Advanced study planned and completed under the direction of a member of the Business Administration department faculty. Open only to graduate students who have demonstrated ability to do independent work. Prerequisite: Formal petition with approval.

Bus 506 Business and Society (3)
The business organization as a social-legal institution with authorized purpose and social-ethical responsibilities. Interrelations with competitors, government, and pressure organizations in the social environment. 3 lectures. Prerequisite: Mktg 508, Econ 511, 512, Mgt 530.

Bus 526 International Business and Operations (3)

CHEMISTRY

Chem 106 Introductory Chemistry (3)
Metric system, density, chemical symbols, chemical formulas, nomenclature, chemical equations, the mole concept, stoichiometry. An introductory course in chemistry, not open to students who have credit for a college chemistry course. 3 lectures. Prerequisite: Math 103 or 109 or equivalent.

Chem 121 General Inorganic Chemistry (4)
Fundamental principles including atomic structure, bonding, nomenclature, chemical equations, states of matter, solutions, some non-metals. Not open to students with credit for Chem 124. 3 lectures, 1 laboratory. Prerequisite: Chem 106 or equivalent or permission of instructor.

Chem 122 General Inorganic Chemistry (4)
Continuation of Chem 121. Colloids, kinetics, equilibrium, acids and bases, electrochemistry, nuclear chemistry, applied chemistry of some non-metals. Not open to students with credit for Chem 125. 3 lectures, 1 laboratory. Prerequisite: Chem 121.

Chem 124 General Chemistry (4)
Atomic structure, chemical equations, stoichiometry, inorganic nomenclature, solutions. Introduction to carbon compounds emphasizing fuels and polymers. Not open to students with credit for Chem 121. 3 lectures, 1 laboratory. Prerequisite: Chem 106 or equivalent or permission of instructor.

Chem 125 General Chemistry (4)
Introduction to chemical thermodynamics, equilibrium, kinetics, acids and bases, coordination compounds, oxidation-reduction reactions, electrochemistry, corrosion, nuclear chemistry. Not open to students with credit for Chem 122. 3 lectures, 1 laboratory. Prerequisite: Chem 124.

Chem 126 General Chemistry (4)
Chemical equilibria, compounds of the metals, laboratory study of the chemical properties and semi-micro qualitative analysis of the representative group elements of the periodic table. 3 lectures, 1 laboratory. Prerequisite: Chem 122 or 125.

Chem 156 General Chemistry Laboratory (1)
Additional laboratory to be taken with Chem 126. Includes chemical properties and semi-micro qualitative analysis of the transition and post-transition metals. Ions of the periodic table, spectrographic analysis, methods of inorganic synthesis. 1 laboratory. Prerequisite: Chem 122 or 125.
Chemistry

Chem 200  Special Problems for Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of department head.

Chem 226  Survey of Organic Chemistry (4)
Structure, nomenclature, some characteristic reactions of functional groups and applications of organic chemicals in agriculture, medicine, industry and the home. A terminal survey course not open to students with credit in Chem 316. 3 lectures, 1 laboratory. Prerequisite: Chem 122 or 125.

Chem 252  Laboratory Glassblowing (1)
Techniques of glassblowing applied to the making of simple laboratory apparatus. 1 laboratory. Prerequisite: Chem 121 or 124.

Chem 253  Chemical Literature (1)
Chemical publications, periodicals, abstracting journals, review serials, patents, institutional publications, information retrieval. 1 lecture. Prerequisite: Chem 226 or 316.

Chem 274  Chemistry of Drugs and Poisons (3)
Biochemical actions of common natural and synthetic drugs and poisons. Basic principles and applications for students in non-biochemical disciplines. 3 lectures. Prerequisite: Chem 122 or 125.

Chem 301  Biophysical Chemistry (3)
Basic physical chemistry for the study of biological systems. Kinetic-molecular theory, gas laws, principles of thermodynamics as applied to biochemical systems. Not open to students with credit in Chem 305. 3 lectures. Prerequisite: Chem 328 or concurrent 371, Phys 123 or 133, Math 131 or 141. Recommended: Math 132 or 142.

Chem 302  Biophysical Chemistry (4)
Application of physical chemistry to biochemical systems. Buffers, electrochemistry, reaction rate theory, enzyme kinetics, viscosity, surface and transport properties of macromolecules. Not open to students with credit in Chem 306. 3 lectures, 1 laboratory. Prerequisite: Chem 301 or 305; 328 or 371.

Chem 305  Physical Chemistry (3)
Physical and molecular constitution of gases; kinetic theory; atomic structure; elementary chemical thermodynamics and thermochemistry; chemical statistics; introduction to phase equilibria. 3 lectures. Prerequisite: Phys 123 or 133, Chem 125 or 126, Math 131 or 141.

Chem 306  Physical Chemistry (3)
Phase equilibria, solutions; distillation theory; colligative properties; electrochemistry with analytical applications; non-ideal systems, chemical kinetics, radioactivity. 3 lectures. Prerequisite: Chem 305.

Chem 307  Physical Chemistry (4)
Physical chemistry of the liquid and solid states. Chemical bonding and molecular structure; spectroscopy, diffraction, electrical and magnetic properties of molecules. Surface chemistry and catalysis. 3 lectures, 1 laboratory. Prerequisite: Chem 302 or 306 and 356, Math 132 or 142, or consent of instructor.

Chem 316  Organic Chemistry (4)
Structure, bonding, nomenclature, isomerism, stereochemistry and physical properties of organic compounds. Reactions and mechanisms of alkanes, alkenes, alkynes, cycloalkanes. Laboratory techniques in organic preparations. 3 lectures, 1 laboratory. Prerequisite: Chem 122 or 125.
Chemistry

Chem 317 Organic Chemistry (5)
Reactions and reaction mechanisms of organic halides, alcohols, phenols, epoxides, ethers, carboxylic acids and their derivatives, aldehydes, ketones; acidity and basicity; infrared and NMR spectroscopy. 3 lectures, 2 laboratories. Prerequisite: Chem 316.

Chem 318 Organic Chemistry (5)
The chemistry of amines, aromatic compounds, heterocycles, macromolecules, some biomolecules, carbanions, rearrangements; mass spectrometry. Practice in organic synthesis. 3 lectures, 2 laboratories. Prerequisite: Chem 317.

Chem 328 Biochemistry (4)
Fundamental chemistry of carbohydrates, proteins, fats, vitamins, enzymes and hormones as applied to their function in plant and animal metabolism. Special reference to the chemistry involved in the use, analysis and manufacture of feeds, foods and other agricultural products. 3 lectures, 1 laboratory. Prerequisite: Chem 226.

Chem 331 Quantitative Analysis (4)
Analytical techniques of industrial significance stressing titrimetric procedures in the laboratory based on acidimetry, alkaliometry and redoximetry. Applications of chemical equilibrium and methods of problem solving. 2 lectures, 2 laboratories. Prerequisite: Chem 126.

Chem 332 Quantitative Analysis (4)
Analytical techniques stressing procedures based upon titrimetric precipitometry, gravimetric analysis and continuation of redoximetry. Properties of precipitates and colloids as applied to industrial analytical chemistry. 2 lectures, 2 laboratories. Prerequisite: Chem 331.

Chem 335 Quantitative Physiological Chemistry (3)
Quantitative determination of metabolites in biological fluids. Medical laboratory techniques in analysis of serum, blood and urine for glucose, nitrogenous substances, electrolytes, and lipids. 2 lectures, 1 laboratory. Prerequisite: Chem 328 or 371, and 331.

Chem 336 Quantitative Physiological Chemistry (4)
Theory of biochemical techniques in clinical chemistry and pathology, metabolic and organ-specific investigations and interpretation of results, clinical instrumentation, serum enzyme and hormone assay techniques. 2 lectures, 2 laboratories. Prerequisite: Chem 335.

Chem 341 Environmental Chemistry (3)

Chem 344 Chemical Process Principles (3)
Fundamental terms, concepts, and principles used in the chemical processing industries. 3 lectures. Prerequisite: Chem 316 or consent of the instructor.

Chem 355 Physical Chemistry Laboratory (1)
Experimental studies of gases, solutions, thermochemistry and chemical equilibria. 1 laboratory. Corequisite: Chem 305.

Chem 356 Physical Chemistry Laboratory (1)
Experimental studies of phase rule, electrochemistry and chemical kinetics. 1 laboratory. Corequisite: Chem 306.

Chem 371 General Biochemistry I (4)
Chemical and physical factors in biological processes. Chemistry and function of major cellular constituents: proteins, nucleic acids, lipids, carbohydrates. 3 lectures, 1 laboratory. Prerequisite: Chem 316. Recommended: Chem 301 and 317.
Chemistry

Chem 372  General Biochemistry II (4)
Intermediary metabolism, regulation and integration of metabolic pathways, bioenergetics, photosynthesis, electron transport, nitrogen fixation, biochemical function of vitamins and minerals. 3 lectures, 1 laboratory. Prerequisite: Chem 371.

Chem 373  General Biochemistry III (4)
Protein conformation and synthesis, structure of the active site and mechanism of enzyme action. Biochemical genetics, cell differentiation and control. 3 lectures, 1 laboratory. Prerequisite: Chem 371.

Chem 400  Special Problems for Advanced Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of the department head.

Chem 405  Advanced Physical Chemistry (3)

Chem 419  Advanced Organic Chemistry (3)
A detailed study of the mechanisms of organic reactions and related topics. 3 lectures. Prerequisite: Chem 305, 318.

Chem 435  Food Analysis (4)
Techniques used commercially in the chemical analysis of seed and cereal crops, fruit and vegetable crops, forage crops, meat and meat products, milk and dairy products, eggs and poultry products. Vitamin determinations, microbiological assay, quality control, taste testing, legal specifications, grading and labeling. 3 lectures, 1 laboratory. Prerequisite: Chem 328.

Chem 436  Agricultural Chemicals (4)
Chemistry of fungicides, insecticides, rodenticides, plant growth regulators, soil conditioners, and fertilizers. Special reference to the analysis, manufacture, toxicology, legal specification, and regulations. 3 lectures, 1 laboratory. Prerequisite: Chem 328.

Chem 439  Instrumental Analysis (4)
Optical, electroanalytical and other techniques of modern instrumental analysis. Current industrial applications. Laboratory work in instrumental methods is emphasized. 2 lectures, 2 laboratories. Prerequisite: Chem 306, 331, 356 or Chem 302, 331. Recommended: 307.

Chem 444  Polymer Chemistry (3)
Polymerization methods and reaction mechanisms; physical properties of polymers and their measurement; chemistry of initiators, catalysts and inhibitors; stereospecific polymers; uses of representative types. 3 lectures. Prerequisite: Chem 317.

Chem 457  Qualitative Organic Analysis (3)
The experimental determination of the identity of organic compounds. Emphasis on chemical methods. 1 lecture, 2 laboratories. Prerequisite: Chem 317.

Chem 458  Instrumental Organic Qualitative Analysis (2)
Laboratory identification of organic molecules using instrumental and chemical methods including nuclear magnetic resonance, gas chromatography and infrared, ultraviolet and mass spectrometry. 2 laboratories. Prerequisite: Chem 457.

Chem 459  Undergraduate Seminar (2)
Oral presentation of current developments in chemistry based on current literature. Preparation for employment and for independent work in chemistry. 2 meetings. Prerequisite: Senior standing.

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Chem 461, 462  Senior Project (2) (2)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time. Prerequisite: Chem 459.

Chem 470  Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Chem 301, or 305, or 317 or consent of instructor.

Chem 471  Selected Advanced Laboratory (1–3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1–3 laboratories. Prerequisite: Consent of instructor.

Chem 481  Inorganic Chemistry (3)
A systematic study of important elements based on periodic grouping and atomic structure with emphasis on chemical bonding, coordination compounds, and acid-base relationships. 3 lectures. Prerequisite: Chem 306 or permission of instructor.

Chem 482  Inorganic Chemistry (3)
Applications of electrode potentials to inorganic systems; nomenclature, bonding, stereochemistry, stability and reactions of coordination compounds; chemistry of the transition elements, lanthanides, organometallics and metal carbonyls; bioinorganic chemistry. 3 lectures. Prerequisite: Chem 481.

Chem 501  Physical Chemistry—Thermodynamics (3)
Fundamental theory and methods of thermodynamics, with application to the calculation of thermodynamic properties. 3 lectures. Prerequisite: Chem 307, 316 or consent of instructor.

Chem 502  Physical Chemistry—Quantum Chemistry (3)
Theory and methods of quantum chemistry with application to the investigation of molecular structure, chemical bonding, and molecular spectra. 3 lectures. Prerequisite: Chem 405 or consent of instructor.

Chem 503  Physical Chemistry—Kinetics (3)
Reaction rates and mechanisms of elementary processes; homogeneous and heterogeneous reactions and catalysis. 3 lectures. Prerequisite: Chem 307, 318 or consent of instructor.

Chem 514  Advanced Organic Chemistry—Synthesis (3)
Modern and practical methods of constructing molecules. 3 lectures. Prerequisite: Chem 318.

Chem 515  Advanced Organic Chemistry—Mechanisms (3)
Mechanisms of pericyclic reactions; selection rules. Introduction to photochemistry; free radical reactions. 3 lectures. Prerequisite: Chem 318.

Chem 516  Advanced Organic Chemistry—Natural Products (3)
Structure determination and total synthesis of compounds of biological origin. 3 lectures. Prerequisite: Chem 318.

Chem 541  Synthetic Methods (2–4)
Techniques for synthesis of organic and inorganic substances. Macroscopic and microscopic procedures of industrial significance. Use of modern equipment and methods; anaerobic, low and high temperature, low and high pressure, and conventional procedures. 2 to 4 laboratories. Prerequisite: Chem 318.

Chem 577  Advanced Biochemistry (3)
Physico-chemical properties of proteins, nucleic acids and enzymes. 3 lectures. Prerequisite: Chem 306, 373 or consent of instructor.
Child Development

Chem 578 Advanced Biochemistry (3)
Food and nutritional aspects of biochemistry. Vitamins, amino acids, essential fatty acids, minerals, energy metabolism. Deficiency and degenerative diseases. Synthetic and imitation foods. 3 lectures. Prerequisite: Chem 328.

Chem 579 Advanced Biochemistry (3)
Molecular biochemistry of cellular ultrastructure, function and division. Function and transformation of biomolecules in plants and animals. 3 lectures. Prerequisite: Chem 373.

Chem 590 Graduate Seminar (1)
Presentation of advanced topics in chemistry, including original work by faculty, guests, and graduate students. Topics will vary each quarter. Total credit limited to 3 units. Required of all graduate students in chemistry. 1 meeting. Prerequisite: graduate standing in chemistry, or consent of instructor.

Chem 598 Internship (3–6)
Supervised technical field experience in areas such as chemical sales, manufacturing, process development, clinical chemistry, analytical chemistry, pollution control. Prerequisite: Graduate standing or consent of instructor, and approval of the department head and school dean.

Chem 599 Thesis (3) (3) (3)
Individual research under the general supervision of the staff leading to a graduate thesis of suitable quality. Prerequisite: Graduate standing in chemistry.

CHILD DEVELOPMENT

CD 101 Orientation (2)
Introduction to the fields of child development and family studies both as a college major and as a useful occupation. 2 lectures.

CD 103 Pairing and Marriage (3)
A functional approach to contemporary dating and pairing patterns with emphasis on cross-sex communication during the developmental stages of the paired relationship. 3 lectures.

CD 108 Child, Family, and Community (3)
Influence of family, society, and cultural forces on behavior of children. Role of parents, teachers, and professional workers in the healthy personality development of the child. 3 lectures.

CD 130 Observation and Reporting Techniques (2)
Observing children individually and in groups. Specific techniques of reporting and interpreting observations. 1 lecture, 1 laboratory.

CD 131 Freshman Laboratory: Beginning Study of the Child and Family (3)
Opportunity for observation and interaction with children in groups. Prerequisite: CD 130 or consent of instructor. 1 lecture, 2 laboratories.

CD 200 Special Problems for Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of department head.

CD 203 Family Development (3)
Survey of family living at each stage of the life cycle. Emphasis on developmental tasks, socio-economic and cultural influences, and family differences. 3 lectures.

CD 232 Child Development—Infancy (3)
Basic principles of development. Growth and development from conception through infancy. Characteristic behavior patterns of the infant in relation to environment. 3 lectures. Prerequisite: Psy 201 or 202, CD 108.

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CD 233 Child Development—Preschool Years (3)
Development and behavior of the preschool child on the basis of current knowledge in child
development. Intellectual, physical, emotional, social, and moral development of the preschool
child. Controlled observations in the laboratory nursery school. 3 lectures. Prerequisite: CD
232.

CD 239 Programs for Young Children (3)
Curriculum development and organization as they relate to programs for young children.
3 lectures. Concurrent with CD 240. Prerequisite: CD 131, 233.

CD 240 Laboratory Study of Young Children (3)
Understanding the principles of behavior and development as implemented in a child develop-
ment laboratory. 1 lecture, 2 laboratories. Prerequisite: CD 131, 233. Concurrent with CD
239.

CD 301 Afro-American Pre-School Child (3)
Cultural and environmental factors that influence the growth and development of the
pre-school Afro-American child. Field trips are required. 3 lectures.

CD 302 Mexican-American Pre-School Child (3)
Cultural and environmental factors that influence the growth and development of the
pre-school Mexican-American child. Field trips are required. 3 lectures.

CD 303 Family Interaction (3)
Dynamic aspects of dating, courtship, marital and family interaction. Examination of day-to-
day experiences faced in family living. 3 lectures. Prerequisite: CD 103, 203.

CD 322 Adult, Family, and Community (3)
Principles in adult, family, and community inter/intra-action related to psychology, sociolo-
y, and philosophy. 3 lectures.

CD 330 Directed Nursery School and Community Experience (6)
Directed work in a nursery school or community facility. Consultation with faculty supervi-
sors. Prerequisite: CD 240 and consent of instructor.

CD 400 Special Problems for Advanced Undergraduates (1-2)
Individual investigation, research, studies, or survey of selected problems. Total credit lim-
ited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of department
head.

CD 404 Administration of Child Development Centers (3)
Preparation for administering child development centers. Housing and equipment, costs,
staff, programs, health protection, and community relations. 3 lectures. Prerequisite: CD 330
or consent of instructor.

CD 413 Parent-Child Relationship (3)
Nature, influence and causes of parent behavior; home-school interaction, programs and
evaluation. 3 lectures. Prerequisite: Junior standing.

CD 430 Experimental Lab (3)
Directed experience in a nursery school under faculty supervision. 1 lecture, 2 laboratories.
Prerequisite: CD 330.

CD 447 The Family—Middle and Aging Years (3)
Analysis of the middle stages of the family life cycle. The family after the children leave the
home. 3 lectures. Prerequisite: CD 203 or consent of instructor.

CD 448 Development in the Adult Years (3)
Development in the middle-aged and among elderly individuals. Current research in the
field of adult development and gerontology. 3 lectures. Prerequisite: CD 203.
City and Regional Planning

CD 450 Introduction to Family Counseling (3)
Basic elements of marriage and family counseling. Client, counselor, and counseling relationships. 3 lectures. Prerequisite: Upper division or graduate standing and consent of instructor.

CD 451 Family Crises (3)
Analysis of causes and effects of crises on the family. Methods for prediction, control, and solution of family crises. 3 lectures. Prerequisite: Senior or graduate standing and permission of instructor.

CD 453 Supervised Field Work (4)
Supervised field work in community organizations, public agencies, and child welfare-related projects. Total credit limited to 8 units. Prerequisite: Senior standing or consent of instructor.

CD 461, 462 Senior Project (2) (2)
Selection and completion of a project under faculty supervision, the project to be related to a probable field of employment. Results of the study are presented in a formal report. Minimum of 120 hours total time.

CD 463 Undergraduate Seminar (2)
Study and discussion of current developments in the field of child development. 2 lectures. Prerequisite: Senior standing.

CD 464 Current Issues in Family Life Education (2)
Evaluation of the role of family life specialists in relation to the teaching profession, public service agencies, and the community. 2 lectures. Prerequisite: CD 203 or consent of instructor.

CD 470 Selected Advanced topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

CD 481 Family Theory (2)
Analysis of the major theoretical approaches in family behavior. 2 lectures. Prerequisite: Senior standing.

CD 533 Seminar in Child Development (3)
Selected aspects of development in relation to contemporary society. Emphasis upon research findings. 3 meetings. Prerequisite: Graduate standing and consent of instructor.

CITY AND REGIONAL PLANNING

CRP 211, 212 Introduction to Urban Environment (3) (3)
History and analysis of social and technological factors which have influenced the physical growth of cities. Philosophical approaches. Problems of growth and the development of various theories of city planning. Recommended for all majors. 3 lectures. Prerequisite: Eng 104.

CRP 215 Data Analysis (3)
Sources of information and data related to City and Regional Planning, Architecture, and Environmental Design. Search, selection, reduction of data, and application to program development. 3 lectures. Prerequisite: CRP 212.

CRP 218 Environmental Planning Management Policy (3)
Current issues in environmental planning and environmental preservation. Survey and synthesis of environmental problems and decisions from the viewpoint of the various disciplines concerned with the trade-offs, conflicts, policy development and environmental management. 3 lectures.
CRP 243 Introduction to Urban Environment (2)
Design applications of CRP 211, 212. 2 lectures. Prerequisite: CRP 212.

CRP 301, 302 Planning Theory (2) (2)
Planning theory and related topics. Environmental engineering and public health. 2 lectures. Prerequisite: CRP 215, EDes 203.

CRP 304 Zoning (2)
Zoning theory and legal background. Historical and current land districting practices. Zoning as a device to guide urban growth; the zoning ordinance, the districting plan; relationship to the general plan. Economic and social ramifications. New concepts. 2 lectures.

CRP 307 Quantitative Methods for Planning (3)
Application of quantitative methods to practical problems and policy questions in land use, environmental impact, population, employment, housing, community development and regional planning. Concepts and computational methods to extend the effectiveness of public decision-making in city and regional planning. 3 lectures. Prerequisite: CRP 212.

CRP 347, 348, 349 Design for Planners (3) (3) (3)
Three-dimensional design with emphasis on spatial relationships and urban forms. The physical city. Effect of color, texture and scale, open spaces. Landscaping and architecture. 3 laboratories. Prerequisite: CRP 212, EDes 110, 203.

CRP 351, 352, 353 Planning Laboratory (4) (4) (4)
Case study application of planning theory to the community, its components, and to the city and the region. Relationships of city spaces and structures. Redevelopment. Individual team, and interdisciplinary approaches. Computer applications. 4 laboratories. Prerequisite: CRP 212, EDes 203.

CRP 360 Urban Aesthetics (1–3)
Aesthetics as an important aspect of the physical, social, economic and governmental organization of cities. Identification, study and evaluation of aesthetic design in the context of the present. 1–3 meetings. Prerequisite: Junior standing and consent of instructor.

CRP 365 Transportation Theory (2)
The circulation and transportation elements of the General Plan. Transportation planning theory, methods and tools related to systematic analysis of city and regional transportation problems including environmental impact assessment. 2 lectures. Prerequisite: CRP 212 or permission of instructor.

CRP 400 Special Problems for Advanced Undergraduates (1–2)
Individual or group investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

CRP 401, 402 Planning Theory (2) (2)
Advanced planning theory and related topics. Planning and environmental law; current and emerging regulatory and non-regulatory tools, methods and organizational structure for implementing plans and policies; professional responsibilities. 2 lectures. Prerequisite: CRP 302.

CRP 406 Environmental and Planning Regulations (3)
Public controls protecting natural environmental systems and regulating human activities. Land use and resource controls. Review of control mechanisms. State and federal legislation, comprehensive environmental requirements. Legal implications of controls, public planning and policy issues. 3 lectures. Prerequisite: CRP 302.

CRP 410 Open Space Planning (2)
The open space element of the General Plan. Legal, economic, tax and zoning aspects of implementation. Relationships with other General Plan elements. Experience of other states and countries. 2 lectures. Prerequisite: CRP 212.
City and Regional Planning

CRP 411 Implementation Techniques (2)
Procedures in enlisting and sustaining community interest in city and regional plan implementation. Field trips. 2 lectures. Prerequisite: CRP 302.

CRP 417 Urban Systems Design (2)
Application of system design concepts to the design of planning models. Study of symbolic models to test and evaluate the organization of urban structures. 2 lectures. Prerequisite: CRP 212 or consent of instructor.

CRP 418 New Town Planning (3)
History, present situation and future of new town planning in the United States. Relationship to other countries. 3 lectures. Prerequisite: CRP 212.

CRP 419 International Planning and Development (2)
Problems of urbanization in different parts of the world. Physical planning methodology. Evaluation of general economic development and comparative planning methods found in selected cities. 2 lectures. Prerequisite: CRP 212 or permission of instructor.

CRP 451, 452, 453 Planning Laboratory (4) (4) (4)
Continuation of CRP 351, 352, 353. 4 laboratories. Prerequisite: CRP 302, 349, 353.

CRP 457 Planning Information Systems (2)
Use of a problem-oriented system to retrieve statistical information pertinent in planning. 2 activities. Prerequisite: Stat 212, EDes 250, 4th year standing.

CRP 461, 462 Senior Project (2) (2)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. To be completed in two consecutive quarters. Minimum 120 hours total time. Prerequisite: CRP 302, 349, 353.

CRP 470 Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

CRP 471 Selected Advanced Laboratory (1-3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1-3 laboratories. Prerequisite: Consent of instructor.

CRP 501 Quantitative Methods in Planning (3)
Problem recognition, data selection, analysis and synthesis with applications of system design, statistical techniques and symbolic model to urban design and regional growth and development policies. 3 lectures. Prerequisite: Graduate standing or consent of instructor.

CRP 502 Planning Administration (3)
Relationships of planning agencies to other government bodies, public agencies and citizen groups. The public planning agency and the private practitioner. Public relations and personnel relations. Current topics in planning administration. 3 lectures.

CRP 503 Capital Improvement Planning (3)
Local, state and federal tax resources. Private and public grants. Capital investments by the private sector. Analysis of physical needs. Long-range and short-term programs. The effect of Capital Improvement Planning on private development plans. The Capital Improvement Plan: initiation, review and implementation techniques. 3 lectures.

CRP 505 The City in History (3)
Historical development of the city as a reflection of cultural patterns of each period or civilization. Analysis of land use, circulation systems, defensive mechanisms and architectural form. 3 lectures. Prerequisite: Graduate standing or consent of instructor.
CRP 506 Contemporary Planning Theory (3)
Development of contemporary planning thought from historical roots. Intensive study of planning literature. Alternative value systems and planning processes. Current approaches and philosophies in the United States and other countries. 3 lectures.

CRP 507 Advanced Regulations and Controls (3)
Base studies and economic development. Funding and fiscal effectuation of policies and plans. Municipal finance planning. The tax base and tax policies related to blight. Survey of federal and state grants. Concepts of social accounting and overhead. Cost benefit studies and economic feasibility of plans. Long-range financial planning. Phasing and time scheduling. Prerequisite: CRP 513 or equivalent. 3 lectures.

CRP 508 Planning Legislation (3)
Theory of federal and state planning enabling acts. Planning law and police power. Use of police power in zoning and subdivision regulations. Eminent domain, building, health and sanitary codes. Public policy versus private property. Court decisions and their effect on planning policies. 3 lectures.

CRP 509 Utility Systems Planning (3)
Water, electrical, gas and communications service systems; storm drainage and flood control; sewage and waste disposal. Influences on land patterns and development practices. Standards and control regulations. Advanced technologies in energy supply systems and waste disposal. 3 lectures.

CRP 511 Perspectives in Regional Planning (3)
History, development and major philosophical approaches of regional planning. Effects of limiting factors on growth and development of regions. Contemporary regional planning compared to emerging paradigms that alter the regional/local planning relationship. 3 lectures.

CRP 512, 513 Foundations in Planning (3) (3)
Evolution of the planning process. Techniques and approaches used in plan preparation. Land use and circulation systems. Open space planning. Means for plan implementation. Planning and environmental law issues. 3 lectures. Prerequisite: Graduate standing or consent of instructor.

CRP 516 Advanced Planning Theory (3)
Selected problem-solving approaches and philosophies for planners in the analysis of social, technological, economical and political trends. 3 lectures. Prerequisite: CRP 506.

CRP 544 Graphic Communication for Planners (3)
Basic techniques used in graphic communication. Orthographic, isometric and perspective drawing. Introduction to various drawing media and presentation techniques for planners. Development of graphic skills and basic proficiency in the communication of information and designs. 3 laboratories. Prerequisite: Graduate standing or consent of instructor.

CRP 548 Philosophy of Urban Design (3)
Introduction to the philosophy and theory particular to environmental design. Exploration of evaluation criteria and critical analysis of man's environment related to design and human needs. Spatial and form relationships, scale, human activities, concept formation, visual organization of the city, landscaping and architecture. 3 laboratories. Prerequisite: CRP 544.

CRP 552, 553 Foundations in Planning Application (6) (6)
Case study applications of planning theory and processes to urban and regional problems in increasing complexity. Interrelationships and impacts of economic and social conditions, technology, resource use, the natural and the built environments. Field trips. Individual, team and interdisciplinary approaches. 6 activities. Prerequisite: CRP 512, 544.

CRP 554, 555 Advanced Planning Laboratory (6) (6)
Application of advanced theory and methods to the solution of complex planning problems of spatial allocation and planning policy. Research, analysis, synthesis and implementation
Civil Engineering

practice under field conditions. Emphasis on multi-disciplinary teamwork. 6 laboratories. Prerequisite: CRP 513 and 553 or equivalents, CRP 501, 506, 511, 548.

CRP 570 Selected Topics in Planning (3)
Directed group study of selected topics in planning theory. Total credit limited to 9 units. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

CRP 599 Thesis (6)
Individual research under the general supervision of the faculty, leading to a graduate thesis of suitable quality. Prerequisite: CRP 501, 507, 516, 555.

CIVIL ENGINEERING

CE 121 Civil Engineering Fundamentals (2)
Engineering approach to problem solving. Analysis of land, air, and water transportation systems. Basic nomenclature and design criteria used in the field. Applications to specific problems. Discussions with practicing engineers on subjects of current interest. 2 lectures.

CE 122 Civil Engineering Fundamentals (2)
Continuation of CE 121. Application of basic design criteria to specific design problems. 2 activities. Prerequisite: CE 121.

CE 123 Civil Engineering Fundamentals (2)
Introduction to problem solving and analysis of data necessary in the profession. Methods and techniques available to the civil engineer for use in study and design of systems. 2 activities. Prerequisite: CE 122.

CE 200 Special Problems for Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of department head.

CE 221 Introduction to Traffic Problems and Transportation (4)
Elements of ground and water traffic circulation and planning. Driver and vehicle performance. Traffic analysis and control. Planning of air, water and ground transportation units and terminals as elements of complete transportation systems. 3 lecture-discussions, 1 laboratory. Prerequisite: CE 123.

CE 228 Civil Engineering Materials (3)
Concepts of stress, strain, stress distribution. Engineering phenomena involving materials used in public works facilities. 2 lectures, 1 laboratory. Prerequisite: Phys 133, Chem 124, Aero 208.

CE 240 Additional Engineering Laboratory (1–2)
Total credit limited to 4 units, with not more than 2 units in any one quarter. 1 or 2 laboratories.

CE 322, 323 Structural Analysis (3) (3)
General structural theorems, energy methods, influence diagrams, deflection of structures, analysis of statically determinate and indeterminate structures. Introduction to matrix methods of analysis and dynamic response. 3 lectures. Prerequisite: Aero 208, 209.

CE 324 Traffic Engineering—Operations and Controls (4)
Techniques for making traffic engineering investigations; traffic laws and ordinances, speed regulation, curb parking regulations, through controls, one-way streets, right-of-way regulations; design and application of signs, markings, lighting; and traffic engineering. 3 lecture-discussions, 1 laboratory. Prerequisite: CE 221 or equivalent.
CE 325  Public Works Design (3)

Underlying principles of layout, selection of type and size of various units, and principles of loading involved in designing public works systems in urban and rural locations. 3 lectures. Prerequisite: Aero 208, 209, CE 322.

CE 326  Drainage Systems (3)

Application of rainfall intensity, frequency and duration statistics to design of drainage systems for transportation facilities. Procedures for sizing of storm sewers, culverts, inlets and bridges. Plan and specification preparation procedures. 2 lectures, 1 activity. Prerequisite: ME 341, CE 121.

CE 329  Civil Engineering Materials (3)

Experimental determination of mechanical properties of concrete, asphalt, and soils as required for engineering applications. Experimental verification of assumptions made in mechanics of materials procedures. Use of strain measuring devices. Preparation of technical reports. 1 lecture, 2 laboratories. Prerequisite: Aero 208, CE 228.

CE 400  Special Problems for Advanced Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

CE 421  Airfield and Highway Structures (4)

Theories, principles, and procedures in the structural design of highway and airfield pavements. Design of rigid and flexible pavements. Construction and maintenance procedures for pavements and stabilized bases. 3 lecture-discussions, 1 laboratory. Prerequisite: CE 329.

CE 422  Geometric Design of Highways (4)

Location and safe geometric design of highway and other transportation facilities. Earthwork and drainage related to highway, railway, dock, and airport design. Theory and practice in design of alignments, highway cross-sections, intersections, interchanges, and freeways in urban and rural areas. 3 lecture-discussions, 1 laboratory. Prerequisite: CE 221, 329.

CE 423  Structural Steel Design (4)


CE 433  Transportation Systems Planning (4)

Planning of urban and statewide transportation systems. Air, water, rail, highway, and pipeline systems separately and in combination. Selection of routes and types of systems based on economic, social, technological, and other characteristics. Planning of terminals for all types of transportation systems. 3 lecture-discussions, 1 laboratory. Prerequisite: CRP 212, IE 414, CE 221, Econ 211.

CE 434  Public Transportation (3)

Interdisciplinary aspects of public transportation problems, systems-team design approach to solutions. History and present state of public transportation; role of public transportation in urban environment; legislative, political, social, and economic aspects of public transportation systems. Methodology and procedures for transit planning. Review of transit studies. 2 lectures, 1 activity. Prerequisite: Senior standing or permission of instructor.

CE 435  Airport Planning and Design (3)

Historical background of aviation and airport development; financing; estimating demand; aircraft characteristics; air traffic control; site selection; airport configuration; geometric design of landing area; planning and development of terminal areas; lighting; pavement design and drainage; design of heliports. 2 lectures, 1 laboratory. Prerequisite: CE 221 or equivalent.

CE 436  Personal Rapid Transit Systems (3)

Survey of present technologies and planning studies. Methodologies for assessing alternative systems and strategies for implementation of a system. Class designed project for a selected
Computer Science

environment. 3 lectures. Prerequisite: Senior standing or consent of instructor.

CE 461, 462 Senior Project (2) (2)
Selection and completion of a project which is typical of problems which graduates must
solve in their fields of employment. Project results are presented in a formal report. Minimum
120 hours total time Prerequisite: CE 421, 422.

CE 463 Undergraduate Seminar (2)
New developments, policies, practices, and procedures discussed in seminar sessions. Each
individual is responsible for the development and effective presentation of topics in his area
of emphasis. 2 meetings. Prerequisite: Senior standing.

CE 464 Professional Practice (3)
Basic elements of professional engineering practice. Professional ethics, procedures, con-
tracts, specifications, cost estimating, and engineer-client relationship. 3 lectures. Prerequisite:
Senior standing.

CE 470 Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and
graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to
3 lectures. Prerequisite: Consent of instructor.

CE 471 Selected Advanced Laboratory (1–3)
Directed group laboratory study of selected topics for advanced students. Open to under-
graduate and graduate students. Class schedule will list topic selected. Total credit limited to
6 units. One to three laboratories. Prerequisite: Consent of instructor.

COMPUTER SCIENCE

CSc 100 Data Processing (2)
Introduction to computer concepts and the COBOL language. Preparation of business
reports with computers. Elements of computer organization and fundamentals of program
writing for business oriented problems. Credit not allowed for Computer Science major. 2
lectures.

CSc 101 Fortran Programming (2)
Emphasis on programming techniques for mathematical analysis. Business and science ap-
lications. 1 lecture, 1 activity.

CSc 110 Computers and Computing (3)
Applications of computers in modern society. Survey of the development of the art of comput-
ing and of computing devices from ancient times to the modern digital computer. Relationship
of mathematics to computing procedures. How computers are programmed. 3 lectures.

CSc 118 Fundamentals of Computer Science (2)
Introduction to problem solving methodology and computer science. Problem statements,
solution procedures, algorithms, and computer programs. Problem solving using digital com-
puters and campus computing facilities. 2 lectures.

CSc 140 Business Data Processing (2)
Essentials of COBOL programming. Problem analysis, flow charting, documentation, and
coding for computer execution of typical business problems. Credit not allowed for Computer
Science major. 2 lectures. Prerequisite: CSc 100.

CSc 200 Special Problems for Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit
limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of depart-
ment head.
CSc 201 Advanced Fortran Programming (2)
Programming in extended Fortran language with emphasis on program efficiency and
advanced features. Comparison of Fortran implementations. 2 lectures. Prerequisite: CSc 101.

CSc 210 Non-Numeric Processing (3)
Concepts and algorithms for non-numeric information processing. Processing of natural
language text. Models of complex information processing systems. Applications to cognitive
processes and problem-solving. List and string processing languages such as LISP and SNO-
BOL. 3 lectures. Prerequisite: One programming course.

CSc 218 Boolean Algebra and Applications (3)
Boolean Algebra and its relation to the programming and logical operation of a simple digital
computer; presentation of switching, arithmetic, control, and memory functions. 3 lectures.
Prerequisite: CSc 101, 118, Eng 251 or consent of instructor.

CSc 219 Linear Programming (3)
Introduction to linear programming, the simplex algorithm, duality, sensitivity and post
optimal analysis. Use of linear programming techniques to solve linear optimization models.
3 lectures. Prerequisite: 6 units of college mathematics.

CSc 221 Computer Principles and Programming (3)
Organization of general purpose and special purpose digital computers, preparation of
programs for general purpose computers, sub-routines. 3 lectures. Prerequisite: CSc 101 or
equivalent.

CSc 222 Digital Computer Symbolic Programming (3)
Extension and amplification of language studied in CSc 221. Use of auxiliary storage, writing
of subroutines, advanced programming techniques. 3 lectures. Prerequisite: CSc 221.

CSc 255 Computer Graphics Applications (3)
For students who wish to learn to use computer graphics in their own disciplines. Plotter
and interactive graphic display characteristics and programming. Use of computer graphics
facilities. Introduction to interactive graphic display characteristics. Credit not allowed for
both CSc 255 and CSc 455. 3 lectures.

CSc 304 Digital Computer Architecture (3)
Comparison of various contemporary computer architectures as seen from the software/
firmware/hardware levels. Variations in instruction sets, addressing techniques, data struc-
tures, input-output capabilities, networks. 3 lectures. Prerequisite: CSc 222 or 306.

CSc 306 Minicomputers (3)
Architectural features of current small computers. Instruction sets, addressing methods,
input-output facilities, interrupt-driven software, minicomputer systems, operating systems,
utilities. 3 lectures. Prerequisite: CSc 218.

CSc 309 Microcomputer Architecture and Programming (3)
Comparison of architecture and instruction sets of microprocessors. Selection criteria and
application of microprocessors. Use of application development aids. 3 lectures. Prerequisite:
CSc 218.

CSc 310 Programming Language/One (PL/I) (3)
Introductory and intermediate treatment of PL/I. PL/I program formats, data forms, data
transmission, internal manipulations, sequence control, and program organization. 3 lectures.
Prerequisite: CSc 101 or equivalent.

CSc 319 Computer Simulation (3)
Computer simulation and modeling of continuous systems. Applications to problems of
design, analysis, and control. 3 lectures. Prerequisite: Math 133 or 242 and knowledge of
Fortran programming.
CSc 325  Job Control Language and Utilities (3)
System/360 Job Control Language for Primary Control Program (PCP). Multiprogramming with a Variable Number of Tasks (MVT). Multiprogramming with a Fixed Number of Tasks (MFT). Cataloged procedures and their modification. Application of system and data utilities to update datasets in auxiliary storage. System/360 access methods. 3 lectures. Prerequisite: CSc 222.

CSc 331  Numerical Linear Analysis (3)
Introduction to methods currently available to engineers, scientists and mathematicians for dealing with systems of linear equations utilizing a digital computer. Solutions of systems of linear equations, calculation of matrix inverses, eigenvalues, and eigenvectors. Applications to problems in engineering and science. 3 lectures. Prerequisite: Math 133 or 143 and ability to program in Fortran.

CSc 332  Numerical Nonlinear Analysis (3)
Introduction to the solution of initial value problems for ordinary differential equations. Numerical solution of nonlinear algebraic equations. Interpolation of data, numerical integration and differentiation of functions. Practical applications and case studies. 3 lectures. Prerequisite: Math 242 and ability to program in Fortran.

CSc 333  Numerical Solution of Ordinary Differential Equations (3)
Numerical solution of initial and boundary value problems for ordinary differential equations. Numerical solution of systems of nonlinear algebraic equations. Practical applications and case studies. 3 lectures. Prerequisite: CSc 332.

CSc 340  Cobol Programming (3)
Structure of the Common Business-Oriented Language (COBOL). Coding fundamentals and program logic. Writing of complete Cobol programs applied to typical business data processing problems. 3 lectures. Prerequisite: Any computer programming course.

CSc 345  Data Structures (3)
Basic concepts of data, storage systems and their properties, data transmission, sequential and linked lists, tree structures, multilinked structures, accessing and traversal, applications to compiler design, list and string processing, sorting, and programming languages. 3 lectures. Prerequisite: CSc 222 or 201 or 310 or 340.

CSc 350  Systems Analysis (3)
Analysis of administrative and management problems to develop understanding and improved solutions through application of computers. Computer simulation and modeling of discrete systems involving stochastic variables. 3 lectures. Prerequisite: Knowledge of Fortran programming, and Stat 211 or 321.

CSc 351  Programming Languages (4)
Formal languages, run time representation, structure of algorithmic languages, parameter passing between routines, storage allocation and mapping, and binding time. Adaptability of selected languages to various fields of application and language extensibility. 4 lectures. Prerequisite: CSc 222, 345.

CSc 352  Compilers and Interpreters (3)
Syntactic and semantic analysis. Intermediate translation forms. Generation of object code for compilers. Interpreter design. 3 lectures. Prerequisite: CSc 351.

CSc 400  Special Problems for Advanced Undergraduates (1–2)
Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with not more than 2 units in any one quarter. Prerequisite: Permission of the department head.

CSc 402, 403  Foundation in Computer Science (5) (5)
Intensive courses to provide the foundation in computer science needed for entrance into the Master's degree program for students whose undergraduate training is not computer
science. Fundamentals of computer organization, computer systems, languages, data structures, compilers and assemblers, job control and operating systems. 5 lectures. Prerequisite: Graduate standing and approval of the head of the department.

CSc 409  Applications of Microprocessors (3)
Design and capability of application development aids, assemblers and high level languages. Interrupt structure design. Introduction to microprogrammable microprocessors. 3 lectures. Prerequisite: CSc 309.

CSc 410  Computer Fundamentals for Educators (3)
For students who plan to utilize computers at the school or district level. Computer fundamentals. Developing skill in a basic computer language. Programming techniques with applications to education problem-solving strategies. Credit not allowed for Computer Science major. 3 lectures. Prerequisite: junior standing.

CSc 411  Computer Applications in School Administration (3)
Applications of computer techniques to data processing and other management applications in the administration of schools and school districts. 3 lectures. Prerequisite: CSc 410.

CSc 414  Computer Assisted Instruction (3)
Techniques of utilizing the computer to assist individualized instruction. Comparison with other methods of programmed instruction. Hardware and software requirements of computerized classrooms for elementary, secondary, and college applications. 3 lectures. Prerequisite: Senior standing.

CSc 419  Mathematical Programming (3)
Extensions of linear programming, introduction to non-linear programming, dynamic programming and dynamic optimization procedures with industrial applications. 3 lectures. Prerequisite: CSc 219 and Math 133 or 143.

CSc 431  Numerical Solutions of Partial Differential Equations (3)
Numerical solutions of time dependent partial differential equations. Practical applications and case studies. 3 lectures. Prerequisite: CSc 333.

CSc 440  Computer System Development (3)
Systems analysis and design considerations for development and installation of automated data processing information systems. Evaluation of performance. Organizational structures. Training. New and improved procedures for management direction and control. 3 lectures. Prerequisite: CSc 222 or 304 or 306.

CSc 445  File Management and Data-base Systems (4)

CSc 452  Computer Programming Systems (3)
Design of assembly systems, macro instructions, program intercommunication and linkage. Structure and use of program libraries. Input and output programming systems, debugging systems and source language debugging. Assembly systems and software. Batch processing and executive systems. 3 lectures. Prerequisites: CSc 222, 345.

CSc 453  Multi-programming and Multi-processor Systems (3)
Interrupt, sequential, and multi-programming systems. Priorities and scheduling. Time sharing systems. Use of bulk memory. Simple two-processor systems and programming. System and language requirements. 3 lectures. Prerequisite: CSc 452 or equivalent.

CSc 455  Computer Graphics (3)
Applications for interactive graphic display systems and XY plotters. Design characteristics of graphical input/output systems. Experience in programming interactive graphic display systems. 3 lectures. Prerequisite: CSc 345.
CSc 461, 462  Senior Project (2) (2)
Selection and completion of a project under faculty supervision. Projects typical of problems
which graduates must solve in their fields of employment. Project results are presented in a
formal report. Minimum 120 hours total time.

CSc 463  Undergraduate Seminar (2)
Reports and discussions by students through seminar methods, based on their senior projects
and on other topics relating to computer usage and programming which are of interest to
persons preparing for a career in computer science. 2 activity periods.

CSc 470  Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and
graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to
3 lectures. Prerequisite: Consent of instructor.

CSc 519  Computer Modeling and Simulation I (4)
Computational aspects of computer algorithms for computer modeling and simulation. High
level languages for computer simulation. 4 lectures. Prerequisite: Knowledge of Fortran pro-
gramming, Math 133 or 242, Stat 321, CSc 319 and CSc 350.

CSc 520  Computer Modeling and Simulation II (4)
Simulation methodology, simulation languages and applications of simulation in several
applied areas. 4 lectures. Prerequisite: CSc 519.

CSc 531  Numerical Solution of Algebraic Systems (3)
Direct and iterative methods for computing solutions, eigenvalues, and eigenvectors of
systems of equations. Emphasis on applications to the physical sciences and engineering. 3
lectures. Prerequisite: CSc 333, Math 313.

CSc 532  Numerical Solution of Differential Equations (3)
Single step and predictor corrector methods for initial value problems. Two-point boundary
value problems. Extrapolation methods. 3 lectures. Prerequisite: CSc 333, Math 313.

CSc 533  Numerical Solution of Partial Differential Equations (3)
Explicit and implicit methods for the solution of boundary value problems for parabolic and
hyperbolic equations. Emphasis on applications to the physical sciences. 3 lectures. Prerequi-
site: CSc 431, Math 319.

CSc 541  Information Processing (4)
Theory and fundamentals. Algorithm design and evaluation, advanced data structures, lan-
guage structure, string manipulation, network and graph theoretic methods of analysis, file
organization and management, internal and external sorting methods. 4 lectures. Prerequisite:
CSc 352, 452 and 310, or CSc 403.

CSc 542  Information Processing (4)
Fundamentals and applications. Principles of system design, modularity and interfacing,
effects of interactive systems, evaluation of information systems. Selected applications from
large business or scientific data processing systems, real-time data acquisition systems, informa-
tion retrieval, management information systems, and educational data systems. 4 lectures.
Prerequisite: CSc 541.

CSc 551  Computer Systems and Software (4)
Comparison of language features and compiler techniques for higher level languages. Predi-
cate calculus. List and string processing languages. Compiler-compiler concept and implemen-
tation. Simulation languages. 4 lectures. Prerequisite: CSc 352, 403.

CSc 552  Computer Systems and Software (4)
General concepts of computer architecture and operating systems. Design features of ad-
vanced computers, general time-sharing systems and schemes for dynamic memory allocation,
scheduling and protection. Dynamic linkage between subroutines. Intercommunication
between input/output and processors. 4 lectures. Prerequisite: CSc 453.
CSc 560 Practicum in Computer Science (5)
Documentation and solution of practical problems in computer science selected from business, industrial, and scientific organizations under guidance of lecturers from cooperating organizations and members of the computer science faculty. 1 lecture, 4 activities. Prerequisite: CSc 520 or 533 or 542 or 552.

CSc 590 Seminar in Computer Science (3)
Current problems and research in the field of computer science through discussions and selected readings. Group study of selected advanced topics. 3 meetings. Prerequisite: Graduate standing.

CSc 599 Thesis (4–6)
Individual research under faculty supervision leading to an acceptable thesis. Prerequisite: Graduate standing and consent of instructor.

CONSERVATION
Cons 311 Introductory Conservation (3)
Basic principles and problems of conservation. Organization, control and interrelationships of government and private agencies dealing with the conservation of natural resources. 3 lectures. Prerequisite: Junior standing and one course in Biological Sciences.

Cons 422 Freshwater Fisheries (3)
Freshwater fishes and fishery resources of the Pacific Coast. Identification, life history, ecology and economics of important western and local species. Field trips to various warm and cold water fishery facilities. 2 lectures, 1 laboratory. Prerequisite: Zoo 132, Zoo 322 recommended.

Cons 431 Game Management (4)
General principles, problems and techniques of increasing the harvest of waterfowl, upland game and big game. The identification and life histories of important western game species. Several weekend field trips. 3 lectures, 1 laboratory. Prerequisite: Bio 325 or ASci 229.

Cons 433 Aquaculture (4)
Biological, physical, chemical, and economic aspects of reproduction, development, growth, nutrition, and disease of fishes in culture. Modern methods and problems in the culture of warm water species, especially those suited to farm situations. 2 lectures, 2 laboratories. Prerequisite: Zoo 132 and Bio 334. Zoo 322 recommended.

CONSTRUCTION
Cstr 240 Additional Construction Laboratory (1–2)
Total credit limited to 4 units with not more than 2 units in any one quarter. 1 or 2 laboratories.

Cstr 317 History of Construction (3)
Development of construction techniques and building science. Effects of scientific and engineering advancements on construction theory. The constructor as a member of the building team and as consultant to the architect, planner and structural engineer. 3 lectures. Prerequisite: Junior standing.

Cstr 321 Concrete Technology (3)
Study of modern concepts which form the basis for solutions to problems of concrete construction. Includes significant developments in concrete chemistry and strength theory from 1963 to present. Development of a rational basis for writing concrete specifications and for proportioning concrete mixes. 2 lectures, 1 laboratory. Prerequisite: ArcE 223, 301.
Construction

Cstr 322  Concrete Formwork Design (2)
Design, construction and economics of concrete formwork. Use of wood, steel, plastic and other formwork systems. Applications to special situations and techniques including precast and prestressed concrete. 1 lecture, 1 laboratory. Prerequisite: ArcE 321, 322.

Cstr 341, 342, 343  Construction Practice (4) (4) (4)
Steel, masonry and concrete structures. Emphasis on recently-developed building systems, equipment, materials and techniques. Related construction drawings and details, shop drawings and design of formwork. One designated field trip required. 1 lecture, 3 laboratories. Prerequisite: Arch 232, EDes 203, ArcE 223.

Cstr 350  Computer Applications in Construction Management (2)
Application of computer systems to the maintenance and implementation of construction operations in the building industry, construction management games and optimization techniques for construction planning. 1 lecture, 1 activity. Prerequisite: ArcE 321, 322.

Cstr 340  Special Problems for Advanced Undergraduates (1-2)
Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

Cstr 412  Construction Regulations (2)
Laws and legal problems related to the construction industry. Contractor’s licensing law, labor laws, lien laws, and safety requirements. 2 lectures. Prerequisite: 4th year standing.

Cstr 420  Construction Cost Estimating (2)
Survey of methods and practices of construction cost estimating. Solutions to problems in estimating. For students not majoring in Construction. 1 lecture, 1 laboratory. Prerequisite: 4th year standing.

Cstr 433  Construction Planning and Control (2)
Introduction to Critical Path Method, PERT, and other systems of construction planning and control. Graphic representation and computer applications. For students not majoring in Construction. 1 lecture, 1 laboratory. Prerequisite: ArcE 321, 322.

Cstr 441, 442, 443  Construction Practice (2) (2) (2)
Continuation of Cstr 343. Problems in quantity surveying, estimating. 2 activities. Prerequisite: Cstr 343.

Cstr 451, 452, 453  Construction Laboratory (5) (5) (5)
Comprehensive projects stressing decision making and design solutions to the problems in construction; team projects encouraged. Emphasis on critical path planning and cost control, job organization, scheduling and financing, field projects supervision, bidding procedures and construction law applications. 5 laboratories. Prerequisite: Cstr 343, ArcE 321, 322, 323, Stat 321.

Cstr 461, 462  Senior Project (2) (2)
Selection and completion of a comprehensive project under faculty supervision. Problems to involve the student’s technical and creative skills. Construction and team projects encouraged. To be completed in two consecutive quarters. 120 hours minimum total time. Prerequisite: Cstr 343.

Cstr 470  Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

Cstr 471  Selected Advanced Laboratory (1-3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1-3 laboratories. Prerequisite: Consent of instructor.
CROP SCIENCE

CrSc 100 Principles of Insect Pest Management (4)
Identification and control of common insect pests of agricultural crops and stored products. Safe use and handling procedures of insecticides and related materials. Natural, cultural, mechanical, and chemical controls of injurious insects and mites. 3 lectures, 1 laboratory. Not open to degree students for degree credit.

CrSc 123 Forage Crops (4)
Production, harvest, and utilization of principal California forage crops. Identification and utilization of forage plants studied in the field. Field trips to local areas. 3 lectures, 1 laboratory.

CrSc 131 Introduction to Crop Science (4)
Production principles for field and vegetable crops. Fundamental botany, taxonomy and cultural practices. Soil tillage, fertilization, seed selection planting and harvesting methods, irrigation, weed control, pest control, and crop rotation. Production practices for cotton and sugar beets. A field trip to a major California production area is required. 3 lectures, 1 laboratory. Credit will not be allowed for both CrSc 131 and CrSc 230.

CrSc 132 Grain Crops (4)
Production, adaptation, distribution, and utilization of major crops harvested by combine including cereals, large seeded legumes, milo, flax, corn, and safflower. Field trips to major California cereal production areas. 3 lectures, 1 laboratory. Prerequisite: CrSc 131 or VgSc 230.

CrSc 133 Row Crops (4)
Adaptation, production, and utilization of major row crops such as potatoes, tomatoes, dry beans, and sugar beets, and peas. A field trip to a major California row crop production area is required. 3 lectures, 1 laboratory. Prerequisite: CrSc 131 or VgSc 230.

CrSc 200 Special Problems for Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of department head.

CrSc 221 Weed Control (4)
Identification, life histories, and control of common, noxious, and poisonous California weeds. Weed control chemicals and equipment for cultivated crops, irrigation systems, range, wastelands. 3 lectures, 1 laboratory. Prerequisite: Sophomore standing.

CrSc 223 Vertebrate Pest Management and Control (3)
Vertebrate pests injurious to agriculture crops, livestock, and stored products, with emphasis on ground squirrels, rats, mice, birds, gophers, and other animals. Life habits, identification, control methods, and materials. Related laws and regulations. 2 lectures, 1 laboratory.

CrSc 230 General Field Crops (4)
Production, harvest, and use of important cereal and field crops in California. Production areas, crop rotations, disease and pest control. 3 lectures, 1 laboratory. Credit will not be allowed for both CrSc 131 and 230.

CrSc 231 Commercial Seed Production and Processing (4)
Production and processing of certified and commercial seed including seed analysis, germination, quality control, cleaning and storage techniques, and seed laws. 3 lectures, 1 laboratory. Prerequisite: CrSc 132 or 133.

CrSc 304 Plant Breeding (4)
Application of principles of plant improvement through selection, hybridization, and utilization of hybrid vigor. 3 lectures, 1 laboratory. Prerequisite: Bio 303.
Crop Science

CrSc 305 Agricultural Inspection (3)

Purpose and function of the State Department of Food and Agriculture, California Agriculture Code, and county departments of agriculture. Basic background to qualify students for the specific county inspector examinations. 2 lectures, 1 activity.

CrSc 311 Applied Insect Pest Management (4)

Principles of controlling insect pests including biological, cultural, physical, mechanical, and chemical controls. Identification of insects injurious to California field, fruit, and vegetable crops including stored products and livestock. Insecticide formulation and methods of application. 3 lectures, 1 laboratory. Prerequisite: Junior standing or consent of instructor.

CrSc 321 Advanced Insect Pest Management (4)

Insecticide classification, insect toxicology, and resistance. Fate of pesticides in the environment. Alternate methods of insect control. Techniques of insect bioassay, insect and vertebrate toxicology, biological controls, insecticide residues. 3 lectures, 1 laboratory. Prerequisite: CrSc 311, Chem 226.

CrSc 322 Crop Technology (3)

Recent developments in technology relating to advancements in crop production and crop systems. 3 lectures. Prerequisite: CrSc 133 and junior standing or consent of instructor.

CrSc 323 Tropical Crop Production (4)

Production distribution, adaptation and utilization of major field and vegetable crops of economic importance in tropical and subtropical areas. 3 lectures, 1 activity.

CrSc 325 Hay and Processed Forage Crops (3)

Intensive study of hay, dehydration and silage making procedures. Storage facilities, grades and market values, anti-oxidants and feed additives that affect bloat and feed quality. 2 lectures, 1 laboratory. Prerequisite: Chem 121.

CrSc 326 Plant Protection Techniques (3)

Plant protection methods and techniques. Pesticide formulation and evaluation of application results for uniformity, rate, and effective placement. Air and ground applications, calibrations. Federal, state, and local laws governing pesticide use and application equipment. 2 lectures, 1 laboratory. Prerequisite: CrSc 221, 311.

CrSc 330 Pasture Management (4)

Identification, production, utilization of irrigated and non-irrigated pasture crops. A study of grazing systems and the merits of mixtures and non-mixtures. A field trip to a production area may be required. 3 lectures, 1 laboratory. Prerequisite: CrSc 131 or CrSc 230.

CrSc 333 Nutriculture (4)

Development, practices, history, and future of crop production using nutrient solutions. Research application, commercial applications, production problems, marketing, and economics. 3 lectures. 1 laboratory. Prerequisite: Chem 122, CrSc 133, SS 221 or consent of instructor.

CrSc 400 Special Problems for Advanced Undergraduates (1–2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of department head.

CrSc 410 Crop Physiology (4)

Practical studies in plant nutrition, soil-water-plant relationships, seed physiology, growth regulators, pesticide reactions, and controlled environments. 3 lectures, 1 laboratory. Prerequisite: Bot 122, SS 221, CrSc 131 or 230, and Chem 328.

CrSc 411 Experimental Techniques and Analysis (4)

Principal methods of experimental design and analysis of collected data. Field practice in planning and lay-out with emphasis on management of agronomic and soils experiments. 3 lectures, 1 laboratory. Prerequisite: Junior or senior standing and Math 103 or equivalent.
CrSc 421 Oil and Fiber Crops (4)
Culture, harvest, grading, and marketing of cotton, flax, safflower, castor beans, minor oil and fiber crops. Field trips to major centers of production and marketing are required. 3 lectures, 1 laboratory. Prerequisite: CrSc 131 or 230.

CrSc 461, 462 Senior Project (2) (2)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

CrSc 463 Undergraduate Seminar (2)
Oral presentation and leadership of group study on recent developments in the major field. 2 lectures.

CrSc 470 Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

CrSc 471 Selected Advanced Laboratory (1–3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. One to three laboratories. Prerequisite: Consent of instructor.

CrSc 521 Advanced Field Crop Production (4)
Production and management of field crops under both intensive and extensive cultural practices; interaction between the various growth factors at various levels of production and interaction of cultural practices and plant requirements. 3 lectures, 1 laboratory. Prerequisite: Permission of the instructor.

CrSc 581 Graduate Seminar in Crop Production (3)
Group study and oral reports on current technical problems and research results pertaining to field and vegetable crops production or marketing. 3 lectures.

DAIRY HUSBANDRY

DH 101 Dairy Feeds and Feeding (2)
Identification and classification of feeds; simple use of food nutrients, protein, fat, and carbohydrates; methods of preparing feeds; relative values of common feeds for each class of livestock with special attention to dairy cattle, the use of byproduct feeds. 2 lectures.

DH 102 Feeding Dairy Cattle (2)
Balancing dairy cattle rations. Feeding practices and nutritional requirements. 2 lectures. Prerequisite: DH 101

DH 121 Elements of Dairying (4)
General introductory dairy course. General information on statistics and opportunities in the dairy industry. Composition and food value of dairy products. Common tests to determine quality of products. Principles and practices of the feeding and management of dairy cattle. 3 lectures, 1 laboratory.

DH 133 Fitting and Showing Dairy Cattle (2)
Selection, preparation, presentation of dairy cattle for shows, sales, and photographing. 1 lecture, 1 laboratory.

DH 142 Dairy Cattle Selection (2)
Selection of dairy cattle with consideration to breed characteristics and conformation. Evaluation of type characteristics. Correlation between type and production. 2 laboratories.
Dairy Husbandry

DH 200 Special Problems for Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of department head.

DH 221 Milk Production (4)
Factors affecting milk production. Dairy production problems and methods. Practice in many of the frequently used dairy production skills. 3 lectures, 1 laboratory. Prerequisite: DH 102, 121, 142.

DH 222 Commercial Dairy Herd Management (4)
Commercial dairy practices from the standpoint of cost of feeding and management. Visits are made to successful dairy farms. 3 lectures, 1 laboratory. Prerequisite: DH 221.

DH 230 General Dairy Husbandry (4)
Selection, breeding, feeding, and management of dairy cattle. Composition and food value of dairy products. Dairy industry statistics and opportunities. Producing and handling products. A general course for other than dairy majors. 3 lectures, 1 laboratory.

DH 233 Advanced Dairy Cattle Selection (2)
Advanced practice in the comparative evaluation of dairy cattle. Detailed scoring and classifying cattle on conformation. Functional anatomy and relationship to production. Visits to breeding establishments and shows. 1 lecture, 1 laboratory. Prerequisite: DH 142.

DH 301 Advanced Dairy Cattle Feeding (2)
Nutrition requirements of dairy cattle. Successful, economical feeding practices. 2 lectures. Prerequisite: DH 102.

DH 323 Breeds, Pedigrees and Management of Dairy Cattle (4)
Origin of modern dairy cattle breeds, organization of cattle clubs. Breed families and herds. Practice in compiling pedigrees. Methods and problems in establishing and managing a pure-bred dairy herd. 3 lectures, 1 laboratory. Prerequisite: DH 221, 222.

DH 330 Artificial Insemination (2)
Techniques in the collection, evaluation, processing, storage and shipment of semen. Insemination procedures. Fertility problems. Record keeping. 1 lecture, 1 laboratory. Prerequisite: DH 121 or ASci 121, VS 123 or VS 100.

DH 400 Special Problems for Advanced Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of department head.

DH 422 Breeding and Selection of Dairy Cattle (4)
Evaluation of inherited characteristics in dairy cattle from an economic standpoint. Proving and selecting sires and dams. 3 lectures, 1 laboratory. Prerequisite: Bio 303, DH 142.

DH 461, 462 Senior Project (2) (2)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

DH 463 Undergraduate Seminar (2)
Reports on student papers, bulletins, periodical articles, and dairy research experiments. Sources of dairy husbandry information. Practice in oral reporting. Late developments and research work in the dairy industry. 2 lectures.

DH 470 Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.
DH 471 Selected Advanced Laboratory (1-3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. One to three laboratories. Prerequisite: Consent of instructor.

DH 519 Advanced Animal Genetics (3)
Application of advanced genetic principles to a program of animal improvement. Mating systems, methods of selection and expected gains. Genetic basis of estimates or heritability, repeatability, genetic correlation, and the development of economical selection indices. 3 lectures. Prerequisite: Bio 303 and permission of instructor.

DH 581 Graduate Seminar in Dairy Production (3)
Current findings and research problems in the field and their application to the industry. 3 lectures.

DAIRY MANUFACTURING

DM 132 Frozen Dairy Foods (4)
Calculating and processing ice cream mixes. Proper equipment and methods required to freeze, package, harden and distribute ice cream and related products. Practice in the college creamery as well as inspection of commercial plants. Manufacture of sherbets and ice milk. Survey of the imitation ice cream field, processing of vegetable fats, etc. 3 lectures, 1 laboratory. Prerequisite: DH 121.

DM 133 Market Milk (4)
Buildings, equipment, and methods used to handle, process and distribute market milk. Judging and grading market milk. Practice in the college creamery and sales room as well as in commercial plants. 3 lectures, 1 laboratory. Prerequisite: DH 121.

DM 202 Dairy and Poultry Product Merchandising (3)
Product promotion, advertising, merchandising. State and national programs. Independent advertising and sales promotion programs. 3 lectures.

DM 220 Dairy Product Consumer Education (2)

DM 230 General Dairy Manufacturing (4)
Nontechnical presentation of the methods and problems involved in modern creamery operation. Testing, flavoring and manufacturing butter, various cheeses, ice cream, market milk, and related products. Elective course for non-dairy students. Survey course for dairy husbandry majors. 3 lectures, 1 laboratory.

DM 233 Dairy Foods Evaluation (2)
Basic principles of sensory examination of dairy foods. Physiology of the various senses and their relationship to distinguishing the quality of dairy products by sight, flavor, body and texture. Product defects, causes, and methods of prevention. 1 lecture, 1 laboratory. Prerequisite: DM 133.

DM 326 Fermented Dairy Foods (3)
Methods, ingredients, and equipment used in the manufacture of fermented dairy products, such as sour cream, buttermilk, and yogurt. Plant practice and field trips to study commercial applications. 2 lectures, 1 laboratory. Prerequisite: Bact 221.

DM 331 Condensed and Dry Milk (4)
Processing, packaging, and marketing of evaporated and condensed milk and dry milk powders. Field trips are made to study commercial plants, methods and equipment. Mojonnier analysis and other routine tests. 3 lectures, 1 laboratory. Prerequisite: DM 132, 133.
Drama

DM 332 Dairy Inspection (3)
California dairy codes and score cards used for dairy plants and farms. Quality tests of dairy products. Practice in inspecting and scoring dairy farms and factories. Organizational structure of inspection services. 2 lectures, 1 laboratory. Prerequisite: DM 133, Bact 221.

DM 334 Cheese (4)
Equipment and methods needed to manufacture, package, cure and market various types of cheese. Practice in the college creamery. 3 lectures, 1 laboratory. Prerequisite: Bact 221, DM 133.

DM 336 Butter and Dairy Spreads (4)
Equipment, ingredients, and methods needed to handle and manufacture various creams, butter, oleomargarine, and other dairy spreads. Practice in university creamery and field trips to observe commercial applications. 3 lectures, 1 laboratory. Prerequisite: DM 133.

DM 431 Dairy Plant Management (4)
Basic management principles applied to the Dairy Industry. Industrial organization and control. Dairy plant location, design facilities and layout. Elements of successful salesmanship, advertising, and marketing. Survey of overhead allocation and of financing and depreciation applied to the dairy industry. Study of significant operating ratios and comparative analysis of financial statements. 3 lectures, 1 laboratory. Prerequisite: Senior standing.

DM 433 Dairy Equipment and Systems (4)
Maintenance and minor repair of vacuum pumps, milk pumps, conveyor and product handling systems, and other specialized equipment. 3 lectures, 1 laboratory. Prerequisite: DM 133 and junior standing.

DRAMA

Dr 200 Special Problems for Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of department head.

Dr 220 Introduction to Theater (3)
Theatrical terminology, basic stagecraft and lighting, stage management, theater practice. Historical development of the theater. 3 lectures.

Dr 320 Acting (3)
Basic acting techniques, improvisation, characterization, pantomime and movement. 3 lectures. Prerequisite: Dr 220.

Dr 321 Directing (3)
Script analysis, motivation and blocking of action, preparation of the prompt book. Direction of practice scenes. 2 lectures, 1 two-hour laboratory. Prerequisite: Dr 220.

Dr 322 Stagecraft (2)
Scenery design, construction, painting, lighting, costumes, and make-up. 2 two-hour laboratories. Maximum of 6 units may be earned. Prerequisite: Dr 220 or consent of instructor.

Dr 327, 328 Theatrical History and Literature (4) (4)
History of the theater and correlated studies of representative plays from 500 B.C. to 1660 A.D., and from 1660 A.D. to present. 4 lectures. Prerequisite: Dr 220 or consent of instructor.

Dr 331 Applied Theater Practices (2)
Preparation of a play for public presentation, including acting, stage management, publicity and house management. Admission to course by audition only. Maximum of 6 units credit may be earned. 2 laboratories.
Dr 347  Children's Drama (3)
Role-playing, group dramatization, and related activities. For students preparing to teach. 1 lecture, 2 two-hour laboratories.

Dr 422  Stage Scenery and Lighting Design (3)
Stage scenery and lighting design from the study of the script through the rendering of elevations and the construction and lighting of models. Light and color as used in scenery design. 3 lectures. Prerequisite: Dr 220.

Dr 470  Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

ECONOMICS

Econ 101  Introduction to Economics (2)
The scope and methods of economic science, with emphasis on the relevance of economics to the overall functioning of society. 2 lectures.

Econ 105  Consumer Economics (3)
Consumer-producer relationships, money management, buying methods; investments, insurance, and housing; agencies that help the consumer. 3 lectures.

Econ 200  Special Problems for Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of department head.

Econ 201  Survey of Economics (3)
Basic material covered in Principles of Economics, Econ 211, 212 in a less detailed and technical manner. For majors requiring one quarter of economics. Not open to students with previous credit in Econ 211 or 212 or equivalent. 3 lectures. Prerequisite: Sophomore standing. Successful completion of Freshman Composition recommended.

Econ 211  Principles of Economics (3)
Macro-economics: principles and applications in the theory of national income, output and employment. Determination and measurement of the national product; inflation; money, banking, monetary and fiscal policies. 3 lectures. Prerequisite: Sophomore standing. Successful completion of English composition recommended.

Econ 212  Principles of Economics (3)
Micro-economics: principles and applications in the theory of producer and consumer behavior, and the distribution of factor income with focus on the output market. Effect on the national economy. 3 lectures. Prerequisite: Econ 211 or consent of instructor.

Econ 221  Microeconomics (4)
Rigorous examination of micro-economic analysis. Marginal analysis as related to consumer, producer, and factor behavior in determination of prices and output. An in-depth study of microeconomic principles. 4 lectures. Prerequisite: Sophomore standing. Successful completion of freshman math and English recommended.

Econ 222  Macroeconomics (4)
Rigorous examination of macroeconomic analysis. Aggregate output, employment, prices, and economic policies for changing these variables. An in-depth study of macroeconomic principles. 4 lectures. Prerequisite: Sophomore standing. Successful completion of freshman mathematics and English recommended.
Economics

Econ 301  Introduction to Managerial Economics (3)
Fundamental principles and analytical tools of economics useful in business decision making; applications to management through case study of actual business and managerial situations. 3 lectures. Prerequisite: Econ 212 or 221 or consent of instructor.

Econ 304  Comparative Economic Systems (3)
Analysis of economic principles and institutions applicable to capitalism, socialism, and communism. 3 lectures. Prerequisite: one course in principles of economics.

Econ 306  Applied Forecasting (3)
Causes and measurement of business fluctuations. Techniques of forecasting. 3 lectures. Prerequisite: one course in principles of economics.

Econ 311, 312  Intermediate Microeconomics (4) (4)
Economics of prices and markets. Demand and supply. Returns and costs, factor pricing and income distribution, welfare and economic progress. 4 lectures. Prerequisite: One course in principles of microeconomics; Math 221 or equivalent; Stat 211, 212 or equivalent.

Econ 313  Intermediate Macroeconomics (4)
Economic activity related to production and resource use to meet goals of society. Income, employment, economic growth and progress of the United States and its regions. 4 lectures. Prerequisite: One course in principles of macroeconomics; Math 221 or equivalent; Stat 211, 212 or equivalent; Econ 337.

Econ 317  Development of Economic Analysis (3)
Analysis of ideas related to the development of economic theory in the Western civilization from the Greeks through the classical, neoclassical, and Keynesian to the current post-Keynesian concepts. 3 lectures. Prerequisite: Junior standing and satisfactory completion of Econ 211, 212 or Econ 221, 222 or consent of instructor.

Econ 323  European Economic History (3)
Analysis of the growth and development of economic institutions in the European economies from about 1600 to present. 3 lectures. Prerequisite: One course in principles of economics.

Econ 324  American Economic History (3)
Topical economic analysis of major events and institutions of American economic history as viewed against their causes, origin and development. Economic development of America from an underdeveloped nation. Agriculture, transportation, monetary and banking policies, business, labor, and growth of governmental activities. 3 lectures. Prerequisite: one course in principles of economics.

Econ 325  Underdevelopment and Economic Growth (3)
Economic Development: the less developed world and the American interest. 3 lectures. Prerequisite: one course in principles of economics.

Econ 334  Urban Economics (3)
Application of basic tools of economic analysis to problems of urban regions. Causes and possible cures for inadequate growth rate, income levels, and the quality of life in urban regions. 3 lectures. Prerequisite: one course in principles of economics.

Econ 337  Money, Banking and Credit (4)
Principles and practices of monetary, banking, and credit institutions as applied to business activity and public policy. 4 lectures. Prerequisite: One course in principles of macroeconomics.

Econ 339, 340  Econometrics (4) (4)
Application of statistical methods useful in economics. The general linear regression model. Specific issues and problems related to economic models: multicollinearity, autocorrelation, heteroscedasticity, dummy variables, lagged variables, and simultaneous equation estimation. Application and evaluation of selected examples of empirical economic research. 4 lectures.
Economics

Prerequisite: Stat 322, Math 132 or 143 or 221, or consent of instructor.

**Econ 400 Special Problems for Advanced Undergraduates (1–2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of the department head.

**Econ 401 International Trade (3)**

Theory of comparative advantage, gains from trade, and recent developments in trade theory; examination of tariffs, quotas, exchange controls, other trade barriers and underlying policy issues; review of U.S. commercial policy, GATT, the common market, regional and world economic organizations. 3 lectures. Prerequisite: Econ 211, 212 or Econ 221, 222 or consent of instructor.

**Econ 402 Public Finance (3)**

Principles of government financing and its various economic and social effects: collecting, spending and administration of public funds, particularly at state and local levels. 3 lectures. Prerequisite: Econ 211, 212 or Econ 221, 222 or consent of instructor.

**Econ 403 Industrial Organization (3)**

Application of basic tools of economics to American Industry. Case studies of individual firms and industries. Performance of various business structures, such as monopoly and oligopoly. Effects of government regulation and antitrust policy. 3 lectures. Prerequisite: Econ 212, or 211 or 221, 222 or consent of instructor.

**Econ 404 International Monetary Economics (3)**

Nature of international payments, U.S. balance of payments. Theory and practice of foreign exchange rate determination under the gold standard, paper standard, and IMF system; international money and capital markets; problems of international liquidity and monetary stability. 3 lectures. Prerequisite: Econ 211, 212 or Econ 221, 222 or consent of instructor.

**Econ 410 Cost-Benefit Analysis (3)**

Principles of rational decision making with respect to business and government spending. Measurement of costs and benefits, interest rates, and criterion selection. 3 lectures. Prerequisite: Econ 312.

**Econ 413 Labor Economics (3)**

Wage determination theory, basic economic factors that affect the labor movement, economic impact of union activities on employment, output, income, wages, prices, and national economic policy. 3 lectures. Prerequisite: Econ 212 or 221 or consent of instructor.

**Econ 414 Monetary and Fiscal Policies (4)**

National economic fluctuation models and related corrective monetary and fiscal policies on income, employment, output, growth and prices. 4 lectures. Prerequisite: Econ 313.

**Econ 433 Transportation Economics (3)**

Analysis of the allocation of resources to the U.S. transport sector and specific transport modes as a result of their natural economic characteristics and public policy. 3 lectures. Prerequisite: one course in principles of economics.

**Econ 461, 462 Senior Project (2) (2)**

Selection and analysis of a problem under faculty supervision. Problems typical of those which graduates must solve in their fields of employment. Formal report is required. Minimum 120 hours total time.

**Econ 463 Undergraduate Seminar (2)**

Seminar in applications of economic theory with emphasis on current problems. 3 meetings. Prerequisite: Econ 462.
Education

**Econ 470** Selected Advanced Topics (1–3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: consent of instructor.

**Econ 500** Independent Study (1–3)

Advanced study planned and completed under the direction of a departmental faculty member. Open only to graduate students demonstrating ability to do independent work. Enrollment by petition. Prerequisite: Consent of the department head.

**Econ 511** Micro-Economics (3)

Analysis of production, demand, supply, costs, market structures, factor pricing, and policy decision making by business firms and consumers. 3 lectures. Prerequisite: Econ 221, 222 or equivalent.

**Econ 512** Macro-Economics (3)

Analysis of aggregative economics. Theories of income, output, employment; growth of the economy; economic policies. 3 lectures. Prerequisite: Econ 221, 222 or equivalent.

**Econ 513** Seminar in Economic Forecasting (3)

Short- and long-term forecasts of business activity through the construction of econometric or time series models. Analysis of models used in forecasting exercises. 3 lectures. Prerequisite: Econ 511 or 512 or equivalent.

**Econ 582** Seminar in Economics (1–3)

Special problems in related areas of Economics. Each seminar will have a subtitle describing its nature and content. 1 to 3 meetings. Maximum of 6 units may be earned. Prerequisite: 9 units of economics and graduate standing or consent of the instructor.

**EDUCATION**

**Ed 138** Exploring Education Careers (2)

Self-determination of abilities, interests and personality attributes for teaching and related positions in education. Considerations for employment prospects. Ed 139 to be taken concurrently for related field experience. 2 lectures.

**Ed 139** Exploring Education Field Experience (1–3)

Determining abilities, interests, and personality factors for teaching and related positions in education. Supervised firsthand experience in elementary and secondary schools.

**Ed 203** Efficient Reading (2)

Development of reading efficiency required in modern business, industry, and the professions. 1 lecture, 1 activity. Prerequisite: Engl 104.

**Ed 301** Multicultural Education in Public Schools (3)

Multicultural factors that influence learning in the public schools; professional responsibilities and legal requirements in the profession. 2 lectures; 1 activity. Prerequisite: Junior standing or permission of instructor.

**Ed 315** Contemporary Education of the Afro-American (3)

Interpretation, analysis, and critique of major problems, issues and trends affecting contemporary education of the Afro-American within social, economic and educational institutions. 3 lectures. Prerequisite: Soc 105, Hist 331, or consent of instructor.

**Ed 322** Community Laboratory (2)

Learning experiences in cooperation with youth club activities and educational agencies. Application of knowledge and skills acquired in college classrooms. Supervised activities with children and adults in educational programs. 1 lecture, 1 activity. Total credit limited to 4 units. Prerequisite: Ed 304 or permission of the instructor.

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Ed 323 Basic Motion Picture Techniques (3)
Planning and production of motion pictures. Writing, filming, editing, and sounding. Includes some basic photography and sound recording techniques. 2 lectures, 1 laboratory. Prerequisite: Junior standing or consent of instructor.

Ed 335 The Learning Process (3)
How and why students learn in school, motivation and classroom behavior, nature of the learning process and human development. Self evaluation of the prospective teacher. 3 lectures. Prerequisite: Junior standing.

Ed 402 Minority Student Counseling and Guidance (3)
Socio-psychological concepts of the minority culture. Effects of poverty and the significance of minority status. Counseling and guidance techniques, parent involvement, and community relations. 3 lectures. Prerequisite: Psy 202.

Ed 414 Teaching Reading to Bilingual Students (3)
Principles, procedures and materials for teaching reading to bilingual students coupled with diagnostic and prescriptive methods for understanding reading problems of the bilingual student. 2 lectures, 1 activity. Prerequisite: Ed 434.

Ed 415 Early Childhood Education (3)
Brief history of the kindergarten and nursery school program. Study of the needs, behavior and development of young children and how they affect readiness for learning. 3 lectures.

Ed 416 Contemporary Education of the Chicano (3)
Methods of teaching the Chicano in public schools subjects with emphasis on materials and procedures which will facilitate learning. 3 lectures. Prerequisite: CD 302, Soc 105, Hist 331 or consent of instructor.

Ed 421 Instructional Media Technology (3)
Visual and auditory methods and materials of value in classroom teaching in elementary and secondary schools. Lecture, lecture-demonstration, discussion, previewing, and laboratory work. Planning and correlating use of audiovisual techniques in the classroom. 2 lectures, 1 laboratory. Prerequisite: Ed 335 or consent of instructor.

Ed 424 Organizing and Teaching Multiple Subjects (3)
Introduction to the organization, selection, presentation, application, and interpretation of subject matter in the basic curriculum areas. Course designed for students who will be teaching in elementary schools. 3 activities. Prerequisite: Ed 438.

Ed 430 Preliminary Student Teaching (6)
Part-time assignment usually prior to Ed 440. Includes participation, teaching and allied activities under direction of a selected regular teacher in consultation with a university supervisor. Application for student teaching must be approved prior to enrollment. A grade below "C" is unacceptable for recommendation for a credential. Prerequisite: admission to teacher preparation program.

Ed 434 Field Experience in Reading Methods (2)
Supervised field experience in the teaching of reading in a school setting. Seminars relating to instructional procedures. Prerequisite: Advanced standing.

Ed 435 Methods of Teaching Reading (3)
Patterns of classroom organization, application of reading programs, approaches, modalities and methods in the classroom. 3 lectures. Prerequisite: Ed 434.

Ed 436 Diagnosis, Prescription and Evaluation (2)
Diagnosis of student learning problems. Prescription and direction of student learning programs. Evaluation of student achievement. 1 lecture, 1 activity. Prerequisite: Advanced standing.
**Ed 438 Instructional Processes (3)**

Development of skills in classroom communication, planning instruction, selection and use of instructional materials. Teaching strategies, guiding discussion, promoting critical thinking, problem-solving, effective questioning, creating a learning environment. Examination of various types of classroom organization. 3 activities. Prerequisite: Admission to teacher education program or permission of instructor.

**Ed 439 Supervised School Experience (2-4)**

Supervised observation and participation in public schools, including experiences as teacher aide or instruction assistant; seminars relating to instructional procedures. Prerequisite: Advanced standing.

**Ed 440 Student Teaching (12)**

Full-time assignment usually preceded by Ed 430. Includes teaching and allied responsibilities under direction of a selected regular teacher in consultation with a university supervisor. Application for student teaching must be approved prior to enrollment. A grade below "C" is unacceptable for recommendation for a credential. Prerequisite: Admission to teacher preparation program.

**Ed 441 Student Teaching Practicum (3)**

Practices and problems of student teaching. Current innovations in teaching procedures and materials. Taken concurrently with single subject student teaching. 2 lectures, 1 activity.

**Ed 442 Curriculum and Methods in Kindergarten-Primary Education (3)**

Objectives, methods, and curriculum for the kindergarten-primary grades. Acquisition of appropriate materials, and construction of instructional aids. 2 lectures, 1 activity. Prerequisite: Advanced standing.

**Ed 443 Curriculum and Methods in Elementary School Language Arts (3)**

Methods and materials for teaching language usage, spelling, handwriting, listening and speaking. 3 lectures. Prerequisite: Advanced standing.

**Ed 444 Curriculum and Methods in Elementary School Science (3)**

Curriculum, methods, and teaching procedures in elementary school science. The California Science Program. 3 lectures. Prerequisite: Advanced standing and approval of credential advisor.

**Ed 445 Curriculum and Methods in Elementary School Social Studies (3)**

Curriculum, methods, and teaching procedures in elementary school social studies with emphasis on the California program. 3 lectures. Prerequisite: Advanced standing and approval of credential advisor.

**Ed 446 Curriculum and Methods in Conservation Education (3)**

Methods of integrating conservation into the curriculum of the public schools. Techniques of teaching, instructional materials, resources, and audio-visual aids. For inservice and preservice personnel. 3 lectures. Prerequisite: Cons 311, Bio 325.

**Ed 451 Senior Project—Practicum (3)**

Analysis of practices and problems of student teaching. Taken concurrently with Ed 440. Limited to B.A. in Liberal Studies credential candidates. Written paper or report required. 2 lectures, 1 activity.

**Ed 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**Ed 480 Problems of Exceptional Children (3)**

Developmental and learning problems common to mentally, emotionally, socially, and physically handicapped children and youth. Legal basis for educational adjustments and program development. 3 lectures. Prerequisite: Ed 335.
Ed 481 Curriculum and Methods for Special Education (3)

Curriculum, methods and materials in the education of children and youth with learning disabilities, behavior disorders and educational retardation. 2 lectures, 1 activity. Prerequisite: Ed 480.

Ed 500 Individual Study (1–3)

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Consent of the department head, the graduate major adviser, the supervising faculty member, and Ed 524.

Ed 501 Philosophy of Education (3)

The function of philosophy; the meaning of education; significance of present philosophical points of view; education aims and values; democracy and education; the relationship of various philosophical outlooks to educational methods and subject matter. 3 lectures.

Ed 503 Guidance Services (3)

Philosophy and concepts and underlying guidance services. Procedures, techniques, and materials employed by counselors, teachers and others in meeting individual student needs. 3 lectures. Prerequisite: Psy 201 or 202.

Ed 504 Measuring and Evaluating Learning (3)

Assessing the results of instruction in terms of educational objectives, principles of test construction, criteria for test selection, analysis and interpretation of test results, application to various school subjects, use of other evidences of performance, and models for evaluating innovations and change. 3 lectures. Prerequisite: Psy 201 or 202.

Ed 507 Staff Administrator Relationships (3)

Principles and practices of personnel administration in school systems: recruitment and selection of personnel; job descriptions and role expectancies; job rewards, benefits, and incentives; rules, regulations, and policies; negotiations and grievance procedures; formal and informal communications; professional ethics and codes of behavior. 3 lectures. Prerequisite: Valid teaching credential or consent of instructor.

Ed 508 Educational Sociology (3)

Sociological backgrounds of school children; effects of social, economic, and political trends and issues on education; problems of leisure, recreation, and occupations; modern interpretations of democratic ideology. Sociological problems are utilized to define the social objectives of the school. 3 lectures.

Ed 510 School Finance and Business Management (3)

Financial administration of public schools in California. Principles of school support, sources and methods of apportioning funds to school districts. Development of budgets; implications for educational needs at the district, school and classroom levels. 3 lectures. Prerequisite: Valid teaching credential or consent of instructor.

Ed 511 School Law (3)

Legal aspects of school administration, including principles embodied in constitutional, statutory and administrative law, common law, and court decisions with implications for administration and operation of public schools in California. 3 lectures. Prerequisite: Valid teaching credential or consent of instructor.

Ed 512 School Administration (3)

Principles and practices of organizing and administering elementary and secondary schools, including leadership, decision-making processes, human relations, instructional problems, special services, school plant management, educational planning for change, and staff development. 3 lectures. Prerequisite: Valid teaching credential or consent of instructor.
Ed 513 Federal, State, County, and District School Administration (3)
Overview of public education in relation to the formal organization and administration at federal, state, intermediate and local district levels, and the influences upon education exerted by political, social, economic and religious groups and organizations. 3 lectures. Prerequisite: Valid teaching credential or consent of instructor.

Ed 515 Curriculum Development (3)
Strategies for curriculum development in elementary and secondary schools: curriculum models, rationales, innovations and trends; leadership for curriculum study; curriculum design and instructional strategies; and assessing effects of curriculum and instructional change upon learning. 3 lectures.

Ed 516 Supervision of Instruction (3)
Principles and techniques of educational leadership in improving teacher-learner relationships in elementary and secondary schools; organizing, equipping and staffing classes; communicating with individuals and groups; in-service education programs and activities; curriculum development and implementation; and program and staff evaluation. 3 lectures. Prerequisite: Valid teaching credential or consent of instructor.

Ed 517 School-Community Relationships (3)
Strategies for community action between educational institutions and their respective publics. Establishing working relationships with other educational institutions; children and youth; parents and home neighborhoods; and politics and community power structures. Cooperative efforts in resolving contemporary urban and rural community problems. 3 lectures.

Ed 518 Reading Problems in the Schools (3)
Reading problems in the schools including diagnosis of reading deficiencies, remediation, and suitable reading material. 3 lectures. Prerequisite: Ed 434, 435, 440, or permission of instructor.

Ed 519 Teaching the Gifted Child (3)
The nature of the growth and development of gifted children, including physical, social, and achievement aspects. Methods of identifying giftedness, gifted children, and children with special abilities. Study of selected programs for teaching gifted children in California and other states. 3 lectures.

Ed 520 Elementary Reading Programs (3)
School reading programs and classroom organization. Application of research findings to teaching reading. Survey of innovative programs in elementary school reading. For teachers and supervisors. 3 lectures. Prerequisite: Ed 434, 435 or permission of instructor.

Ed 521 Teaching the Culturally Different (3)
Cultural factors that inhibit learning in the school; problems and needs of the disadvantaged child; classroom procedure and materials to facilitate learning and increase educational achievement; preparation for teaching in depressed areas. 3 lectures. Prerequisite: Graduate standing.

Ed 522 Teaching Reading in the Secondary Schools (3)
Principles, procedures, and materials for improving reading in the subject matter areas with students of different backgrounds and abilities in grades 7 through 12. 3 lectures. Prerequisite: Ed 434, 435, 440, or permission of instructor.

Ed 523 Remedial and Special Education (3)
Theory and practice of diagnosing educational and psychological difficulties affecting the ability of children to profit from education. Case study and case conference approaches to understanding and assisting children with learning difficulties. 3 lectures. Prerequisite: Ed 503, Psy 432.
Ed 524 Investigative Techniques (3)
Principles and methods of planning and carrying out systematic investigations dealing with learning, teaching, curriculum, instructional planning, pupil personnel services, and other related areas. 3 lectures. Prerequisite: Math 100, Psy 201 or 202.

Ed 525 Group Guidance (3)
A study of group research, techniques and evaluation with emphasis on practical application in educational settings, groups dissemination of occupational-educational information, group counseling and classroom activity groups. 3 lectures. Prerequisite: Ed 503.

Ed 526 Supervised Case Studies in Reading (3)
Supervised diagnosis and treatment of reading disability cases referred to the University by counselors, parents, teachers, and pupils themselves. Weekly interviews with school students, and seminars for discussion and analysis of current cases. Prerequisite: Ed 440, 518, Psy 433, or permission of instructor.

Ed 528 Advanced Counseling Critique (3)
Advanced practice in vocational, personal, and educational counseling for students in the pupil personnel program. Counseling theory and procedure, educational and career planning. Application of theory to practical counseling situations. 3 lectures. Prerequisite: Ed 503, 525.

Ed 529 Supervision of Vocational and Practical Arts Education (3)
Methods of designing and implementing programs of vocational and practical arts education (applied arts) including agriculture, business, diversified co-operative, distributive, work experience education, homemaking, industrial arts, and trade technical education. 3 lectures.

Ed 539 Educational, Occupational and Community Information (3)
Collecting occupational, educational and community information including community resources such as agencies and organizations that provide services to individuals or groups. Sources and techniques of collecting and imparting such information stressed. 3 lectures. Prerequisite: Ed 503.

Ed 540 Appraising Career Development (3)
Appraisal procedures and theory in career guidance and counseling. Synthesis of personal and social data to diagnose and predict career development and choice. 3 lectures. Prerequisite: Ed 503.

Ed 541 Administration of Pupil Personnel Services (3)
Organization of pupil personnel services programs, their administration, their evaluation. Use of community resources and a study of laws relating to children and child welfare. 3 lectures. Prerequisite: Ed 503.

Ed 546 Supervised Field Experience, Guidance and Counseling (3)
Practical application of guidance services and counseling in public schools, colleges, and related community settings. Weekly seminars with College staff included. Prerequisite: Consent of Pupil Personnel Services Committee.

Ed 550 Career Education (3)
Curriculum and purpose of career education in elementary and secondary schools and higher education. 3 lectures.

Ed 564 Reading Process (3)
Physiological, psychological and psycholinguistic components of the reading process. 3 lectures. Prerequisite: Ed 434, 435.

Ed 566 Remediation of Reading Problems (3)
Interpreting diagnostic results and prescribing remediation for specific reading problems within classrooms and special reading centers. 3 lectures. Prerequisite: Ed 514.
Electrical Engineering

Ed 570 Disruptive Behavior in the Classroom (3)
Basic strategies for facilitating social-emotional techniques which shift disruptive behavior to appropriate behavior. 3 lectures. Prerequisite: Student teaching.

Ed 580 Student Teaching: Special Education (6)
Teaching experience with individual and small groups with learning disabilities. A multidimensional approach to treatment after careful and intensive diagnosis of problems. Prerequisite: Ed 481, 523.

Ed 581 Graduate Seminar in Education (1–3)
Group study of contemporary problems in education. Trends, developments, and issues. Total credit limited to 6 units. Prerequisite: Graduate standing.

Ed 588 Administration or Supervision Field Work (3)
Supervised field work in school administration or supervision at the elementary or secondary level; specific assignments made to cover important aspects of school administration or supervision. Prerequisite: Valid teaching credential, Ed 531 or 516, Ed 532 or 512, and consent of instructor.

ELECTRICAL ENGINEERING

EE 110 Orientation (1)
Familiarization with the field of electrical and electronic engineering. 1 lecture.

EE 122 Elements of Electricity (3)
Electrical fundamentals, properties of wires, wiring devices and electrical apparatus. Wiring practice. Introduction to polyphase circuits and motors. 3 lectures.

EE 162 Electrical Laboratory (1)
Basic electricity, electrical wiring practices, measurements, and safety. 1 laboratory. Concurrent or prerequisite: EE 122.

EE 200 Special Problems for Undergraduates (1–2)
Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of department head.

EE 201 Electric Circuit Theory (3)
Fundamental electric laws. Electric circuits and circuit theorems. Analysis of alternating current, single and three phase circuits using symbolic method (complex phasors). Coupled circuits and transients. For non-electrical engineering majors. 3 lectures. Prerequisite: Math 242, Phys 133.

EE 211, 212 Electric Circuit Analysis (3) (4)
Basic definitions. Power and energy relationship. Transient and steady state analysis of linear direct and alternating current circuits by mesh and nodal methods. Network theorems, duality, phasor and complex frequency concepts. EE 211: 3 lectures; EE 212: 4 lectures. Prerequisite: Math 143 or equivalent.

EE 231 Electric Machines (3)
Review of d.c. and a.c. electric circuit principles. Introduction to polyphase a.c. circuits. Physical and electrical characteristics of the more common type of d.c. and a.c. machines. Starting and reversing methods for machines. Basic transformer connections and usage. Not for engineering majors. 3 lectures. Prerequisite: EE 122 or ET 126 or equivalent.

EE 241, 242 Electric Circuits Laboratory (1) (1)
Steady-state and transient electric circuit behavior. Instrumentation techniques. 1 laboratory. Concurrent or prerequisite: EE 211, 212.
EE 261  Electric Circuits Laboratory (1)

EE 271  Electric Machines Lab (1)
  Transformers, d.c. and a.c. rotating machines and evaluation of operating characteristics of these devices. 1 laboratory. Concurrent or prerequisite: EE 231.

EE 301  Network and System Analysis (3)

EE 303  Power Transmission (3)
  Transmission line parameters and characteristic constants. Power and signal transmission. Reflection, impedance matching, and transmission systems. 3 lectures. Prerequisite: EE 301.

EE 324  Electrical Systems Design (3)

EE 325  Energy Conversion Electromagnetics (3)
  The fundamentals of electro-mechanical energy conversion. Magnetic circuits and electromagnetic devices. Theory of operation and operating characteristics of transformers, d.c. machines and a.c. induction and synchronous machines. 3 lectures. Prerequisite: EE 201 or EE 212.

EE 327  Illumination (3)
  Theory and practice of illumination. Mechanical and electrical problems in installation and control of lighting sources. Measurement of light. 2 lectures, 1 laboratory. Prerequisite: Consent of instructor.

EE 341  Advanced Circuits Laboratory (1)
  Fourier analysis, network transfer functions, and network response. 1 laboratory. Concurrent or prerequisite: EE 301.

EE 343  Power Transmission Laboratory (1)
  Power transmission lines. Load study of power transmission networks by using digital computers and a.c. network analyzer. 1 laboratory. Concurrent or prerequisite: EE 303.

EE 351  Systems Engineering (3)
  Circuits, networks and systems utilizing analog and digital computer simulation methods. Modeling, formulation of system equations, transient and forced response of dynamic systems. 2 lectures, 1 laboratory. Prerequisite: EE 301.

EE 365  Energy Conversion Laboratory (1)
  Single phase and three-phase transformers. Starting of large rotating machines, evaluation of characteristics of rotating machines. 1 laboratory. Concurrent or prerequisite: EE 325.

EE 400  Special Problems for Advanced Undergraduates (1-2)
  Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

EE 404  Stochastic Processes in Systems (3)
  Application of probabilistic models to solution of system problems in control engineering and power systems. Engineering decision choices among alternative designs, systems and random signals. Analysis of linear systems with random input. 3 lectures. Prerequisite: Senior standing.
EE 406 Power System Analysis I (4)

Introduction to electric power systems. Representation of power systems and components. One line diagrams and per unit calculations. Power limits and stability, system model representation of the synchronous machine, symmetrical faults, electrical insulation, grounding. 4 lectures. Prerequisite: EE 303.

EE 407 Power Systems Analysis II (4)

System protection, relays and relay systems, faults, load flow calculation, computer solutions, power system instrumentation and measurement techniques. 4 lectures. Prerequisite: EE 406.

EE 410 Power Control I (4)

Power semiconductor devices. Theory of power diodes, SCR, Triac, Diac, Unijunction transistor, etc., as a modeling of diode and SCR circuits, SCR trigger circuits, analysis of SCR circuit in rectifiers, inverters, and cycloconverters. 3 lectures, 1 laboratory. Prerequisite: EE 325, EL 309.

EE 411 Power Control II (4)

Analysis of d.c. and a.c. motors controlled by rectifiers, inverters, and cycloconverters; modeling of rectifier—d.c. motor systems; modeling of inverter—induction motor drive system; regenerative braking; electric propulsion; analog and digital computer study of motor control system. 3 lectures, 1 laboratory. Prerequisite: EE 410.

EE 414 Direct Energy Conversion (3)

Direct energy conversion, and storage, with consideration of resources, batteries, fuel cells, thermoelectricity, thermionic generators, solar energy, cells, MHD, power generation, and related topics. 3 lectures. Recommended as a complement to ME 415. Prerequisite: ME 302.

EE 417 Alternating Current Machines (4)

Analysis of a.c. systems and components. Generalized, operational and dynamic analysis. Unbalanced operations. 3 lectures, 1 laboratory. Prerequisite: EE 325, 365.

EE 419 Nuclear Power Plant Instrumentation and Control (3)

Block diagram transfer function representation of nuclear power plants. The control problem. Instrumentation practices in nuclear power plant design. Design and use of instrumentation sensors and modules in plant safety and control systems. 3 lectures. Prerequisite: EL 431 or ME 422, EL 321 or equivalent.

EE 421 Senior Systems Design (1–3)

Application of engineering systems and analysis to design problems. Creative thinking emphasized. Group and individual assignments. 1–3 activity periods. Prerequisite: Senior standing in Electronic or Electrical Engineering or consent of instructor.

EE 431 Control Systems (3)

Automatic feedback control systems. Analysis of linear systems. 3 lectures. Prerequisite: EE 325, 351.

EE 432 Control Systems Engineering (3)

An advanced course in analysis and design of control systems based on root-locus, frequency domain and computer approach. Non-linear sampled data and self-adaptive systems. 3 lectures. Prerequisite: EE 431 or consent of instructor.

EE 434 Control Systems Laboratory (1)

Laboratory work in feedback control systems. Recommended to accompany or follow EE 431. 1 laboratory. Concurrent or prerequisite: EE 431.

EE 444 Power Systems Analysis (1)

EE 461, 462 Senior Project (2) (2)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time. Prerequisite: EE 325, 351, EL 309, 319.

EE 463 Undergraduate Seminar (2)
Discussion of new developments in the fields of power systems and control. Fields of employment and job considerations. 2 meetings. Prerequisite: senior standing.

EE 470 Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

EE 471 Selected Advanced Laboratory (1-3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. One to three laboratories. Prerequisite: Consent of instructor.

ELECTRONIC ENGINEERING

EL 131 Introduction to Electric Circuits (2)
Analytic problem solving in elementary d.c. circuits. Experimental laboratory verification. Measurement techniques, use of power supplies and meters. Magnetism and electromagnetism. Induced voltages and currents. 2 activities.

EL 132 Introduction to Semiconductor Devices (2)
Use of oscilloscope, transistor curve tracers, signal generators, and VTVM for measurements in electronic circuits. 2 activities.

EL 200 Special Problems for Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of department head.

EL 207 Introduction to Electric and Magnetic Fields (4)
Introduction to fundamental physical concepts underlying electricity and electronics, with particular reference to basic electric and magnetic field theory. Engineering applications of electric and magnetic fields. 4 lectures. Prerequisite: Phys 131, Math 143.

EL 303 Signal Transmission (3)
Distributed constants and traveling waves. Transmission line parameters and characteristic constants. Lines with and without reflection. Pulse transmission. Smith Chart, coaxial lines. Measurements, impedance matching, transmission systems. 3 lectures. Prerequisite: EE 301.

EL 305 Introduction to Digital Circuits (4)
Solid-state devices and circuits used in digital computer electronics. Diode and transistor switching action, operation of multivibrators (flip-flop) circuits. Integrated circuit fabrication and operation. Not open to Engineering or Engineering Technology majors. 3 lectures, 1 laboratory. Prerequisite: Phys 133.

EL 307 Electronic Devices and Circuits (4)
Physical and analytical study of various electron devices with primary emphasis on semiconductor material, diode and transistor theory. Transistor circuit models, basic amplifiers, and biasing. 4 lectures. Prerequisite: EL 207.

EL 308 Electronic Circuits (4)
Analysis and design of linear small-signal amplifiers, tuned amplifiers, power amplifiers, and feedback. 4 lectures. Prerequisite: EE 301, EL 307.
EL 309 Integrated Electronic Circuits (4)
Analysis and design of power supplies, oscillator, pulse, digital, gating, counting and timing circuits. Piecewise-linear analytical techniques are emphasized. 4 lectures. Prerequisite: EL 308.

EL 313 Analog Computer Techniques (3)
Course designed for mathematics, science and engineering majors other than electronic and electrical. Fundamental principles of analog computers, field of application in science and engineering. Programming techniques. Output devices. Simulation of linear and non-linear systems. 2 lectures, 1 two-hour laboratory. Prerequisite: Math 242.

EL 314 Applied Electronics for Non-Engineers (4)
Basic electronic principles, digital, analog, transducers and servo-systems used in scientific instrumentation. Designed for science students with minimal background in electronics. 3 lectures, 1 laboratory. Prerequisite: Math 117 and junior standing or consent of instructor.

EL 319 Logic and Switching Circuits (3)
Number base conversion complements and fundamental coding theory. Design and analysis of combinational logic circuits. Minimization techniques. Multiple function synthesis using ROM's and PLA's. Synchronous sequential circuit design. Design of counters and sequence generators. Introduction to computer organization. 3 lectures. Prerequisite: EL 307.

EL 321 Electronics (3)
Semiconductor electronic devices and circuits. Rectifiers, amplifiers, feedback oscillators, pulse forming and shaping, frequency response, modulation, detection and computer logic circuits. Not for electronic or electrical engineering majors. 3 lectures. Prerequisite: EE 201.

EL 327 Electronic Instrumentation and Measurement (4)
Principles and characteristics of instruments and instrumentation systems; analog and digital transducers; A/D conversion; data and signal transmission and amplification problems. Low level signal, high frequency signal, and high accuracy signal measurement problems. Automated instrumentation systems. 3 lectures, 1 laboratory. Prerequisite: EE 301, EL 308.

EL 334 Electromagnetic Fields I (3)
Advanced treatment of static electric and magnetic fields and electric currents. Magnetic fields in ferromagnetic materials, time changing electric and magnetic fields. 3 lectures. Prerequisite: Math 318, EL 207.

EL 343 Signal Transmission Laboratory (1)
Impedance measurements, traveling-wave phenomena in transmission lines, impedance matching. 1 laboratory. Concurrent or prerequisite: EL 303.

EL 347 Electronic Devices Laboratory (1)
Semiconductor devices: junction diodes, junction transistors, field-effect transistors and other solid state devices. 1 laboratory. Concurrent or prerequisite: EE 307.

EL 348 Electronic Circuits Laboratory (1)
Design, construction and testing of solid state amplifier to meet stated specifications. 1 laboratory. Concurrent or prerequisite: EL 308.

EL 349 Integrated Electronic Circuits Laboratory (1)
Design and testing of analog circuits and linear and digital integrated circuits. 1 laboratory. Concurrent or prerequisite: EL 309.

EL 361 Electronics Laboratory (1)
Rectifiers, amplifiers, feedback, oscillators, and digital logic circuits. 1 laboratory. Concurrent or prerequisite: EL 321.
Electronic Engineering

EL 400  Special Problems for Advanced Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

EL 401  Electromagnetic Fields II (3)
Maxwell's equations. Plane waves in various media, wave polarization, reflection and refraction. Transmission lines, waveguides and antenna concepts. 3 lectures. Prerequisite: EL 334.

EL 402  Microwave Engineering (3)
Application of Maxwell's equations and boundary value problems to wave guide structures. Microwave equivalent circuit theorem. Passive microwave devices including treatment of microwave propagation in ferrites. 3 lectures. Prerequisite: EL 401.

EL 404  Microprocessor System Design Methodologies (3)
Classification and functional configurations of existing microprocessors and analysis of hardware system designs and system economics. Interface design techniques utilizing programmable I/O interfaces, real-time clocks, interrupts, and DMA channels. Representative applications. 3 lectures. Prerequisite: EL 319, CSc 221, or consent of instructor.

EL 405  Advanced Amplifier Theory (3)
Analysis and design of modern electronic amplifiers and amplifier systems with advanced techniques. Pole-zero analysis, wide-band, lowpass and high-frequency, bandpass amplifiers design using Y and S parameters. Noise analysis. 3 lectures. Prerequisite: EL 303–343, 308–348, EL 309.

EL 406  Communication Theory (3)
A unified treatment of various types of transmission systems with emphasis on the role of system bandwidth and noise in limiting the transmission of information. Single-side-band AM and various types of pulse modulation systems are included. 3 lectures. Prerequisite: EL 303, 309.

EL 407  Digital Computer Subsystems (3)
Design of registers, counters, sequencers, accumulators, encoders, decoders, memories, and other computer subsystems. Use of modern techniques and devices in implementation. Consideration given to cost, speed, and dependability. 3 lectures. Prerequisite: EL 309, 319.

EL 408  Digital Computer Systems (3)
Design and interconnection of various parts of a digital computing system. Design and implementation of micro-programming. Use of micro-processors in developing control circuitry for the main frame of a modern computer. 3 lectures. Prerequisite: EL 407, and CSc 221 or consent of instructor.

EL 409  Computer Peripheral Interfacing (3)
Hardware interfacing of a computer with external devices and systems, interfacing of common peripheral devices. 3 lectures. Prerequisite: EL 407.

EL 411  Network Synthesis and Filter Design Fundamentals (3)

EL 412  Analog Computation and Simulation (3)
Development of the concepts of analog computation and simulation, including system modeling, programming and scaling techniques. Application to problems in engineering and science, including some treatment of non-linear techniques; actual practice. 2 lectures, 1 two-hour activity. Prerequisite: EL 308, EE 351.
Electronic Engineering

EL 417  Acoustical Transducers and Measurements (3)

Theoretical acoustics, electro-acoustic transducers. Performance characteristics of electromechanical systems, models and electrical analog techniques. Acoustical measurement techniques and current standards. 3 lectures. Prerequisite: Senior standing in engineering or physics.

EL 420  Solid State Physical Electronics (3)

Fermi-Dirac statistics, mobility and diffusion in semiconductors, temperature dependence of carrier concentration, continuity equation, effects of doping gradients, metal semiconductor contacts, photovoltaic and thermo-electric effects. 3 lectures. Prerequisite: EL 308, Phys 211.

EL 421  Solid-state Microelectronics (3)


EL 423  Microwave Electronics (2)

Klystron amplifiers, reflex oscillators, magnetrons, traveling wave tubes, solid state signal sources, masers, and parametric amplifiers. 2 lectures. Prerequisite: EL 401.

EL 424  Antenna Theory and Application (3)

Linear antenna theory. The antenna as a matching device. Antenna directivity, gain, efficiency, resistance, aperture, and reciprocity. Application of antenna theory to various types of antennas. 3 lectures. Prerequisite: EL 401.

EL 425  Active Network Synthesis (3)

Selected topics in modern network synthesis, using active devices as negative impedance converters, to satisfy prescribed one and two-port immittance and transfer functions using only R and C elements. 3 lectures. Prerequisite: EE 301, EL 309.

EL 429  Television Engineering (3)

Generation, transmission and reception of television signals with particular reference to the design and engineering of receiver circuits and systems. Design of CATV systems. Specifications of TV systems used in industry, business, and medicine. 3 lectures. Prerequisite: EL 309.

EL 430  Computer-Aided Circuit Design (2)

Analysis and design of active and passive electronic circuits using digital computers. Graphic terminal and time-sharing systems. Survey of available CAD programs. Applications of ECAP program for dc, ac and transient analysis, including tolerance, sensitivity, optimization and device modeling. 1 lecture, 1 activity. Prerequisite: Engr 251, EL 309 or consent of instructor.

EL 441  Microwave Laboratory (1)

Experimental investigation of vacuum-tube and solid state microwave sources, crystal and power detectors, coaxial cables, directional couplers and n-port devices. Measurement of SWR by slotted line and reflectometer techniques. Techniques for measurement of attenuation, frequency and power. Modulation techniques and spectrum analysis. 1 laboratory. Prerequisite: EL 303, 401.

EL 444  Network Synthesis and Filter Design Lab (1)

Modern network synthesis; network driving point and transfer function synthesis; design, construction and testing filters of the Butterworth and/or Chebyshev kind—lowpass, bandpass, band elimination and highpass filters. 1 laboratory. Concurrent or prerequisite: EL 411.

EL 445  Advanced Amplifier Design Laboratory (1)

Experimental investigation employing advanced techniques. Design of electronic amplifiers and amplifier systems utilizing recently developed components. 1 laboratory. Concurrent or prerequisite: EL 405.
EL 446  Microprocessor Interfacing Laboratory (1)
Design and construction of selected digital systems. Utilization of superstrip boards to
construct MSI, LSI based logic circuits. Interfacing of student built systems with several
representative microprocessors. Hardware/software performance evaluation of microproces-
sor interfacing techniques. 1 laboratory. Prerequisite: EL 404 concurrent.

EL 447  Digital Subsystems Laboratory (1)
Laboratory analysis of logic circuits. Synthesis of counters, registers, adders, and other
digital subsystems using small and medium scale integrated circuits. 1 laboratory. Prerequisite: EL 319.

EL 448  Digital Computer Systems Laboratory (1)
Laboratory analysis and synthesis of digital computer systems and subsystems. Use of small
and medium scale integrated circuits and preconstructed digital subsystems. 1 laboratory. Prerequisite: EL 407, EL 447.

EL 451  Solid State and Microelectronic Laboratory (1)
Laboratory investigation of electronic properties of semiconducting materials. Fundamental
experiments in fabrication and evaluation of solid state and microelectronic devices and cir-
cuits. 1 laboratory. Prerequisite: Senior standing or consent of instructor.

EL 455  Active Network Synthesis Laboratory (1)
Advanced laboratory study of sensitivity and stability of active networks prescribed for
realization of transfer functions by active network synthesis techniques. Formal experiments
and individual project work. 1 laboratory. Concurrent or prerequisite: EL 425.

EL 456  Communication Systems Laboratory (1)
Methods of analog and digital modulation and demodulation. Effect of the transmission
medium on modulation and coding techniques. 1 laboratory. Concurrent or prerequisite: EL
406

EL 461, 462  Senior Project (2) (2)
Selection and completion of a project under faculty supervision. Projects results are present-
ed in a formal report. Minimum 120 hours total time. Prerequisite: EE 325, EL 309, 319, 334.

EL 463  Undergraduate Seminar (2)
Discussion of new developments in the fields of communications computers, and industrial
electronics. Fields of employment and job considerations. 2 lectures. Prerequisite: Senior
standing.

EL 470  Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and
graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to
3 lectures. Prerequisite: Consent of instructor.

EL 471  Selected Advanced Laboratory (1–3)
Directed group laboratory study of selected topics for advanced students. Open to under-
graduate and graduate students. Class schedule will list topic selected. Total credit limited to
6 units. One to three laboratories. Prerequisite: Consent of instructor.

ENGINEERING

Engr 102  Orientation (1)
Familiarization with the scope of engineering science. 1 lecture.

Engr 251  Digital Computer Applications (2)
Programming techniques and procedures with applications to several selected engineering
problems from a variety of course situations. Actual problem solutions by means of a digital
computer will be required. 2 activities. Prerequisite: Math 142 or 132, Phys 131 or 121.
Engineering

Engr 260 Engineering and Technology Internship (2–4)

The selected student will spend specified quarters in industry or in a government installation, under educational supervision, working in a field related to his major. Total credit limited to 8 units. Prerequisite: Admission to cooperative education program and consent of instructor.

Engr 301 Technology in the 20th Century (3)

The role of science, engineering and technology in the twentieth century. Effects of technological change, the function of the scientist-engineer in society. The computer as a tool, case studies of systems to compare alternative approaches to problem solving. 3 lectures. Prerequisite: Junior standing or consent of instructor.

Engr 302 Plastics Design (2)

Properties of plastics as a class of materials. Interpretation of plastic design data. Principles underlying the properties of plastics. Design problems. Laboratory applications of plastics processes and their effects on design. 1 lecture, 1 laboratory. Prerequisite: Chem 122 or 125 or consent of instructor.

Engr 311, 312 Mechanical and Electrical Systems (3–3)

Introduction to design and installation of heating, air conditioning, plumbing, fire protection and electrical systems. Emphasis on structural and architectural implications of system types, lighting and power requirements, code constraints, and first and operating costs. 3 lectures.

Engr 400 Special Problems for Advanced Undergraduates (1–2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

Engr 409 Introduction to Medical Engineering (3)

Introduction to medical systems—analysis and synthesis, instrumentation and patient monitoring. Applications of electrical engineering to medicine. 3 lectures. Prerequisite: Bio 101, Senior standing and permission of instructor.

Engr 410 Engineer Examination Review (2)

Review of engineering fundamentals including mathematics, statics, dynamics, strength of materials, fluid mechanics, electricity, thermodynamics, heat transfer, chemistry, and economics, in preparation for Engineer-in-Training and Professional Engineer examinations. Not acceptable for graduate credit. 2 lectures. Prerequisite: Senior standing in Engineering, Architecture, or Agricultural Engineering.

Engr 438, 439 Systems Engineering (3) (3)

Preliminary design of a complex engineering system. Emphasis on overall problems involved. Requires concentrated study of some aspect or component of the system. Opportunity for creative engineering practice. Written and oral reports made by the entire design team. 3 activities.

Engr 461, 462 Senior Project (2) (2)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their field of employment. Project results are presented in a formal report. Minimum 120 hours total time.

Engr 463 Undergraduate Seminar (2)

New developments, policies, practices, and procedures. Each individual is responsible for the development and effective presentation of topics in his area of special emphasis. 2 meetings. Prerequisite: Senior standing.

Engr 500 Individual Study (1–3)

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head, graduate adviser and supervising faculty member.
Engr 503 Advanced Structural Analysis (3)
Deformations of aircraft structures due to static and dynamic loads. Computation of natural mode shapes and frequencies. Determination of dynamic stress fields in aircraft due to transient motions caused by external forces. 3 lectures. Prerequisite: ME 427 or senior level structural design course.

Engr 505 Theoretical Aerodynamics (3)
Fundamentals of analytical aerodynamics, potential flow, vortex theory, circulation, Kutta Joukowski theorem, lifting line theory, three dimensional lift and drag of wings, performance, stability and control. 3 lectures. Prerequisite: Aero 303 or equivalent.

Engr 506 Elements of Rocket Propulsion (3)
Analysis and design of liquid and solid rockets using basic design parameters such as droplet atomization, droplet and particle combustion, heat transfer, combustion stability and control, and thermochemical computations. 3 lectures. Prerequisite: Aero 401 or equivalent.

Engr 507 Fuels and Propellants (3)
Properties of liquid, solid, and gaseous fuels and propellants. Combustion and reaction thermodynamics; theoretical specific impulse computation. Flame theory; ionization and high temperature gas dynamics. 3 lectures. Prerequisite: Graduate standing.

Engr 508 Variational Principles in Solid Mechanics (3)
Potential energy method; direct and indirect methods of the calculus of variations, effects of extensional deformation and initial curvature, applications to straight and curved beams, plates. Complementary energy principle; development of compatibility equations; applications to St. Venant torsion and shear lag, frames. 3 lectures. Prerequisite: 400-level course in structures.

Engr 511 Electric Machines Theory (3)
Advance topics in electric machines theory. Introduction to Park's transformation. Analysis of electric machines using Kron's generalized concept. Excitation systems. 3 lectures. Prerequisite: EE 325 or equivalent.

Engr 513, 514 Control Systems Theory (3) (3)

Engr 515 Digital Filtering (3)

Engr 517 Information Theory (3)
An introduction to information transmission theory and coding theory, covering information and entropy, Markov information sources, code properties, coding theorems; Shannon-Fano Codes, linear codes, hamming codes, continuous channels, Gaussian signals and channels. 3 lectures. Prerequisite: Consent of instructor.

Engr 518 Advanced Power System Analysis (3)
Symmetrical Components. Unbalanced faults. Analysis by digital computer simulation. Load flow studies. Elements of power system stability. 3 lectures. Prerequisite: EE 406 or equivalent.

Engr 519 Power System Design (4)
Design studies involving aspects of an electric power system. Current industrial designs. Simulation techniques used extensively. 4 lectures. Prerequisite: Engr 518.
Engr 520 Digital Systems Design (3)
Design of asynchronous sequential machines and pulse mode logic circuits. Selected automata theory topics. Modern digital system design. Analysis of MOS-LSI multiphase logic structures. Comparison of digital subsystems. Microprocessor as a digital subsystem module. 3 lectures. Prerequisite: EL 319, graduate standing, or consent of instructor.

Engr 521 Computer Systems (3)
Organization of digital systems, primarily the modern general purpose, high speed digital computer; arithmetic units, control units, memories, peripheral equipment. Cost and speed trade-offs in the design of such systems. 3 lectures. Prerequisite: EL 407, Engr 520, or consent of instructor.

Engr 522 Microprocessor-Based Digital System Design (4)
Design and implementation of microprocessor-based digital systems. Their analysis and cost effective use in system design problems. Data acquisition and control systems. Analysis role of microperipherals. Laboratory problems associated with interfacing microprocessors to various systems. 3 lectures, 1 laboratory. Prerequisite: EL 404, Engr 521 or consent of instructor.

Engr 524 Solid State Electronics (3)
Physical theory of solid-state devices. Properties of metal-semiconductor junctions and p-n junctions. Derivation of properties of diodes, transistors, and four-layer devices from basic physical and mathematical considerations. 3 lectures. Prerequisite: Phys 412 or equivalent.

Engr 525 Stochastic Processes for Engineers (3)
Stochastic processes used in the solution of engineering problems. Stationary processes and power spectra; Gaussian processes, Poisson processes, Markov and Semi-Markov processes. Applications to the problems of filtering and prediction (Wiener & Kalman filters), and to the problems of queuing traffic congestion, flow of material and equipment in a system. 3 lectures. Prerequisite: Stat 321, EE 404 or equivalent and consent of instructor.

Engr 526 Modern Communication Theory (3)
Introduction to modern communication theory. Representation of random signals; signal detection and selection, estimation of signal parameters and modulation. Optimum receiver principles, application to digital communications and radar systems. 3 lectures. Prerequisite: EL 406, either EL 410 or EE 404, and consent of instructor.

Engr 527 Advanced Network Theory (3)
Circuits, matrices, and linear vector spaces; linear graph theory; state equations for linear networks in normal form; eigenvalues and eigenvectors; reciprocal networks; normal modes. 3 lectures. Prerequisite: EE 301 or equivalent and consent of instructor.

Engr 529 Noise in Electron Devices (3)
Physical sources of electronic noise, noise classification and characterization, noise in vacuum tubes, semi-conductors, p-n junction diode. Schottky barrier diode, bipolar and unipolar transistors, low-noise amplifiers, minimum noise considerations. Noise generation and measurement. 3 lectures. Prerequisite: EE 301 or equivalent.

Engr 532 Industrial Ventilation and Exhaust Systems (3)
Environmental contamination, dispersion mechanisms, industrial comfort criteria; control of temperature, humidity, cleanliness and motion of air. Natural and forced ventilation, control velocities, air-handling systems and components. 3 lectures. Prerequisite: Graduate standing and consent of instructor.

Engr 533 Aerosol Technology (3)
Definition, theory and measurement of particle properties, particle statistics, size distribution, particle transport, gas cleaning, sampling of airborne contaminants. 3 lectures. Prerequisite: Graduate standing and consent of instructor.
Engr 534 Advanced Design of Air Pollution Control Systems (3)

Comprehensive problems in air conservation. Methods of analysis, design of unit operations and processes for environmental engineering facilities. 3 lectures. Prerequisite: Graduate standing and EnvE 325.

Engr 535 Advanced Wastewater Treatment (3)

Operations and processes used in tertiary treatment. Chemical coagulation, flocculation, sedimentation, filtration, absorption. Methods for removal of phosphorous, nitrogen, solids and organics. Integration of advanced wastewater treatment processes. 3 lectures. Prerequisite: Consent of instructor.

Engr 541 Advanced Operations Research (3)

Models for mathematical programming and operations research. Mathematical programming topics in linear programming, network analysis, and dynamic programming. Operations research models will include queuing, inventory models, simulation, and Monte Carlo. Special analysis problems in non-linear programming and integer programming. 3 lectures. Prerequisite: IE 333, CSc 219, Stat 322, or consent of instructor.

Engr 542 Reliability Engineering (3)

Theory and techniques for determining the reliability of systems and system elements. Influence of failures in series, parallel, and redundant designs. Failure modes and effects. Frequency distributions of failures and failure rates. Methods of estimating, predicting, measuring, and testing for reliability and effectiveness. 3 lectures. Prerequisite: IE 430, Stat 322, 425; or consent of instructor.

Engr 543 Advanced Human Factors (3)

Theory and application of man-machine relations and system design. Concepts of mathematical models, human information input channels, decision making based on capability of human operator. 2 lectures, 1 laboratory. Prerequisite: IE 319 or equivalent and a course in biology.

Engr 550 Kinematic Analysis and Design (3)

Analysis and design of mechanical linkages by means of geometric and algebraic methods. Optimization studies. 3 lectures. Prerequisite: ME 324 or equivalent.

Engr 551 Mechanical Systems Analysis (3)

Various system modeling methods applied to mechanical systems. System stability studies and system optimization methods. 3 lectures. Prerequisite: Consent of instructor.

Engr 552 Conductive Heat Transfer (3)

Theory of steady-state and transient conduction in isotropic and anisotropic media. Development of differential equations, solutions by series, conformal mapping, transforms, finite differences. Concentrated and distributed heat sources. 3 lectures. Prerequisite: ME 342, 303, EnvE 313, Math 318; or consent of instructor.

Engr 553 Convective Heat Transfer (3)

Analysis of convective transfer of energy, mass and momentum. High speed flow and ablation. Phase change heat transfer. 3 lectures. Prerequisite: EnvE 313, ME 342, Math 318.

Engr 556 Stability of Structural Systems (3)

Static and dynamic analysis of structural and mechanical systems, stability analysis by solution of differential equations, energy methods, perturbation methods. Buckling of columns, torsional buckling, dynamic buckling. 3 lectures. Prerequisite: Consent of instructor.

Engr 562 Mechanical Metallurgy (3)

Analysis of stress and strain in solids; elements of theory of elasticity and plasticity, and their applications to metal forming. Residual stresses, theory of dislocations, theory of recrystallization, effects of temperature and rate of loading; fracture mechanics, fatigue and creep. 3 lectures. Prerequisite: Met 306 or consent of instructor.
Engineering Technology

Engr 564 Theory of Stress Corrosion Cracking (3)
Stress corrosion cracking, hydrogen embrittlement, liquid metal embrittlement, corrosion fatigue, and other failure modes induced by specific environment. 3 lectures. Prerequisite: Met 424, Chem 306, ME 212.

Engr 571 Transportation and Traffic Planning Models (3)
Development, analysis and discussion of applications of mathematical and schematic replicative, predictive and planning models in transportation and traffic engineering design problems. Selection of balanced transportation systems based on use of modal split and traffic models. 2 lectures, 1 activity. Prerequisite: Engr 251, Math 242, Stat 322, CE 433.

Engr 572 Transportation Structural Models (3)
Principles of similitude; relationship to prototypes and experimental measurements of transportation structural models. 2 lectures, 1 activity. Prerequisite: CE 423 and consent of instructor.

Engr 573 Public Works Administration (3)
Management and engineering of transportation and related systems in public jurisdictions. Traffic systems, streets and highways, illumination, distribution systems, etc. Personnel management, financing, public relations, and contract management. 3 lectures. Prerequisite: Graduate standing or consent of instructor.

Engr 599 Design Project (Thesis) (2) (2) (5)
Each individual or group will be assigned an industrial project for solution under faculty supervision as a thesis requirement for the Master of Engineering degree. An appropriate experimental or analytical thesis may be accepted.

ENGINEERING TECHNOLOGY

ET 121 Air Conditioning and Refrigeration Principles (4)
Principles of commercial and industrial air conditioning and refrigeration systems. Installation, service maintenance, and cost estimating. 3 lectures, 1 laboratory. Prerequisite: Phys 121.

ET 122, 123 Environmental Graphics (2) (2)
Principles and practices of mechanical and architectural graphics applied to the development of the spatial concepts essential to the design and installation of environmental systems. 1 lecture, 1 laboratory.

ET 124 Electric Circuits (4)
Fundamental concepts and laws of electrical and magnetic circuits, application of a.c. and d.c. power in technology. 3 lectures, 1 laboratory.

ET 125 Electronic Instrument Practices (4)
Electronic instrumentation. Measurement accuracy and error sources. Characteristics and limitations of basic instruments from d.c. meters through oscilloscopes. 3 lectures, 1 laboratory. Prerequisite: ET 124.

ET 126 Electrical Practices (4)
Fundamentals of industrial power distribution systems. Introduction to theory and practice of polyphase circuits and motors. Electrical safety, industrial wiring practices, and practical troubleshooting. 3 lectures, 1 laboratory. Prerequisite: ET 124.

ET 131 Introduction to Engineering Drafting (2)
Basic instruction in drafting techniques and equipment. Geometric constructions for drafting. Basic principles and practices of isometric, oblique, and multiview drawing systems. 1 lecture, 1 laboratory.

ET 141 Applied Descriptive Geometry (2)
Graphical solutions of problems involving points, lines and planes in three-dimensional space by method of multiview projection. Intersections and development of geometric solids.
Engineering Technology

Application to engineering design. 2 laboratories. Prerequisite: One year of high school drafting or ET 131.

ET 142 Engineering Drawing Systems (2)
Multiview and pictorial drawing. Detail and assembly drawings. Conventional industrial drafting practices including sectioning and dimensioning techniques and dimensioning for numerical control. 2 laboratories. Prerequisite: One year of high school drafting or ET 131.

ET 143 Engineering Graphics (2)
Vector diagrams. Gears and cams. Graphical mathematics. Functional scales. Introduction to alignment charts and monograms. Industrial drafting systems. Interpretation of specialized types of technical drawings, including architectural, structural, welding, piping, diagrammatic and electrical. 2 laboratories. Prerequisite: ET 142.

ET 151 Fundamentals of Technical Drawing (2)
Basic theory and application of multiview and pictorial projection. Descriptive geometry. Current industrial practices and standards. Includes sectioning, techniques of dimensioning, including dimensioning for numerical control, detail drawings, and assembly drawings. Free-hand sketching and interpretation of engineering drawings. 2 laboratories. Prerequisite: High school drafting or ET 131.

ET 153 Interpretation of Technical Drawings (1)
Basic principles of technical drawing. Applications to electronic and electrical engineering. Diagrams and standard symbols. Dimensioning techniques including datum dimensioning. 1 laboratory. Prerequisite: ET 131 or high school drafting.

ET 155 Applied Engineering Drawing (1)
Basic principles of technical drawing. Mechanical engineering applications. Interpretation of specialized types of technical drawings including multiview, pictorial views, section views and schematics. Applications of welding and fasteners. Dimensioning principles and techniques, including dimensioning for numerical control. 1 laboratory. Prerequisite: ET 131 or high school drafting.

ET 156 Electronic Graphics and Standards (2)
Schematic drafting and representation of electrical and electronic circuits, solid state devices, transducers and machines. Layouts, technical sketching, industrial standards and symbols. 2 laboratories. Prerequisite: One year of high school drafting or ET 131.

ET 200 Special Problems for Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of the department head.

ET 201 Air Conditioning and Refrigeration Codes (2)
Introduction to current federal, state, and local codes for equipment and human safety as applied to building plumbing, heating, ventilating, refrigeration, and air conditioning systems. 2 lectures.

ET 221 Mechanical Equipment of Buildings (3)
Application of engineering analysis and building code requirements in the design of building systems for handling water supplies, liquid wastes, fuel, gas and ventilation. Related systems connecting groups of buildings, health and accident hazards involved. 2 lectures, 1 laboratory. Prerequisite: Phys 132.

ET 232 Electronic Circuits and Devices I (4)
Semiconductor devices and circuits. H-parameters and load line techniques in analyzing amplifiers. Computation of current, voltage, and power gains, input and output impedances. Bias stability and leakage current considerations. 3 lectures, 1 laboratory. Prerequisite: Math 120.
Engineering Technology

ET 233  Electronic Circuits and Devices II (4)
Analysis of field effect transistor and vacuum tube amplifier circuits. Application of device parameters in gain calculations; characteristic curves. DC power supplies; active current and voltage regulation. Astable, bistable and monostable multivibrator circuit analysis. Introduction to optoelectronics. 3 lectures, 1 laboratory. Prerequisite: ET 232.

ET 234  Passive Network Analysis (4)

ET 237  Industrial Hydraulics and Pneumatics (4)
Basic principles of hydraulics and pneumatics. Characteristics and performance of various hydraulics and pneumatic components such as pumps, compressors, cylinders, motors, valves, accumulators, lines, fittings, filters, etc. Hydraulic fluids. Component selection and circuit layout using U.S. standard graphic symbols. Introduction to electric, pneumatic and fluid control devices. 3 lectures, 1 laboratory. Prerequisite: ME 311.

ET 311  Advanced Networks (4)
Application of constant-k, M-derived and T-\(\pi\) LC filters, single and double tuned circuits, phantom circuits, and transmission lines. Smith charts and stub matching. 3 lectures, 1 laboratory. Prerequisite: ET 234, Math 132 concurrently.

ET 313  Plumbing and Building Sanitation (3)
Application of materials and equipment in the design of piping for plumbing and drainage, special wastes, water supplies, fuel services, and fire protection systems in buildings and engineering structures. Selection of piping, connections, and plumbing fixtures as specified by current national and local codes. Specification writing for complete building sanitation systems. 3 lectures. Prerequisite: Phys 121.

ET 320  Mechanisms (4)
Motion of machine parts. Graphical methods for determining displacements, velocities, and accelerations in linkages, cams, gears, and other mechanical assemblies. 2 lectures, 2 two-hour laboratories. Prerequisite: Phys 121, ET 142, Engr 251.

ET 321  Air Distribution Systems (3)
Materials and techniques in fabrication and installation of air ducts for heating, ventilating, refrigerating, and air conditioning. Introduction to fabrication of air handling equipment and related accessories for high and low velocity systems. 1 lecture, 2 laboratories. Prerequisite: EnvE 204 or ET 221.

ET 331, 332  Refrigeration Systems (3) (3)
Operation, installation, and supervision of medium and low temperature refrigeration systems for food and product processing and storage using various staging systems. Cold storage and building requirements for efficient operation. Low temperature testing and cryogenic refrigeration. Transport refrigeration system. 2 lectures, 1 laboratory. Prerequisite: EnvE 233.

ET 333  Introduction to Microwaves (4)
Survey of tube and solid-state microwave devices. Introduction to electromagnetic field theory. Radiation and propagation of waves. Waveguides and resonators. Radar systems, masers and lasers. 3 lectures, 1 laboratory. Prerequisite: Phys 123, ET 311, Math 133 concurrently.

ET 334  Digital Computer Circuits and Hardware (4)
Review of combinational circuits and analysis of sequential circuits, gates, flip-flops, counters, decoders, multiplexers, arithmetic-logic unit. Properties of core, solid-state ROM and RAM, and bubble memories. 3 lectures, 1 laboratory. Prerequisite: CSc 218, ET 233 or EL 305.
ET 337  Instrumentation of Mechanical Systems (3)

Principles of process instrumentation and control. Temperature, pressure, flow and level measurement. Conductivity, pH, humidity, density instrumentation. Gas chromatography. Pneumatic and electric transmission devices and controllers. Signal conditioning. recorders and indicators. 2 lectures, 1 laboratory. Prerequisite: ET 125, ME 311.

ET 338  Industrial Engines (3)

Types of power plants and their application to vehicles and stationary plant generators, compressors, and other industrial equipment. Includes gas, gasoline, diesel and steam engines; gas and steam turbines, boilers and some of the newer developments being applied to industry. Fuel conservation and pollution control. 2 lectures, 1 laboratory. Prerequisite: ME 136, 146, ET 237, 337, ME 301.

ET 344  Advanced Design Graphics (2)

Preparation of detail and assembly drawings from design layouts. Advanced tolerancing, surface finishes and production notes and parts lists. Welding symbols. Types of drawings such as structural, electrical, manufacturing, piping, etc. 2 laboratories. Prerequisite: ME 136, 146, ET 237, 337, ME 301.

ET 400  Special Problems for Advanced Undergraduates (1-2)

Individual investigation of techniques, studies or laboratory applications of selected problems. Total credit limited to 4 units, with maximum of 2 units per quarter. Prerequisite: Permission of department head.

ET 421, 422  Applied Machine Design (4) (4)

Machine design emphasizing graphical techniques, feasibility models, and utilization of standard and special elements. Laboratory includes solution of realistic design projects by student teams. 2 lectures, 2 laboratories. Prerequisite: ET 344, 320; Aero 202.

ET 425, 426  Air Conditioning Systems (3) (3)

Application of complete air conditioning consisting of heating, ventilation, humidification, dehumidification, refrigeration, air pollution, water treatment and control equipment for commercial and industrial applications. 2 lectures, 1 laboratory. Prerequisite: ET 332.

ET 431  Active Linear Circuits (4)

RC coupled amplifiers; low frequency roll-off, Miller effect, gain-bandwidth product, pulse testing and Bode plots, push-pull and complementary symmetry power amplifiers. Negative feedback; Nyquist stability criteria, reduction of block diagrams for closed loop analysis. Positive feedback and sinusoidal oscillators; Barkhousen criteria for oscillation. Operational amplifiers; integration and differentiation of waveforms, gain shaping and active filtering. Dual input integrated circuits. 3 lectures, 1 laboratory. Prerequisite: ET 233, 234, Math 133.

ET 432  Automatic Control (4)

Electronic and electromechanical systems used in servomechanisms. Open and closed loop frequency response. Bode plots. Introduction to root locus. Amplification and control systems for automatic control of sequential and continuous processes. 3 lectures, 1 laboratory. Prerequisite: ET 431.

ET 433  Communication Systems (4)

Fourier analysis of signal waveforms. Continuous (AM, SSB, DSB, FM and PM) and discrete (PAM, PDM, PPM, and PCM) modulation. Frequency spectra, techniques of generation, demodulation. Radio receivers. Introduction to phase lock loop techniques. 3 lectures, 1 laboratory. Prerequisite: ET 311, ET 431.

ET 437  Applied Fluid Power Systems (4)

Application aspects of hydraulic and pneumatic equipment. Effect of application on design of components in fluid power systems. 2 lectures, 2 laboratories. Prerequisite: ET 237, 344, 421.
Engineering Technology

ET 438  Mini-Computer Technology (4)
Analysis of mini-computer circuits. Organization of circuits into a complete computing system. Special purpose assembly language programming. Techniques for location of circuit malfunctions with the aid of computer maintenance manuals and laboratory equipment. 3 lectures, 1 laboratory. Prerequisite: ET 334.

ET 439  Instruments and Controls (3)
Application of instrumentation and automatic controls to heating, ventilation and air conditioning systems. 2 lectures, 1 laboratory. Concurrent: ET 331.

ET 440  Biomedical Instrumentation (4)
Introduction to instrumentation for medical purposes. Application of the principles of engineering technology to the maintenance, calibration, fabrication, and application of instruments for obtaining physiological measurements. 3 lectures, 1 laboratory. Prerequisite: ET 431, Zoo 131 or consent of instructor.

ET 441  Video Technology (4)
Introduction to colorimetry principles. Operation of circuits in a solid state color system. Circuit responses observed in laboratory. Field trip to major network television facility. 3 lectures, 1 laboratory. Prerequisite: ET 433.

ET 443  Mechanical Systems (4)
Application of technical principles incorporating various components into an integrated system. Project design oriented activities to provide an industrial like condition so that the student may become familiar with component selection of brakes, clutches, frames and machine members, emphasizing industrial handbook and catalog material. 4 laboratories. Prerequisite: ET 237, ET 422, Met 235.

ET 448  Computer Peripheral Maintenance (2)
Analysis of peripheral device operation for teletypes, card readers, line printers, tape drives and disc drives. Techniques for location of malfunctions using maintenance manuals and laboratory equipment. Preventive maintenance procedures. 2 activities. Prerequisite: ET 438.

ET 449  Microprocessor Technology (2)
Analysis of microprocessor circuits and CPU organization. Applications of microprocessors in instrumentation, general and special purpose computers, and consumer products. Introduction to programming techniques and use of ROM and RAM solid state memories. 2 activities. Prerequisite: ET 438.

ET 461, 462  Senior Project (2) (2)
Selection and completion of a project under faculty supervision. Projects are typical of problems graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time. Prerequisite: Senior standing.

ET 463  Undergraduate Seminar (2)
Special studies and technical developments in the field. Individual reports on important technology in the engineering technology field. 2 meetings.

ET 470  Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

ET 471  Selected Advanced Laboratory (1–3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. One to three laboratories. Prerequisite: Consent of instructor.
ENGLISH

Engl 104 Freshman Composition (3)
Practical study and application of techniques of exposition. Critical reading of model essays. Frequent writing assignments. 3 lectures.

Engl 105 Freshman Composition (3)
Practical study and application of persuasion and argument. Introduction to library research. Less frequent but more intensive writing assignments culminating in an original research paper. Readings for critical analysis. 3 lectures. Prerequisite: Engl 104.

Engl 114 English Composition (4)
Practical study and application of techniques of exposition. Critical reading of model essays. Frequent writing assignments. 4 lectures.

Engl 115 English Composition (4)
Practical study and application of persuasion and argument. Introduction to library research. Less frequent but more intensive writing assignments culminating in an original research paper. Readings for critical analysis. 4 lectures. Prerequisite: Engl 114.

Engl 123 Intensive English (3)
For the non-native speaker of standard English who needs additional work with English as a foreign language. Practice in pronunciation, sentence structure, reading and composition. Individual work in the language laboratory. 3 two-hour laboratories.

Engl 124, 125, 126 Intensive Composition (3) (3) (3)

Engl 204 Introduction to Genres (4)
Understanding the elements of fiction, drama, and poetry through guided discussion of significant examples of each of the major genre forms. Credit not allowed for both Engl 204 and Engl 207. 4 lectures. Prerequisite: One composition course.

Engl 205 Early Children's Literature (3)
Evaluation of stories, plays and poems which are suitable for introducing literary values in pre-school through third grade. 3 lectures. Prerequisite: One composition course or consent of instructor.

Engl 206 Introduction to Linguistics (3)
Overview of linguistics from its origin to present forms and practices, vocabulary, areas of study, practical applications. 3 lectures. Prerequisite: One composition course or consent of instructor.

Engl 207 Introduction to Literature (3)
Introduction to major forms of literature. Study in depth of selected works with reading for appreciation. May not be elected by English majors. Credit not allowed for both Engl 204 and 207. 3 lectures. Prerequisite: Engl 104 or 114.

Engl 208 Introduction to American Literature (4)
Literary perspectives on the American experience through selected readings from representative American authors. May not be elected by English majors. Not open for credit to students with credit in Engl 311, 312, or 313. 4 lectures. Prerequisite: Engl 104 or 114.

Engl 209 Intermediate Children's Literature (3)
Evaluation of stories, plays, and poems which are suitable for introducing literary values in grades 4 through 8. 3 lectures. Prerequisite: One composition course or consent of instructor.
Engl 210 Introduction to Shakespeare (4)
Selected readings in Shakespeare. Course is designed for General Education. 4 lectures. Prerequisite: One composition course.

Engl 211, 212 Introduction to European Literature (4) (4)
Directed readings in European literature from the Greeks and Romans to the present, exclusive of the British. 4 lectures. Prerequisite: One composition course.

Engl 213 Twentieth Century Literature (4)
Readings in the literature of the modern period; significant writers and their literary and technical achievements; relationships to prevailing twentieth century modes of thought. Open to majors and non-majors. 4 lectures. Prerequisite: Engl 204 or 207 or 208.

Engl 214 Afro-American Literature (4)
Selected readings in Afro-American literature. 4 lectures. Prerequisite: One composition course.

Engl 215 Mexican-American Literature (4)
Selected readings in Mexican-American literature in translation. 4 lectures. Prerequisite: One composition course.

Engl 218 Report Writing (3)
Forms of communication used in science and industry. Letters, reports, proposals, and articles. Extensive writing practice. 3 lectures. Prerequisite: One composition course.

Engl 219 Technical Writing (3)
Content, style, design, and production of communications such as data sheets, manuals, brochures, news releases, and advertisements. Extensive writing and editing. 3 lectures. Prerequisite: One composition course.

Engl 221, 222 British Literature (4) (4)
Selected readings in British literature from the beginning to the mid-20th century. 4 lectures. Prerequisite: One composition course.

Engl 250 Introduction to Cinema (3)
Stylistic and historical developments. The film art studied through readings, lectures, viewing, and appraisal of landmarks of international cinema. 2 lectures-discussions, 1 activity. Prerequisite: Engl 104, 114, or equivalent.

Engl 300 Advanced Composition (3)
Application of grammatical and rhetorical principles to writing. Production of clear, well-planned, effective prose. 3 lectures.

Engl 301 Modern English Grammar (4)
Linguistic analysis of the English language. Phonology, morphology, and syntax. Traditional, descriptive-structural, and transformational-generative grammars. 4 lectures. Prerequisite: One composition course.

Engl 303 History of the English Language (4)
A study of the development of the English language from its origins to its present forms and practices. Required of all English majors. 3 lectures. Prerequisite: Engl 105 or 115, 221.

Engl 304 Advanced Composition—Non-Fiction (4)
Instruction and practice in writing, revising, and evaluating various forms of non-fiction. 4 lectures. Prerequisite: One composition course.

Engl 305 Advanced Composition—Narrative Writing (4)
Instruction and practice in writing, revising, and evaluating various kinds of narrative writing. Introduction to types of critical writing. 4 lectures. Prerequisite: Engl 304.
Engl 307 Contemporary Grammar and Composition (4)
English grammar and composition in current elementary school programs. Narrative, report, analytical and literary skills in oral and written composition. Vocabulary, word order, sentence structure, idea development, standards for spelling, punctuation, and composition form. Review of appropriate texts. 4 lectures. Prerequisite: Engl 115 or equivalent.

Engl 310 Corporate Communication (3)
Instruction and practice in forms of communication characteristic of business and industry. 3 lectures. Prerequisite: Engl 104 or 114.

Engl 311, 312 American Literature (4) (4)
Directed readings in American writers from Colonial times to the present. 4 lectures. Prerequisite: One composition course.

Engl 316 Readings for Young Adults (3)
A survey of readings in literature, suitable for use in secondary schools. 3 lectures. Prerequisite: One composition course.

Engl 317 Modern Drama (3)
A survey of British and American Drama of the 20th century. 3 lectures. Prerequisite: Engl 204.

Engl 319 The Bible as Literature (3)
The Old and New Testaments with historical background. Literary forms and characteristics of Hebraic writing. Appreciation of the far-reaching use of Biblical narrative and reference in literature, speeches, art, drama, and modern film. 3 lectures.

Engl 400 Special Problems for Advanced Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of the department head.

Engl 410 Chaucer (4)
Selected readings from Chaucer, with emphasis on the literary background, language changes, and scholarship. 4 lectures.

Engl 411 Milton (4)
A study of Comus, Lycidas, Paradise Lost, Paradise Regained, and Samson Agonistes, with some attention to the minor poems. 4 lectures.

Engl 414 Significant World Writers (4)
Study in depth of selected world writers, as individual writers or in groups. Each course will have a subtitle descriptive of the content. May be repeated to 8 units. 4 lectures. Prerequisite: Engl 211.

Engl 415 Modern Novel (3)
Readings in representative 20th century novels with special emphasis on origins, form, style, and ideas. 3 lectures. Prerequisite: Engl 204 or 9 units of literature.

Engl 416 Modern Poetry (3)
Study of poetry as an art expression of the 20th century. 3 lectures. Prerequisite: Engl 204 or 9 units of literature.

Engl 417 Significant British Writers (4)
Study in depth of selected British writers, as individual writers or in groups. Each course will have a subtitle descriptive of the content. May be repeated to 8 units. 4 lectures. Prerequisite: Engl 221, 222, 223 or consent of instructor.

Engl 418 Significant American Writers (4)
Study in depth of selected American writers, as individual writers or in groups. Each course will have a subtitle descriptive of the content. May be repeated to 8 units. 4 lectures. Prerequisite: Engl 311, 312 or consent of instructor.
Engl 419  Elizabethan Drama (3)
A survey of the English drama from its beginning to 1642, excluding Shakespeare. 3 lectures. Prerequisite: Engl 204, 221.

Engl 424  Organizing and Teaching English (3)
Introduction to the organization, selection, presentation, application, and interpretation of subject matter in English in secondary schools. 3 lectures. Prerequisite: Admission to teacher education program or valid teaching credential.

Engl 425  Applied Language Study (4)
Linguistic theory applied in practical solutions to questions and issues in human communications, human relations, and literature. 4 lectures. Prerequisite: Engl 301 or consent of instructor.

Engl 461  Senior Project (2)
Selection and completion of a project under faculty supervision. Projects typify problems which a graduate may face in his field of employment. Project results are presented in a formal written report. Minimum 60 hours total time.

Engl 470  Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

Engl 502  Introduction to Critical Analysis (3)
Basic approaches used by critics. Multiple points of view; application to literary works; reflection of critical analysis in student compositions. Designed to aid the teacher of secondary English to enrich the courses taught in secondary schools. 3 lectures. Prerequisite: graduate standing.

Engl 503  Contemporary Language Study (3)
Correlation between current development of English language and courses in grammar and composition in public schools. Usage, vocabulary, spelling, idiom, punctuation, grammar, sentence structure. Understanding of effects of language change upon writing and speaking. Suitable for upper grade, junior and senior high school teachers. 3 lectures. Prerequisite: Engl 301 or consent of instructor.

Engl 504  Problems in Language (3)
Study of development of English; consideration of problems of grammar and uses of language. May be repeated to 9 units. 3 lectures. Prerequisite: Engl 503.

Engl 505  Problems in Composition (3)
Study of special problems in composition. Direct application of new language information to composition or detailed analysis of relationship between rhetorical principles and writing. May be repeated to 9 units. 3 lectures. Prerequisite: Graduate status in English.

Engl 511  Problems in American Literature (3)
Concentrated study of American authors or periods. Written and oral reports of individual investigation. May be repeated to 9 units. 3 lectures. Prerequisite: Graduate status in English.

Engl 512  Problems in British Literature (3)
Concentrated study of British authors or periods. Written and oral reports of individual investigation. May be repeated to 9 units. 3 lectures. Prerequisite: Graduate standing in English.

Engl 522  Introduction to Teaching English as a Second Language (3)
Contrastive analysis of native and target language, methods and materials for testing and teaching English to non-native speakers: phonemic analysis, oral-aural drill, pattern practice, structure and grammar, composition, planning of curriculum materials from available resources. 3 lectures.
Environmental Design

Engl 590 Graduate Seminar in English (1–3)
Independent or group study of special problems in selected areas of language, composition, or literature. Total credit limited to 3 units. 1–3 lectures. Prerequisite: Graduate status in English.

ENTOMOLOGY

Ent 220 Agricultural Entomology (4)
Major insect orders and families of agricultural importance. Taxonomy, identification, life cycles, and histories and controls of insects. 2 lectures, 2 laboratories.

Ent 326 General Entomology (4)
Introduction to the study of insects. Structure, major orders and families of insects, life histories, economic importance and control. Insect collection required. 3 lectures, 1 laboratory.

Ent 332 Economic Entomology (3)
Identification, life histories and control of insects beneficial or injurious to various crops, fruits, stored products, domestic animals and man; important invertebrates such as mites, ticks and spiders. 1 lecture, 2 laboratories. Prerequisite: Zoo 132 or Bot 122; Ent 326; Chem 226 or consent of instructor.

Ent 421 Immature Stages of Insects (4)
Identification, biology, and economic importance of preimaginal insect forms. 2 lectures, 2 laboratories. Prerequisite: Ent 326, Bio 325.

ENVIRONMENTAL DESIGN

EDes 101 Introduction to Architecture and Environmental Design (2)
Familiarization with the professional fields of architecture, landscape architecture, structural engineering, construction, and city planning. Introduction to the school's programs as they relate to individual aptitudes. The design process. Visiting speakers. 2 lectures.

EDes 110 Descriptive Drawing (1)
Exercises in drawing without mechanical aids. Total credit limited to 3 units, not more than 1 unit in any one quarter. 1 laboratory.

EDes 111 Introduction to Drawing and Perspective (3)
Basic techniques used in graphic communication. Orthographic and isometric projection. Mechanical perspective, shades and shadows. 3 laboratories.

EDes 112 Basic Graphics (3)
Drawing as a communication tool in the Environmental Design fields. Exercises to develop basic skills and speed in the representation of ideas. Use of various drawing media. 3 laboratories. Prerequisite: EDes 111.

EDes 113 Graphics (6)
Covers material in EDes 111 and 112. Primarily for transfer students. Partial credit may be granted. 6 laboratories.

EDes 201, 202, 203 Environmental Design Fundamentals (3) (3) (3)

EDes 204 Societal Factors in Environmental Design (3)
Social and cultural factors in environmental design. Physical settings, cultural sentiments and societal factors which influence environmental form. 3 lectures.
Environmental Engineering

EDes 205 Survey of Environmental Design (3)
Overview of man-altered environments. Buildings, cities and regions. Breadthview for non-architectural majors of man's structures and the role of the environmental designers and developers. Directions of change and improvement. 3 lectures.

EDes 210 Advanced Descriptive Drawing (2)
Advanced programs in descriptive drawing as continuation of EDes 110. 2 laboratories.

EDes 213 Principles of Site Analysis (3)
Introduction and application of selected inventory and analysis techniques through literature survey and exercises at several scales. Limited sites to regional. 3 lectures. Prerequisite: Engl 104.

EDes 221 Introduction to Environmental Design Science (3)
Introduction to environmental sciences and their impact on man's physical structures. Influence of light, sound, thermal conditions and solar energy on buildings and community design. Energy conservation design factors. 3 lectures. Prerequisite: Phys 131, 132.

EDes 250 Digital Computer Applications (2)
Introduction to the application of batch-processing, time-sharing and computer graphics in environmental design. 1 lecture, 1 laboratory.

EDes 301 Environmental Impact Reporting (3)
Systematic and interdisciplinary methodologies for information handling and transfer for decision making in environmental development. Public concerns, participation and legal implications. Problem areas. 3 lectures. Prerequisite: Third-year standing.

EDes 303 Human Factors for Environmental Designers (3)
Integrated approach to development of systematic design programs. Developing and interpreting human factors design criteria, performance and satisfaction as a function of environmental factors, determining and assessing user preferences, methods of field observation and analysis. 3 lectures. Prerequisite: Psy 202 and second year standing in School of Architecture and Environmental Design or permission of instructor.

EDes 304 Human Factors for Environmental Designers (3)
Development of human factors based on urban design criteria. Identifying and interpreting client/user needs, expectations and requirements. Application of interview, questionnaire and survey methods to environmental, sociocultural and adaptative processes. 3 lectures. Prerequisite: EDes 303 or permission of instructor.

EDes 319 Human Performance in the Built Environment (3)
Assessment and measurement of the relationships between design, methods of construction, cost and manpower utilization. Design and construction of structures for minimum cost consistent with intended function. Materials selection and construction processes related to minimum man-hours and nonspecialized labor skills. 3 lectures. Prerequisite: Third-year standing in the School of Architecture and Environmental Design.

EDes 463 Undergraduate Seminar (2)
Discussion and lectures on problems of practice in the environmental design field. Professional ethics. Students present organized material on some subject of interest in Architecture, Architectural Engineering, Construction, City and Regional Planning or Landscape Architecture. 2 meetings. Prerequisite: Senior standing in degree major.

ENVIRONMENTAL ENGINEERING

EnvE 101 Environmental Engineering Systems (2)
Analysis and design of elementary systems related to environmental control. Topics in thermal environmental control, air and water pollution control, and solid waste management. 1 lecture, 1 laboratory.
EnvE 200 Special Problems for Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of department head.

EnvE 204 Heating and Ventilating (5)
Analysis of heating and ventilating processes and equipment; application to industrial, commercial and public buildings. 5 lectures. Prerequisite: Chem 121 or 124 and Phys 122 or 132.

EnvE 221 Solar Energy (3)
Methods of utilizing solar energy. Energy concepts. Collection and storage systems; greenhouse effect. Commercial and residential building applications. Solar power generation; measurements; recent technical developments and literature. 3 lectures. Prerequisite: Phys 121, 122, 123 or equivalent.

EnvE 231, 233 Fluid Systems (3) (2)
Materials, equipment, principles, and techniques used in designing and installing environmental fluid flow systems. Field trips to relevant installations. 2 lecture, 1 laboratory (231). 1 lecture, 1 laboratory (233). Prerequisite or concurrent: Phys 122 or 132, Chem 121 or 124.

EnvE 240 Additional Engineering Laboratory (1-2)
Elective project work. Total credit limited to 4 units with not more than 2 units in any quarter. 1 or 2 laboratories.

EnvE 251 Environmental Engineering Measurements (2)
Experimental studies of the instrumentation and basic measurements of concern to the environmental engineer. Procedures used in the analysis and reporting of experimental data. Corollary concepts of basic physical phenomena. 1 lecture, 1 laboratory. Prerequisite: EnvE 204.

EnvE 304 Thermodynamics of Processes (3)
Material balances, energy balances, liquids and mixtures, vapor-liquid equilibria, solubility and absorption, equilibrium in chemical reactions. 3 lectures. Prerequisite: ME 302; Chem 126 or permission of instructor.

EnvE 305 Thermodynamics of Refrigeration (4)
Thermodynamic analysis of basic power and refrigeration cycles. Thermodynamic analysis of various vapor compression refrigeration systems and components. Combustion. 4 lectures. Prerequisite: ME 302, Chem 125.

EnvE 306 Survey of Heating and Air Conditioning (3)
Basic principles concerning comfort, thermal types of equipment and systems, space requirements and energy sources. Course designed for students not majoring in Environmental Engineering. 3 lectures. Prerequisite: Phys 131.

EnvE 309 Noise and Vibration Control (3)
Behavior of sound waves, selection of instrumentation, practical measurements, criteria for noise and vibration control in environmental systems. 3 lectures. Prerequisite: Phys 133, Math 241.

EnvE 310 Weather and Climate (3)
Weather and climate as a part of the environment. Impact of these factors on industry, commerce and agriculture. Public services. Observation instruments and techniques. Not open to students who have credit for EnvE 428. 3 lectures. Prerequisite: Chem 106, Math 103, Phys 104 and junior standing.

EnvE 313 Heat Transfer (3)
Basic principles of heat transfer. Radiation, conduction, convection in gases and liquids, boiling and condensing of fluids during forced and gravity flow conditions. 3 lectures. Prerequisite: ME 302 or Chem 305, Math 242.
Environmental Engineering

EnvE 322 Solar Energy Engineering (3)
Radiation measurement and estimation at earth's surface. Radiation properties of opaque and transparent materials. Flat plate and focusing collectors. Energy storage. Heating and cooling of buildings. Solar power and distillation. 2 lectures, 1 laboratory. Prerequisite: EnvE 221, 313, ME 302 or Chem 305, ME 341.

EnvE 324 Introduction to Air Pollution (3)
Causes and effects of air pollution on the individual, the community and industry. Legal and public relations aspects. For non-majors. 3 lectures. Prerequisite: Junior standing.

EnvE 325 Environmental Air Quality (3)
Consideration of ambient air contamination inside and outside of a control space. Factors included in establishing, monitoring and maintaining air quality standards. 3 lectures. Prerequisite: Chem 125. Concurrent: ME 302.

EnvE 326 Air Pollution Measurements (3)
Planning and conduct of atmospheric surveys. Collection, evaluation, and interpretation of data as they pertain to the concentration of pollutants sampled. 2 lectures, 1 laboratory. Prerequisite: Chem 126, EnvE 325.

EnvE 327 Water Pollution (3)
Sources of pollution. Water quality standards. Principle techniques and operations applicable to liquid waste disposal systems. Application of theory of mixing, filtration, fluid flow, sedimentation, filtration, and heat transfer to systems design and pollution control. 3 lectures. Prerequisite: Bio 101, Chem 124. Concurrent: Math 120 or equivalent.

EnvE 330 Environmental Quality Control (3)
Aspects of the total environment. Application of scientific and engineering principles to control the development and use of air, water and land resources. Control of the pollution of the environment. Disposal of wastes. Administrative and legal aspects. 3 lectures. Prerequisite: Junior standing.

EnvE 352, 353 Thermal and Fluids Laboratory (3) (3)
Laboratory tests in controls, thermodynamics, fluid flow, heat transfer, noise, and vibration analog methods. Performance testing of refrigeration systems, evaporators, condensers, fans, air washers, and air distribution devices. 1 lecture, 2 laboratories. Prerequisite: EnvE 251.

EnvE 361 System Design (3)
Project work in designing environmental control systems. Heating, ventilating, air conditioning and air cleaning. Energy conservation analysis of systems and utilization of solar energy. 3 laboratories. Prerequisite: EnvE 204, 322, ME 302.

EnvE 365 Environmental Management & Urban Systems (2)
Interdisciplinary study of urban pollution sources and control. Political, economic, and technological interrelationships. Participation in APEX, Air Pollution Exercise, assuming roles of several urban decision makers. 1 lecture, 1 activity. Prerequisite: Junior standing.

EnvE 400 Special Problems for Advanced Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

EnvE 403 Advanced Mass and Energy Transfer (3)
Psychrometric properties, processes and measurements. Wetted surface heat and mass transfer. Solar and convective periodic loads. 3 lectures. Prerequisite: EnvE 313, ME 341.

EnvE 405 Air Conditioning Processes and Systems (2)
Theory and application of turbomachinery to environmental control systems. Analysis, cost, and design of energy conservation systems and related topics. 2 lectures. Prerequisite: EnvE 305, 313, 403, ME 341.
Environmental Engineering

EnvE 406 Advanced Fluid Flow (4)
Fluid dynamics and fluid machinery. Centrifugal and axial fans, pumps and compressors. Turbines. Fluid flow in ducts. 4 lectures. Prerequisite: ME 341, EnvE 251.

EnvE 411 Air Pollution Control (3)
Theory, principles and practices related to the control of particulate emissions. Mechanical separations. Cost and design of control systems. 3 lectures. Prerequisite: EnvE 326.

EnvE 416 Automatic Process Control (2)
Introduction to automatic control instrumentation. Graphical method for analysis of control systems. Analytical determination of control response. 2 lectures. Prerequisite: Math 242, ME 302, EnvE 313.

EnvE 421 Advanced Pollution Control (3)
Theory, principles and practices related to the control of gaseous emissions. Process characteristics. Odor control. Mass transfer operations as applied to environmental control. 3 lectures. Prerequisite: EnvE 325.

EnvE 422 Environmental Radiation Surveillance (2)
Sources of radioactive contaminants, biological effects, radiation protection. Environmental sampling and analysis of airborne radiation. Controls and disposal of wastes. 2 lectures. Prerequisite: EnvE 325, Phys 133.

EnvE 423 Industrial Environments (2)
Effects of the environment in relation to health and the performance of work. Adverse and favorable temperatures and pressures, atmospheric impurities, toxicants. Control of occupational hazards and disease. 2 lectures. Prerequisite: EnvE 411.

EnvE 428 Meteorology (3)
Weather instruments; insolation convection and advection; land and sea breezes; fog, smogs, clouds, and showers; thunderstorms; lapse rate and temperature inversions; cyclones; anticyclones; tornadoes and waterspouts; stacks and plumes; meteorological conditions under which air pollution accumulates. 2 lectures, 1 laboratory. Prerequisite: Phys 122 or 132.

EnvE 434 Water Quality Measurements (2)
Methods employed in the qualitative and quantitative determinations of water and waste water constituents. Physical, chemical and biological procedures used in determining water quality. Testing of effluents from industrial and municipal treatment plants. 1 lecture, 1 laboratory. Prerequisite: Chem 126, 226.

EnvE 435 Water and Waste Water Treatment (3)
Unit operations and unit processes encountered in potable water and waste water treatment. Principles of physical operations; screening, mixing and agitation, sedimentation, filtration, heat and mass transfer. Chemical and biological processes used in potable water and waste water treatment. 3 lectures. Prerequisite: Bact 221, Chem 306, EnvE 434.

EnvE 438 Water and Waste Water Treatment (3)
Application of the physical operation, and chemical and biological unit processes principles to the analysis and design of potable water and waste water treatment facilities. Advanced waste water treatment technology. Water and waste water sludge treatment. 3 lectures. Prerequisite: EnvE 435.

EnvE 439 Solid Waste Management (2)
Chemical and physical properties of municipal and industrial refuse. Landfill disposal, incineration, composting. Industrial and commercial solid waste disposal problems and treatment methods. Pyrolysis. Salvage and recycle operations. Economics of disposal methods. Interrelationship between water quality and landfill operations. 2 lectures. Prerequisite: EnvE 435.
Finance and Property Management

EnvE 441, 442 Advanced System Design (2) (3)
Individual and team project work in designing systems for industrial ventilation, air and water pollution control, solid waste disposal and heating, ventilating and air conditioning. 2 laboratories (441); 1 lecture, 2 laboratories (442). Prerequisite: EnvE 204, 313, ME 341.

EnvE 443 Advanced System Design (3)
Individual and team project work in designing air conditioning and refrigeration systems. 1 lecture, 2 laboratories. Prerequisite: EnvE 441.

EnvE 461, 462 Senior Project (2) (2)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum of 120 hours total time.

EnvE 463 Undergraduate Seminar (2)
Special studies and technical developments in the field. Individual reports on important research in the environmental engineering field. 2 lectures.

EnvE 470 Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

EnvE 471 Selected Advanced Laboratory (1-3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. One to three laboratories. Prerequisite: Consent of instructor.

ETHNIC STUDIES

Eth S 105 Introduction to Ethnic Studies (1)
Introduction to the contributions of academic disciplines to the study of ethnic groups. The role of ethnic studies in establishing communication and mutual understanding between ethnic groups and the entire community. 1 lecture.

Eth S 114 Racism in American Culture (3)
Survey and analysis of racism in the development of American institutions and its effect upon minority ethnic groups and society. 3 lectures.

Eth S 210 Cultural Heritage (3)
History and culture of selected minority groups, their role in and contributions to the American cultural heritage. Total credit limited to 9 units. 3 lectures.

FINANCE AND PROPERTY MANAGEMENT

FPM 201 Survey of Securities Investments (3)
Security types available for investment, sources of investment information, operation of security markets. Basic types of approach to investment determination, fundamental and technical approaches. 3 lectures.

FPM 310 Insurance Principles (4)
Basic principles of insurance and insurance buying from the viewpoint of the consumer. Major types of insurance coverage—life, health, property, and casualty—and the underlying economic problems each is designed to solve. 4 lectures. Prerequisite: Bus 201 or 207.

FPM 330 Real Estate Principles (4)
Introduction to the field of real estate providing a basic background for further study. Includes legal aspects, financing, valuation, economics, public control, title insurance and escrow, closing, safe-guards for the buyer of real estate, investment, and leasing. 4 lectures. Prerequisite: Bus 201 or 207.
FPM 331  Real Estate Practice (4)
Practical aspects of the real estate business: licensing, office management, selling, contracts and leases, advertising and public relations, financing, escrow, taxation, insurance, business opportunities, property management, exchanging, syndication and investment. 4 lectures. Prerequisite: FPM 330.

FPM 332  Real Estate Finance (4)
Analysis of the relationship between national and local money markets. Real estate financing techniques, sources of funds, government participation, legal instruments of finance. 4 lectures. Prerequisite: FPM 330.

FPM 333  Real Estate Appraisal (4)
Cost, market, and income approaches to valuation. Appraisal process for urban residential and investment properties. 4 lectures. Prerequisite: FPM 330.

FPM 334  Real Estate Investment (4)
Effects of federal, state and local taxes on investment transactions. Intensive investigation and computer analysis of urban investment opportunities. Problems in exchanging and property management. 4 lectures. Prerequisite: FPM 330, FPM 332 and/or 333 recommended.

FPM 342  Financial Management (4)
Theory and applications of financing business operations. Financial management of current and fixed assets from internal and external sources. Analysis, planning, control, and problem solving. 4 lectures. Prerequisite: Math 221, Actg 301.

FPM 411  Security Analysis and Portfolio Management (4)
Analysis of securities, markets, and valuation. Security price movements related to money and capital market factors and corporate events. Portfolio planning, risk, media, and objectives of individual and institutional investors. 4 lectures. Prerequisite: Econ 337, FPM 342, Stat 212.

FPM 412  Law of Real Property (4)
Legal problems of acquisition, ownership and transfer of real property. Leases, liens, taxes, homestead, environmental law, easements and zoning. 4 lectures. Prerequisite: Bus 201 or 207.

FPM 420  Management of Financial Institutions (4)
Analysis of practices and policies of financial institutions. Commercial banks, thrift institutions, insurance companies, investment bankers, and security dealers. Management policies resulting from the legal, competitive and economic environment in which each type of institution operates. 4 lectures. Prerequisite: Econ 337, FPM 342.

FPM 466  Financial Management II (4)
Development of analytical and decision-making techniques in applying financial theory to business management problems. Cost of capital, capital structure, capital budgeting, risk and valuation theory. Analysis of cases to emphasize practical problems. 4 lectures. Prerequisite: FPM 342, Econ 337.

FPM 522  Money and Capital Markets (3)
Money and capital markets and financial intermediaries. Factors that affect supply, demand, prices, and interest rates in these markets. 3 lectures. Prerequisite: FPM 525 or consent of instructor.

FPM 525  Business Finance (4)
Financing current and fixed assets from internal and external sources with emphasis on analysis, planning and control. Problems in financial management and policy: capital budgeting; optimal financial structure; working capital management; financing dynamic growth. 4 lectures. Prerequisite: Actg 510, Mgt 527.
FOOD INDUSTRIES

FI 101 Survey of Food Industry (2)
Introductory course including size, distribution, major production areas of the food processing industry. 2 lectures.

FI 122 Introductory Food Engineering (3)
Processing equipment, mechanical principles and automatic controls, physical properties of steam, fluids and heat transfer. 2 lectures, 1 laboratory.

FI 123 Elements of Food Preservation (3)
Principles of food preservation including canning, freezing, dehydration, fermentation and concentration. Credit not allowed for students having credit in FI 230. Students are required to meet sanitation and safety regulations in processing laboratories. 2 lectures, 1 laboratory.

FI 200 Special Problems for Undergraduates (1-2)
Individual investigation, research studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of instructor.

FI 209 Meat Procurement and Use (3)
Selection, identification and cutting of meat. Physical and chemical composition of meat and its relationship to flavor, tenderness, nutritional value and related subjects. Credit not allowed for students having credit in FI 210. Students are required to meet sanitation and safety regulations in laboratories. 2 lectures, 1 laboratory.

FI 210 Meats (3)
The meat industry. Processing methods and operations. Practice in slaughtering and cutting beef, pork and lamb. Meat inspection, grading, composition, curing, preservation and related topics. Credit not allowed for students having credit in FI 210. Students are required to meet sanitation and safety regulations in processing laboratories. 2 lectures, 1 laboratory.

FI 212 Meat Classification and Grading (2)
A comprehensive and detailed study of those factors related to carcass quality, conformation, and yield. Judging of carcass and wholesale cuts. Field trip to meat packing plants is required. 1 lecture, 1 laboratory. Prerequisite: FI 210.

FI 221 Unit Processing Operations (3)
Thermal processing procedures for fruits, vegetables and specialty items. Students are required to meet sanitation and safety regulations in processing laboratories. 2 lectures, 1 laboratory. Prerequisite: FI 123 or 230.

FI 222 Unit Processing Operations (3)
Processing procedures for frozen foods, juices, jams, jellies, specialty foods and by-product utilization. Students are required to meet sanitation and safety regulations in processing laboratories. 2 lectures, 1 laboratory. Prerequisite: FI 123 or 230.

FI 223 Unit Processing Operations (3)
Processing procedures for dehydrated fruits, vegetables and specialty items, as well as the concentration of liquids. Students are required to meet sanitation and safety regulations in processing laboratories. 2 lectures, 1 laboratory. Prerequisite: FI 123 or 230.

FI 230 Elements of Food Processing (4)
Principles of unit operations in food processing covering canning, freezing, dehydration, fermentation and concentration. Food quality and spoilage. For non-food processing majors. Credit not allowed for students having credit in FI 123. Students are required to meet sanitation and safety regulations in processing laboratories. 3 lectures, 1 laboratory.

FI 233 Processed Food Inspection (3)
Fundamentals, principles, and procedures for inspecting processed foods based upon federal, state and industry grades. Laws and agencies concerning the food industry and consumer protection. Laboratory work in grading various products. 2 lectures, 1 laboratory.
FI 321 Food Plant Quality Control (3)
   Methods of organizing and operating food and plant quality control systems including
   chemical and physical techniques. 2 lectures, 1 laboratory. Prerequisite: Chem 121.

FI 331 Sanitation and Waste Disposal (3)
   The organization, management and operation of a food plant sanitation and waste disposal
   program. 2 lectures, 1 laboratory. Prerequisite: Bact 221.

FI 332 Statistical Quality Control (3)
   The application of statistical methods in quality control programs and evaluation of opera-
   tions. 2 lectures, 1 laboratory. Prerequisite: Junior standing.

FI 336 Packaging (3)
   Study of packaging materials, packages and packaging methods applicable to a variety of
   processed foods. 2 lectures, 1 laboratory. Prerequisite: Junior standing.

FI 338 Sausage, Smoked and Canned Meats (3)
   The manufacturing of processed meats. Product formulation, curing, smoke house opera-
   tion. 2 lectures, 1 laboratory. Prerequisite: FI 210 or 209.

FI 341 Wines and Fermented Foods (3)
   Methods of production and testing of beer, wines and fermented foods. Field trips required.
   2 lectures, 1 laboratory. Prerequisite: Junior standing.

FI 361 Meat Packing By-Products (2)
   Value, origin, classification and uses of meat by-products. Investigation of scientific prin-
   ciples and manufacturing processes. Field trips required. 1 lecture, 1 activity. Prerequisite:
   Junior standing, FI 210 or 209.

FI 400 Special Problems for Advanced Undergraduates (1–2)
   Individual investigation, research, studies, or surveys of selected problems. Total credit
   limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of instruc-
   tor.

FI 421 Advanced Food Processing (3)
   Food processing operations with problems involving physical and chemical action of the
   processes. Field trips required. 2 lectures, 1 laboratory. Prerequisite: Junior standing, FI 221,
   223.

FI 422 Advanced Food Processing (3)
   Function of food additives and ingredients in the formulation and processing of food
   products. 2 lectures, 1 laboratory. Prerequisite: Junior standing, Chem 121, FI 123 or 230.

FI 425 Food Evaluation (3)
   Characteristics of food color, consistency, texture and flavor. Sensory evaluation and grad-
   ing, food acceptance testing and statistical analysis of data. 2 lectures, 1 laboratory. Prerequi-
   site: Junior standing.

FI 431 Advanced Meats (3)
   Characteristics of meats and meat products with emphasis on quality control and special
   problems associated with the processing and distribution of meats. 2 lectures, 1 laboratory. Prerequi-
   site: Junior standing, FI 210 or 209.

FI 433 Food Processing Management (3)
   Food plant layout and flow lines, evolutionary operations technique, unit cost accounting,
   work simplification and scheduling. 2 lectures, 1 laboratory. Prerequisite: Junior standing, FI
   122, FI 123 or 230.

FI 461, 462 Senior Project (2) (2)
   Selection and completion of a project under faculty supervision. Projects typical of problems
   which graduates must solve in their fields of employment. Project results are presented in a
formal report. Minimum 120 hours total time.

FI 463 Undergraduate Seminar (2)
Major developments in the chosen field of the student. Discussion of new developments, policies, practices, and procedures. Each individual is responsible for the development and presentation of a topic in his chosen field. 2 lectures. Prerequisite: senior standing.

FI 470 Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

FI 471 Selected Advanced Laboratory (1–3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1–3 laboratories. Prerequisite: Consent of instructor.

FI 551 Food Constituents and Characteristics (4)
Graduate level study of chemical and physical properties of proteins, carbohydrates, lipids, pigments, enzymes and additives related to formulation and processing of food. 3 lectures, 1 laboratory. Prerequisite: Graduate standing and permission of instructor.

FI 581 Graduate Seminar in Food Processing (3)
Current findings and research problems in the field and their application to the industry. 3 lectures. Prerequisite: Graduate standing and permission of instructor.

FOREIGN LANGUAGE

ForL 101, 102, 103 Foreign Language (3) (3) (3)
Organized group instruction arranged for students who wish to acquire basic skill in a foreign language indicated by subtitle. Not open for credit by examination. To be taken in numerical sequence. 3 lectures.

ForL 470 Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

FRENCH

Fr 101, 102, 103 Elementary French (4) (4) (4)
For beginners. Class practice in pronunciation, sentence structure, reading, writing, and basic conversation. Laboratory drill required. To be taken in numerical sequence. 4 lectures.

Fr 201, 202, 203 Intermediate French (3) (3) (3)
Further practice in speaking, reading, and writing French. Introduction to French culture. To be taken in numerical sequence. 3 lectures. Prerequisite: Fr 103 or equivalent.

Fr 301, 302, 303 Third Year French (3) (3) (3)
Readings in French literature; poetry, essays, novels, plays. To be taken in numerical sequence. 3 lectures. Prerequisite: Fr 203 or equivalent.

FRUIT SCIENCE

FrSc 123 Beekeeping (3)
Practical studies and exercises in the handling of honey bees with special reference to pollination of commercial crops. Honey processing and marketing. Bee inspection and disease detection. 2 lectures, 1 laboratory.
History and outlook for California fruit growing. Apple, fig, and pear production practices. Field laboratories in orchard management practices, tree and fruit identification, harvesting, grading and packing of college orchard products. 3 lectures, 1 laboratory. Credit will not be allowed for both FrSc 131 and 230.

Planting and planning the deciduous orchard. Apricot, cherry, peach, olive, plum and prune production practices with special emphasis on pruning trees and grapevines. 3 lectures, 1 laboratory. Prerequisite: FrSc 131.

Production practices common to deciduous nut crops produced in California. Normal spring cultural problems including thinning and spraying. Small fruit culture. 3 lectures, 1 laboratory. Prerequisite: FrSc 132.

Production practices, areas of production, suitable varieties, harvest and processing of important deciduous and subtropical fruit crops. Methods of propagation and training. 3 lectures, 1 laboratory. Credit will not be allowed for both FrSc 131 and FrSc 230.

A comprehensive study of grape growing utilizing the college plantings for field practice in planting, training and maintaining the vineyard. Varietal identification and use. 3 lectures, 1 laboratory.

Propagation by seed, cuttings, layering, grafting, and budding. Rootstocks for deciduous fruits, commercial nursery practices. 3 lectures, 1 laboratory. Prerequisite: FrSc 133 or 230.

Common practices in producing tree and fruit crops of economic importance in tropical areas—cocoa, tea, coffee, pineapple, oil palm, bananas, dates and papaya. 3 lectures, 1 activity.

Commercial production practices, mechanization and processing. Management of college planting. Field labor management efficiency studies. Techniques in handling and harvesting. 3 lectures, 1 laboratory. Prerequisite: FrSc 231.

Growing and marketing oranges, lemons, grapefruit, avocados and dates. Minor subtropical fruits also included. Orchard practice. A field trip to a major California production area is required. 3 lectures, 1 laboratory.

Storage problems, post-harvest physiology, environmental factors affecting fruit development. Maturity standards. Two-day field trip required. 2 lectures, 1 laboratory. Prerequisite: FrSc 131 or 230.

Organization and management of labor and equipment in field and processing operations. Production problem analysis. Advanced work in production management. Job instruction training. 3 lectures, 1 laboratory. Prerequisite: FrSc 421.

Advanced commercial production and management techniques. Use of mechanical aids and harvesters as related to size of crops, harvesting, and post-harvest handling. 3 lectures, 1 laboratory. Prerequisite: Permission of instructor.
Geology

FrSc 581 Graduate Seminar in Fruit Production (3)
Group study of current problems of fruit production; current experimental and research findings as applied to production and marketing. 3 lectures.

GEOGRAPHY

Geog 150 Human Geography (4)
Introduction to the concepts, techniques, and tools in geography. Survey of the field of geography with attention focused on man's adaptation to his environment and his role in changing the face of the earth. 4 lectures.

Geog 215 Man's Impact on Earth (3)
Short history of major attitudes toward nature; problems stemming from the interactions of population growth, technology, and natural resources; transformation of natural landscapes into cultural landscapes. 3 lectures.

Geog 250 Physical Geography (4)
Distribution and interrelationships of the earth's physical phenomena. Landforms, weather and climate, vegetation and soils. Field trips, atlas work, weather, and topographic maps. 4 lectures.

Geog 305 Political Geography (3)
Spatial influences on man's political behavior. Geopolitics, boundaries, significance of resources on power politics, internal spatial structure of the nation-state, relationships between nation-states. 3 lectures. Prerequisite: Pol Sc 201 or equivalent.

Geog 308 Global Geography (3)
Survey of man's utilization and occupation of the earth. Interrelations of human life and elements of natural dependence of nations, and world trade. Supporting power of geographical environment. 3 lectures.

Geog 309 Geography of California (3)
The physical environment of California; patterns of settlement and economic development; current problems. 3 lectures. Prerequisite: One course in geography or consent of instructor.

Geog 310 Urban Geography (3)
Presentation of geographic concepts, principles, and generalizations related to urban functions, forms, distribution, and growth. Location, areal extent, and interaction among the various urban functions. 3 lectures.

Geog 315 Economic Geography (3)
Man's utilization of the natural environment. Spatial aspects of production, distribution, and consumption of commodities from the earth. 3 lectures. Prerequisite: Econ 201 or equivalent.

Geog 401 Area Geography (3)
Detailed study of geographic characteristics of a selected world area. Each time the course is offered it will bear a subtitle descriptive of the particular world area studied. 3 lectures. May be repeated to a total of 12 units. Prerequisite: One course in geography.

GEOLOGY

Geol 201 Physical Geology (3)
Processes responsible for the earth's present characteristics. Mountain building, metamorphism, igneous activity, depositional agencies, sedimentation. Examples from local area. Topographical and geological maps. Rocks and minerals. 3 lectures.

Geol 202 Historical Geology (3)
Geol 203 Introductory Paleontology (3)
The fossil record. Mechanisms and patterns of evolution. Adaptation of ancient organisms to their environments. Fossils in the interpretation of earth history. Important events in the history of life. Historical development of the major groups of invertebrates, vertebrates, and plants. 3 lectures.

Geol 204 Geologic History of California (3)
Development of California through geologic time. Where and why the rocks appeared. Movement on faults, and mountain building. Geologic processes at work today and yesterday. Relationship of California geology to the rest of the world. 3 lectures.

Geol 205 Earthquakes and Earth Hazards (3)

Geol 211 Cities and Geology (3)

Geol 241 Physical Geology Laboratory (1)
Properties, identification, and origin of earth materials. Interpretation of topographic maps, aerial photos, geologic maps, scale models, and field observations in terms of the effect of geologic processes on the earth's surface, internal structure, and man's use of the earth. 1 laboratory. Prerequisite or concurrent: Geol 201.

Geol 302 Geological Resources (3)
Nature of the planet's natural mineral resources. Mode of occurrence, geology, origins and quantity of ores, fossil fuels, and industrial minerals. Exploration methods and prospecting. The world supply of geological resources. 3 lectures. Prerequisite: Introductory science course.

Geol 321 Marine Geology (4)
Techniques of ocean floor exploration, nearshore sedimentary processes and shoreline evolution, continental margin sediments and geologic history, ocean floor topography and sediments, origin and evolution of ocean basins, physical resources of the ocean. 3 lectures, 1 activity. Prerequisite: Geol 201 or consent of instructor.

GERMAN
Ger 101, 102, 103 Elementary German (4) (4) (4)
For beginners. Class practice in pronunciation, sentence structure, reading, writing and basic conversation. Laboratory drill required. To be taken in numerical sequence. 4 lectures.

Ger 201, 202, 203 Intermediate German (3) (3) (3)
Readings and oral practice through free oral composition. Systematic review of German. Grammar and practice in writing. Discussion of German social and cultural values. To be taken in numerical sequence. 3 lectures/discussion. Prerequisite: Ger 103 or placement test.

Ger 210 German Conversation (3)
Conversational German spoken in class with emphasis on understanding and speaking the language. Audio-lingual methods with some grammar and composition. 3 lectures. prerequisite: Ger 103 or equivalent.

Ger 301, 302 Scientific German (4) (4)
Short, intensive grammar. Emphasis on reading of scientific German materials and texts. Translation projects in the field of student's choice. To be taken in numerical sequence. 3 lectures, 1 activity.
Graphic Communications

GRAPHIC COMMUNICATIONS

GrC 101 Introduction to Graphic Communication (2)
Orientation to the Graphic Communications program. Examination of the industry, its traditions, technological changes, and employment opportunities. 2 lectures.

GrC 111 Substrates and Ink (4)
Manufacturing processes. Testing, procurement, pricing, paper classifications and measurement. Application to end use. 3 lectures, 1 activity.

GrC 122 Design with Type (6)
Introduction to typography. Type classification, identification, and selection. Copyfitting, markup systems, and proofreading. Fundamentals of layout and design for print media. 4 lectures, 2 laboratories.

GrC 123 Binding and Finishing (3)
Effective imposition techniques. Cutting, folding, assembling of folded material, finishing operations. Case and perfect bookbinding. 2 lectures, 1 laboratory.

GrC 127 Graphic Arts Processes (3)
Introduction to the graphic arts. Printing processes, design, layout, composition, presswork, cold type, binding, silk screen, offset, photography, and duplicating processes. For non-majors. 1 lecture, 2 laboratories.

GrC 132 Letterpress (3)
Handfed and automatic platen press operation. Makeready, lockup, imposition, scoring and perforating. Inking systems. 1 lecture, 2 laboratories.

GrC 200 Special Problems for Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of department head.

GrC 204 Introduction to Printing Management (3)
Structure of the industry. Production systems analysis, trade customs, and applied management. 3 lectures.

GrC 223 Copy Preparation (3)
Preparation of line and tone copy for the reproduction processes. Designing roughs and visuals and preparation of single and multi-color mechanicals. Production planning. 2 lectures, 1 laboratory.

GrC 224 Composing Machines (3)
Introduction to composition systems. Newspaper, bookwork, magazine, and commercial composition. 1 lecture, 2 laboratories. Prerequisite: GrC 122 or consent of instructor.

GrC 227 Process Camera (5)
Characteristics of photographic materials and equipment for the graphic arts. Theory and practice in the use of the process camera for line, halftone and color separation photography. Densitometry. Sensitometry. 2 lectures, 3 laboratories. Prerequisite: Sophomore standing or consent of instructor.

GrC 228 Image Assembly and Platemaking (4)
Planning for lithographic press plates. Ruling, scribing, opaquing, and retouching negatives and positives. Preparation of supports for black and white and color imaging. Image assembly for large presses. Black and white and color proofing techniques. Preparation of various offset plates. 2 lectures, 2 laboratories. Prerequisite: GrC 227 or consent of instructor.
GrC 229 Offset Lithographic Presswork (5)
Theory and practice in the use of sheet-fed offset presses for both single color and multicolor printing. Investigation of feeding, printing and delivery systems. Dampening and inking systems. Process color printing. Press quality control. 3 lectures, 2 laboratories. Prerequisite: GrC 228 or consent of instructor.

GrC 233 Relief Printing Specialties (3)
Automatic and cylinder presswork. Halftones, process color printing. Die cutting, creasing, foil stamping, blind embossing and varnishing. 1 lecture, 2 laboratories. Prerequisite: GrC 132.

GrC 301 Composition Systems (5)
Metallic and non-metallic composition for display and text types. First and second generation phototypesetting machines. Computerized photocomposition systems. 3 lectures, 2 laboratories. Prerequisite: GrC 224.

GrC 302 Technical Basics for Printing (3)
Application of electronics, optics, and other selected areas of science and technology in the printing and publishing industries. Advanced instrumentation, control, actuation, and systematization for graphic arts operations. 3 lectures.

GrC 303 Estimating (3)
Estimating various kinds of printing produced by the major processes. Use of standard price catalogs. Analysis of material, labor, and machine cost factors. 3 lectures. Prerequisite. GrC 111 or junior standing.

GrC 304 Theory of Color (2)
Light and color theory. Understanding of the physical, chemical, and psychological concepts of color. Color systems. Application of color theory to full-color printing. 2 lectures.

GrC 312 Theory of Lithography (3)
Theories of the lithographic process in relation to chemical and physical factors. Film emulsion and bases, darkroom chemistry and processing, lithographic plate bases, coatings and processing, pH of solutions, lithographic press chemistry, blankets and schematics. 3 lectures.

GrC 323 Pre-Separated Art for Camera (3)
Manual preparation and separation of line and continuous tone images for multicolor reproduction. Preparation of complex full-color mechanical layouts. 1 lecture, 2 activities. Prerequisite: GrC 223.

GrC 326 Printing Equipment Management (3)
Procedures in designing, maintaining and decision making for printing equipment including pneumatics, hydraulics, mechanical and electrical systems. Pollution, safety and training in the graphic communications industry. 2 lectures, 1 activity. Prerequisite: GrC 204 and Junior standing.

GrC 329 Reproduction Engineering (3)
Orientation to high-speed, short-run reproduction. Microfilming, blueprinting, xerography. Direct image masters. Programmed duplicators. Specialized finishing operations. Coordination of rapid printing in captive and specialty printing plants. 2 lectures, 1 activity. Prerequisite: GrC 229.

GrC 330 Packaging Substrates (3)
Application of substrates and material design for consumer, industrial, and military packaging. Paper, paperboard, plastic, metal, glass, laminates, and other applicable materials. Physical testing and characteristics. Graphic design implementation of each substrate. 2 lectures, 1 laboratory. Prerequisite: Junior standing or instructor approval.

GrC 333 Plant Organization and Layout (3)
Printing plant design and layout. Production analysis, work flow patterns, and utilization of space. Organization of plant services. 2 lectures, 1 activity.
Graphic Communications

GrC 334  Commercial Typography (3)
Design and composition for commercial printing. Corporate stationery, folders, booklets, book, and direct mail pieces. Analysis of process limitations. 1 lecture, 2 activities. Prerequisite: GrC 122, 223.

GrC 335  Line and Halftone Media (5)
Preparation and evaluation of original art copy for commercial use. Laboratory problems in drawing and layout for single and multiple color runs. Study of various approaches to registration; uses of color and texture in art copy. 2 lectures, 3 laboratories.

GrC 357  Screen Processes (2)
Screen process reproduction methods with applications to industry and communications. Includes paper, tusche, knife-cut and photographic stencils. Printing mediums, surfaces, and industrial applications such as printed circuits and packaging. 2 laboratories. Prerequisite: GrC 228 or consent of instructor.

GrC 400  Special Problems for Advanced Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of department head.

GrC 401  Printing Sales (4)
Sales management, salesmanship, sales forecasting techniques, and marketing of printed products. Purchasing. 4 lectures. Prerequisite: Senior or advanced junior standing.

GrC 408  Newspaper and Publications Management (3)
Analysis of newspaper and publications production systems. Organization of the production function. Personnel and industrial problems peculiar to the industry. 2 lectures, 1 laboratory. Prerequisite: Senior standing or consent of instructor.

GrC 411  Estimating, Pricing and Costing (4)

GrC 416  Web Printing (5)
Theory and practice in the use of web presses for letterpress, offset, rotogravure, and flexographic printing. Applications for newspapers, packaging, business forms, magazines, books, catalogs and advertising materials. 3 lectures, 2 laboratories. Prerequisite: GrC 229.

GrC 421  Printing Management (4)
Principles and applications of printing production forecasting. Functions of printing production control. Printing production records. Establishment of inspection standards. Judgment and measurement inspection. Instruments for quality control in the printing industry. 3 lectures, 1 activity. Prerequisite: GrC 204.

GrC 422  Printing Management (3)
Applied techniques of printing plant personnel management. Investigation and determination of job descriptions, testing for staff and line employees. Setup of graphic arts in-plant training programs. Evaluation procedures for personnel working in the printing facility. Printing industry association relationships. 3 lectures. Prerequisite: GrC 204.

GrC 423  Printing Management (4)
Trends in the graphic arts labor movement. Graphic arts labor unions. Collective bargaining and grievance procedures practiced in the printing industry. Administration of the labor contract by printing plant supervisor. Study of industry-specific case problems. 3 lectures, 1 activity. Prerequisite: GrC 204.
GrC 429 Advanced Composition Systems (3)
Non-metallic composition for display and text types, CRT composition, character generation, pagination, character control, and computer utilization. 2 lectures, 1 laboratory. Prerequisite: GrC 301.

GrC 431 Package Estimating (3)
Principles of packaging, economics and cost determination. Establishment of unit cost, subcontracting, overhead and profit. Estimating costs of converting operations. 3 lectures. Prerequisite: GrC 330 or instructor approval.

GrC 437 Consumer Packaging (3)
Consumer requirements including utility and protection. Consumer motivation. Graphics, size, shape, and legal ramifications. 2 lectures, 1 activity. Prerequisite: Mktg 204, GrC 431 or instructor approval.

GrC 439 Advanced Line and Halftone Media (5)
Complex and experimental art media and their limitations for use in line and halftone reproductions by the major printing processes. 2 lectures, 3 laboratories. Prerequisite: GrC 335.

GrC 459 Graphic Communication Developments (2)
Developments and trends in processes, methods, materials and equipment used in graphic communication. 2 activities. Prerequisite Senior standing or consent of instructor.

GrC 461 Senior Project (2)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in formal report. Minimum 120 hours total time. Prerequisite: Senior standing.

GrC 470 Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

HISTORY
Hist 101, 102 History of Western Civilization (5) (5)
Development of western civilization from earliest times to the present. Political, economic, social, intellectual, and religious contributions of the various peoples to contemporary life. 5 lectures.

Hist 112 History of California (3)
Development of California; early explorations, colonization; institutions, government, and economy from beginning to the present; development of culture, industry, agriculture, government, and population. 3 lectures.

Hist 200 Special Problems for Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of department head.

Hist 201, 202 United States History (4) (4)
A comprehensive survey of the development of the United States from the 15th century to the present. Hist 202 satisfies the general education requirement of Hist 204 for Social Science and History majors. 4 lectures.

Hist 204 Growth of American Democracy (3)
The historic backgrounds of present-day economic, political, and social problems. Development of American institutions and ideals. Not open to students with credit in or enrolled in Hist 202. 3 lectures.
History

Hist 205 The United States in World Affairs (3)

The origin, nature, and implementation of U.S. foreign policy since the Second World War. Domestic and international factors relating to U.S. objectives; discussion and analysis of major issues and problems of contemporary U.S. foreign policy. 3 lectures.

Hist 206 American Democracy and World Affairs (5)

Combines Hist 204 and 205. Historical significance of American institutions and ideals and the increasing involvement of the United States in world affairs. Not open to students with credit in or enrolled in Hist 202, 204, or 205. 5 lectures.

Hist 211 Issues in United States History (3)

Analysis of selected issues in United States civilization from the seventeenth to the twentieth century. Multiple causation as a means of explaining historical change. 3 lectures.

Hist 301 Introduction to Historiography (4)

Techniques, theory and principles of history and historical research. Seminar approach focussing on discussion, research, and historical writing. 4 seminars. Prerequisite: Junior standing or consent of instructor.

Hist 303 Concepts in World Civilization (4)

Intercultural and cross-cultural analysis of the human response to political, economic, social, and cultural forces of selected epochs in the history of world civilizations. 4 lectures.

Hist 305 History of American Agriculture (3)

Agricultural development with emphasis upon economic political and social implications. 3 lectures. Prerequisite: Junior standing.

Hist 306 History of Science and Technology (3)

Development of selected scientific ideas and their technological applications; relationship to the society in which the ideas and techniques were nurtured. 3 lectures. Prerequisite: Junior standing and 9 units of natural sciences.

Hist 307, 308, 309 Latin American History (3) (3) (3)

Imposition of Spanish and Portuguese institutions upon native American cultures; resultant colonial political and economic administrations and problems. Ideological and commercial conflicts causing the wars for independence; clashes during the national period of constitutionalism and dictatorships, vested interests and economic change. Significance of the Mexican and Cuban social revolutions. 3 lectures. Prerequisite: Junior standing.

Hist 311, 312, 313 British History (3) (3) (3)

History of the English people from the Roman era to the present. Development of law, language, religion, literature, and the struggles for parliamentary government and economic opportunities. 3 lectures. Prerequisite: Junior standing.

Hist 314 The Middle East (3)

Islamic civilization, the Ottoman Empire, origins of Pan-Islamism, Arab, Turkish, Iranian nationalism, impact of World Wars I and II, and the background of contemporary problems. 3 lectures. Prerequisite: Junior standing.

Hist 321 Chicano History in the American Southwest (3)

History of the struggle of the Mexican community within the United States for recognition and preservation of its culture, and for economic and social equity. 3 lectures. Prerequisite: 3 units of American history.

Hist 325 Ethnic Groups in American History (3)

Role of ethnic, racial, and religious minorities; their contributions to the political, economic, and social development of American life. 3 lectures. Prerequisite: Junior standing.
Hist 331  Early Afro-American History (3)
  Political and social history of Afro-Americans from the early 17th century to the end of the
  Reconstruction. Contributions to American cultural and political life. 3 lectures. Prerequisite:
  Junior standing.

Hist 332  Recent Afro-American History (3)
  Political and social history of Afro-Americans from the end of Reconstruction to the present
  as background of contemporary developments. 3 lectures. Prerequisite: Junior standing and
  Hist 331.

Hist 341  Mexican History (3)
  Obtrusion of Spanish institutions on the Mexican civilizations and the subordination of
  Spanish influence to the dominant Mexican cultures. Diffusion and struggle for identity of the
  Mexican in North America, progress of his twentieth-century revolt for social equity. 3 lec-
  tures. Prerequisite: Junior standing.

Hist 343  The Classical Age (3)
  The foundations of western civilization; origins and development of the science, technology,
  philosophy, religion, art, and sociopolitical institutions which produced the modern world;
  continuity between ancient times and the present. 3 lectures. Prerequisite: Junior standing.

Hist 346  Medieval Europe (3)
  Medieval society from the emergence of feudalism to the beginning of the Renaissance:
  triumph of the papacy; development of feudal monarchies and institutions; the crusades;
  recovery of commerce; rediscovery of Greek thought, and rise of universities. 3 lectures.

Hist 347  Renaissance and Reformation (3)
  Decline of medieval universalism; rise of commercial capitalism and dynastic nation-states;
  flowering of the Renaissance; Protestant reformation. Economic, political, social, intellectual,
  and cultural influences. 3 lectures. Prerequisite: Junior standing and Hist 102 or equivalent.

Hist 348  Counter-Reformation, Absolutism, and Religious War (3)
  The era of the Counter-Reformation and Divine Right absolutism, religious and dynastic
  wars and their impact on the political, economic, social, religious and cultural fabric of Euro-
  pean civilization. 3 lectures. Prerequisite: Junior standing and Hist 102 or equivalent.

Hist 349  The Age of Enlightenment and Revolution (3)
  Ancien Regime, Enlightenment, Despotism, and Bourgeois Revolution in the West; political,
  economic, social, and cultural developments from the beginning of the eighteenth century
  through the Napoleonic era. 3 lectures.

Hist 351, 352, 353  Modern European History (3) (3) (3)
  Growth of political institutions; development of national states; imperial rivalries; origins
  of World War I; peace settlements; totalitarianism; World War II; developments since 1945. 3
  lectures. Prerequisite: Hist 101 and 102, or permission of the instructor.

Hist 381, 382  African History (3) (3)
  Survey of African history from earliest times; ancient African civilizations, Moslem penetra-
  tion, indigenous kingdoms, European colonialism, rise of African nationalism, development of
  independent Africa as illustrated by the history of selected countries. 3 lectures. Prerequisite:
  Junior standing.

Hist 385  Topics in California History (2)
  In-depth analysis of selected political, economic, and social issues involved in the develop-
  ment of California from the earliest times to the present. 2 lectures.

Hist 400  Special Problems for Advanced Undergraduates (1–2)
  Individual investigation, research, studies, or surveys of selected problems. Total credit
  limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of the
  department head.
History

Hist 401 Early American History to 1763 (3)
Age of exploration; European powers in eastern North America; English settlements; development of the English colonies, with emphasis on Virginia and Massachusetts; proprietary interests; growth of internal control, and colonial conflicts. 3 lectures. Prerequisite: Junior standing and Hist 201 or consent of instructor.

Hist 402 American Revolution and the New Nation (3)
Background of the Anglo-American imperial problem; the War for Independence and internal democratic upheaval of the era; establishment of the new nation, origins of the Constitution, the party system, American foreign policy, the national economy. 3 lectures. Prerequisite: Junior standing and Hist 201 or consent of instructor.

Hist 403 Early National and Jacksonian Eras (3)
Growing nationalism and simultaneous development of sectional rivalries; emerging two-party system; the transportation revolution; early industrialization; and a changing social order. 3 lectures. Prerequisite: Junior standing and Hist 201 or equivalent.

Hist 404 Civil War and Reconstruction (3)
Interaction of political, social and economic forces with personalities and ideas in a period in which the political process failed to function. 3 lectures. Prerequisite: Junior standing and Hist 202 or equivalent.

Hist 405 Rise of Industrial America (3)
Social, political, and economic history during the latter part of the 19th century. Interaction between rising industrialism and traditional agrarian democracy. Relationship between the industrial system and the values of democratic institutions. 3 lectures. Prerequisite: History 202 or equivalent and junior standing.

Hist 406 Progressive America (3)
Economic, social, intellectual, and political history, and foreign policy. Progressive response to problems of industrialization, agriculture, and urbanization; development of the American corporate business system; era of normalcy and onset of the depression. 3 lectures. Prerequisite: Junior standing and Hist 202 or 204 or equivalent.

Hist 407 The New Deal and Contemporary America (3)
Major developments of the mid-twentieth century. Change and growth in domestic and foreign policies; the Depression, New Deal, World War II, Cold War. Problems of world leadership and contemporary domestic problems. 3 lectures. Prerequisite: Junior standing and Hist 202 or 204 or equivalent.

Hist 411, 412, 413 History of East Asia (3) (3) (3)
Social, political, economic, and intellectual developments in Japan, China, Korea, and Southeast Asia from earliest times to the present. 3 lectures. Prerequisite: Junior standing.

Hist 414 Modern China (3)
Analysis of Chinese history in the twentieth century, the conflict between modernity and cultural continuity. The Chinese Communist Party and People's Republic of China since 1949. 3 lectures.

Hist 424 Organizing and Teaching History (3)
Organization, selection, presentation, application, and interpretation of subject matter in history in secondary schools. 3 seminars. Prerequisite: Admission to teacher education program or valid teaching credential.

Hist 425, 426, 427 Russian History (3) (3) (3)
Evolution of Russian autocratic society from the emergence of Muscovy to the consolidation of the Soviet Society. 3 lectures. Prerequisite: Junior standing.
Hist 435  Women in History (3)
Traditional roles and attitudes about women; contributions of individual women; changing conditions and their implications for today's woman. 3 lectures. Prerequisite: Junior standing.

Hist 460  Senior Project (2)
Selection and completion of a project under faculty supervision. Results presented in a formal report. Minimum of 60 hours time. Prerequisite: Hist 301

Hist 463  Undergraduate Seminar (2)
Historical analysis of selected problems and topics for undergraduates. Prerequisite: Hist 301, 302

Hist 465  Oral History (3)
Practical experience in all facets of oral history. Value and tools of oral history, preparation for the interview, interviewing, transcribing, editing the transcript, and preservation and use of the tape and transcript. 3 activities. Prerequisite: Junior standing.

Hist 470  Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

Hist 590  Seminar in History (3)
Historical analysis of selected problems and topics. Each seminar will carry a subtitle descriptive of its content. 3 meetings. Maximum of 6 units may be earned. Prerequisite: Graduate standing.

HOME ECONOMICS

HE 101  Orientation to Home Economics (2)
Exploration of professional opportunities available in home economics; advantages, disadvantages and the personal and professional qualifications required. 2 lectures.

HE 121  Introduction to Foods (5)
Formation and illustration of basic concepts and scientific principles in food preparation. Supporting factors necessary for successful meal preparation. 3 lectures, 2 two-hour laboratories.

HE 122  Design Analysis for Home Economists (2)
Directed laboratory experience in use of design principles as they apply to all areas of home economics. 2 two-hour laboratories.

HE 131  Clothing Construction (3)
Basic studies in clothing construction. Emphasis on care, performance, fabric, and design. Application to consumer education. 1 lecture, 2 three-hour laboratories.

HE 200  Special Problems for Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of department head.

HE 203  Personal and Home Management (3)
Application of home management principles to personal and family situations. Relationship of values, standards and goals to the allocation of resources and the decision-making process. 3 lectures.

HE 207  Problems of Family Housing (3)
Effects of various housing conditions on the dynamics of family life in the home. Emphasis on consumer housing problems of low income families. 3 lectures. Prerequisite: Soc 105.
Home Economics

HE 210 Nutrition (3)
- Nutritional needs throughout the life cycle. Chemical composition of foods and their utilization in the body. 3 lectures.

HE 220 Contemporary Textile Products (3)
- Selection, use and care of textiles: apparel, carpets, draperies, upholstery, linens. Legislation as it affects consumers and the industry. 3 lectures.

HE 224 Creative Textiles (3)
- Exploration and development of creative textiles through observations and laboratory experiences. 1 lecture, 2 two-hour laboratories. Prerequisite: HE 122 or consent of instructor.

HE 225 Textile Development and Dyeing (3)
- The development of textiles. Use of various fibers; dyeing processes, and construction. 1 lecture, 2 two-hour laboratories. Prerequisite: HE 122 or consent of instructor.

HE 226 Home Food Conservation (2)
- Conservation techniques to obtain maximum control of food quality with most efficient use of time, energy, and economic resources. 1 lecture, 2 two-hour laboratory. Prerequisite: HE 121.

HE 229 Food Selection and Preparation (3)
- Food supply, availability, quality and cost; food legislation; buying practices. Economic, nutritional and aesthetic considerations in meal management. 2 lectures, 1 activity. Prerequisite: Non-Home Economics major or permission of instructor.

HE 237 Children's Clothing (3)
- Design, construction, and selection of children's clothing. Emphasis upon the psychological, physiological, and developmental needs of various age levels. Comparative analysis of self-made and ready-to-wear clothing. 2 lectures, 1 laboratory. Prerequisite: HE 131 or consent of instructor.

HE 241 Flat Pattern (3)
- Pattern design analyzed through the basic techniques of fitting and use of flat pattern. 1 lecture, 2 laboratories. Prerequisite: HE 131 or consent of instructor.

HE 242 Interior Design (4)
- Basic interior design dealing with the visual, functional, and consumer aspects of manipulating interior space. Individual creative laboratory experience in solving realistic design problems. 3 lectures, 1 laboratory. Prerequisite: HE 122 or consent of instructor.

HE 310 Maternal and Child Nutrition (3)
- Nutritional requirements from conception to adolescence; role of nutrition in normal development. 3 lectures. Prerequisite: HE 210

HE 315 Textile and Clothing Industries (3)
- Commercial aspects of design, production, development and distribution of textiles and clothing. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HE 321 Meal Management (3)
- Planning, preparing, and serving family meals. Emphasis on nutritional, aesthetic, and economic aspects. 1 lecture, 2 two-hour laboratories. Prerequisite: HE 121, 210

HE 322 Textiles (3)
- Physical and chemical characteristics of natural and synthetic fibers. Yarns, fabrics, and textile finishes. Application of theory to textile fabrics. Selection, use, and care. 2 lectures, 1 three-hour laboratory. Prerequisite: Chem 226 or consent of instructor.

HE 323 Housing for Contemporaries (3)
- Design decisions creating an interior and exterior environment expressive of social, functional and esthetic needs as applied to a mass produced housing unit. 3 lectures. Prerequisite:
Home Economics

HE 207, 242 and junior standing.

HE 324 Management of Consumer Resources (3)
Basic home management principles of values, goals, decision-making, and resources as directly related to individual and family consumption patterns. 3 lectures. Prerequisite: HE 203, Econ 201.

HE 326 Demonstration Techniques (3)
Development of effective means of communication by use of the demonstration technique, through presentations with evaluations. 3 two-hour laboratories. Prerequisite: Sp 201, HE 331 or consent of instructor.

HE 328 Advanced Nutrition (4)
Nutrient requirements of man; factors affecting requirements. Biochemical and physiological functions of nutrients and their interactions in the body. Evaluation of nutritional status. Topics in nutrition research. 4 lectures. Prerequisite: HE 210, Chem 226, Zoo 131.

HE 331 Household Equipment (4)
Principles involved in construction, operation, use, selection and safety of household equipment. 2 lectures, 2 two-hour laboratories. Prerequisite: Junior standing.

HE 332 Advanced Interior Design (3)
Individual creative experiences in problems of interior design. Total credit limited to 6 units. 3 two-hour laboratories. Prerequisite: HE 323 or consent of instructor.

HE 333 Draping (3)
French draping fundamentals. Designing for the individual and the fabric. Advanced fitting techniques. 1 lecture, 2 laboratories. Prerequisite: HE 241 or consent of instructor.

HE 334 Special Fabric Construction Techniques (2)
Selected experiences in clothing construction using a variety of special fabrics. 2 laboratories. Prerequisite: HE 131 or consent of instructor.

HE 341 Dynamics of Clothing (3)
Socio-psychological, economic and aesthetic aspects of clothing as related to human behavior. 3 lectures. Prerequisite: One course in psychology, Soc 105.

HE 344 Practical Interior Furnishing Techniques (2)
Practical experiences in furniture refinishing and restoring, slip covering, and selected window treatments. 2 laboratories. Prerequisite: HE 242 or consent of instructor.

HE 348 Advanced Nutrition Laboratory (2)
Nutrient requirements and their evaluation. Quantitative laboratory techniques used in nutrition research. 2 three-hour laboratories. Prerequisite: HE 328 or consent of instructor.

HE 400 Special Problems for Advanced Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Senior standing or consent of instructor.

HE 401 Occupational Training Seminar (3)
Current developments in the teaching of home economics-related occupations at the secondary level. May be repeated up to 6 units. 3 meetings. Prerequisite: Senior standing or consent of instructor.

HE 404 Financial Problems of the Family (3)
Application of basic home management principles to financial problems throughout the family life cycle. Methods of assisting families with financial problems according to their specific socio-economic levels. 3 lectures. Prerequisite: HE 203.
Home Economics

HE 406  Home Maintenance and Repair (3)
Basic principles and skills applicable to the maintenance of a safe and functional housing unit. 3 lectures. Prerequisite: HE 331 or consent of instructor.

HE 409  History of Furniture Design (3)
Development of furniture styles and their environments from ancient times to the present. 3 lectures. Prerequisite: Junior standing.

HE 410  Community Nutrition (3)
Problems inherent in improvement of nutrition at the community level. Relation to local, state, and national nutrition programs. Role of the nutritionist in public health, social welfare, agricultural extension, and school lunch program. 3 lectures. Prerequisite: HE 210.

HE 411  Curriculum and Methods for Homemaking Education (4)
Development of a timely philosophy in consumer and homemaking education. Classroom management, procedures, curriculum development, teaching aids and evaluating techniques for teaching homemaking in junior and senior high schools, including federally reimbursed programs. Field trips required. 4 lectures. Prerequisite: Consent of instructor.

HE 412  Home Economics Student Teaching Seminar (3)
Practices and problems of student teaching in Home Economics. Synthesizes professional study and experience to develop teaching competence. Taken concurrently with student teaching. 3 lectures.

HE 415  Methods of Teaching Nutrition (3)
Identification of nutrition learning needs and problems at various stages of the life cycle. Selection of valid content and learning activities for a variety of teaching situations and strategies in community, classroom and clinic. 3 lectures. Prerequisite: HE 210. Senior standing.

HE 421  Meals for Special Occasions (2)
Distinctive foods as related to gourmet, regional, national, and international cuisine. 1 lecture, 1 laboratory. Prerequisite: HE 121 or consent of instructor.

HE 422  Advanced Textiles (3)
Advanced study of fiber structure and fabric properties as related to fabric performance. Laboratory testing of fibers and fabrics. 2 lectures, 1 three-hour laboratory. Prerequisite: HE 322

HE 425  Quantity Cookery (3)
Economic principles and problems involved in planning and preparing food using institutional equipment to meet specific product standards for large groups. 1 lecture, 2 laboratories. Prerequisite: Senior standing or consent of instructor.

HE 426  Food Production Management (3)
Principles of successful organization and management with their application to the effective operation of food service. Administrative responsibilities of the food service manager. Advance reservation with instructor required. 3 lectures. Prerequisite: Senior standing or consent of instructor.

HE 427  Equipment and Layout (3)
Selection, maintenance and arrangement of equipment and furnishings for food service departments with emphasis on materials, construction and specifications. Designated field trips required. 2 lectures, 1 laboratory. Prerequisite: Senior standing or consent of instructor.

HE 428  Management for Contemporary Living (3)
Management principles related to various contemporary family and group living situations. Application to students' current living conditions. Field work included. 2 lectures, 1 laboratory. Prerequisite: HE 203, senior standing or consent of instructor.
HE 429  Diet Therapy (4)
Modification of normal food intake and dietary patterns, with emphasis on dietary adjustments necessitated by certain disease processes and conditions. 3 lectures, 1 two-hour laboratory. Prerequisite: HE 328

HE 433  Historic Costume (3)
Costumes of the past as related to contemporary fashions. 3 lectures.

HE 440  Internship (3-12)
Career experience with private or public agencies. Total credit limited to 12 units. Prerequisite: Junior standing and permission of instructor.

HE 442  Tailoring (2)
Selection and construction of tailored garments. 2 laboratories. Prerequisite: HE 241 or consent of instructor.

HE 461, 462  Senior Project (2) (2)
Selection and completion of a project under faculty supervision, the project to be related to a probable field of employment. Results of the study are presented in a formal report. Minimum of 120 hours to be used in making the study. Prerequisite: Engl 114, Engl 218 or 300, Senior standing in the major.

HE 463  Undergraduate Seminar (2)
Development of the home economics profession. Discussion of current social issues and their relation to home economics. Reporting of recent trends and discussion of the future directions of the field. 2 lectures. Prerequisite: HE 461 and Senior standing in major.

HE 470  Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

HE 471  Selected Advanced Laboratory (1-3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topics selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

HE 500  Individual Study (1-3)
Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Consent of the department head, the graduate program coordinator, and the supervising faculty member.

HE 501  Management of Family Resources (3)
Principles, major problems and trends in the economics of the family. 3 lectures. Prerequisite: Graduate standing.

HE 511  Research Design (3)
Methods of research and critical analysis of scientific literature and problems in home economics. 3 lectures. Prerequisite: Graduate standing.

HE 525  Experimental Studies in Textiles (4)
Review and reporting of pertinent studies in textile research. Testing of fabrics using equipment available. 3 lectures, 1 laboratory. Prerequisite: HE 422

HE 528  Experimental Studies in Foods (4)
Experimental approach to the study of chemical and physical properties of interacting components of selected foods; correlated emphasis on selection, application, and evaluation of pertinent literature. 3 lectures, 1 laboratory. Prerequisite: Graduate standing.
HE 532 Problems and Trends in Interior Design (3)
Current developments in design, materials, and coordination of home furnishings. Individual problems. 2 lectures, 1 two-hour laboratory. Prerequisite: Graduate standing or consent of instructor.

HE 536 Experimental Studies in Household Equipment (3)
Development of professional and consumer criteria to improve evaluation of household appliances. Current research and techniques for investigations with home equipment. 2 lectures, 1 laboratory. Prerequisite: HE 331 or consent of instructor.

HE 580 Seminar (1–3)
Advanced study of current issues and topics significant for professional home economists. Class schedule will list topics selected. 1–3 lectures. Maximum of 6 units may be earned. Prerequisite: Graduate standing.

HE 582 Graduate Seminar in Nutrition (1)
Critical review of literature on selected topics in the field of nutrition. Total credit limited to 3 units. Prerequisite: Graduate standing.

HE 584 Expanding Roles for Women (3)
Redefinition of sex roles. Methods of solving family role conflicts as women enter the labor force and the political arena. 3 lectures.

HE 585 Seminar in Clothing (3)
Current trends in clothing design and construction. Advanced study of clothing related to human behavior. 3 lectures. Prerequisite: HE 341 or consent of instructor.

HE 587 Seminar in Family Housing (3)
Current housing problems of minorities, the elderly, handicapped, and other groups of concern to professional home economists. 3 lectures. Prerequisite: Graduate standing or consent of instructor.

HE 599 Thesis (3)
Individual research under the general supervision of the staff, leading to a graduate thesis of suitable quality. Prerequisite: Graduate standing.

HUMANITIES
Hum 270 Contemporary Ideas (3)
Interdisciplinary study of human values as they relate to one or more areas of these disciplines: history, literature, philosophy, and the arts. 3 lectures. Prerequisite: Phil 101 or consent of the instructor.

Hum 320 Future Studies (3)
Evaluation of methods used in forecasting future trends. Critical examination of the predictions made by futurists and their implications for humankind. 3 lectures. Prerequisite: Junior or senior standing and Engl 105.

Hum 350 Esthetics (3)
Interdisciplinary investigation of artistic phenomena and esthetic experience which may emphasize psychology, philosophy, history, arts, or literature. 3 lectures. Prerequisite: Phil 101.

Hum 402 Human Values (3)
Humanistic and social science learning concerning human values. 3 lectures. Prerequisite: Senior standing.

Hum 461 Senior Project (3)
Selection and completion of a project under faculty supervision. Results presented in a formal report. Minimum of 120 hours time.
INDUSTRIAL ENGINEERING

IE 101 Introduction to Industrial Engineering (3)

Historical development of the industrial economy and the profession of industrial engineering. Basic concepts and principles of industrial organization and management. Review of career opportunities. The dynamics of the industrial enterprise and the functional activities associated with industrial engineering. 3 lectures.

IE 123 Industrial Systems Analysis (4)

Systems, subsystems, and relationships (interfaces) of industrial systems concepts in modern productive society. Trends in techniques for data gathering, analysis, and presentation for management decisions. 3 lectures, 1 laboratory.

IE 141 Manufacturing Processes (1)

Principles and theory of metal casting. Inherent design and cost implications in production of goods by metal casting techniques. Experiences in sand and shell molding, investment casting, core making, and sand testing. 1 laboratory.

IE 200 Special Problems for Undergraduates (1–2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of department head.

IE 201 Production Costs Estimating (3)

Estimating the costs of a finished product from design and marketing information. Product material costs, processing and assembly labor costs, investment costs, depreciation, overhead costs for typical manufactured items. Compilation of segmented cost information into a final result for engineering, customer, or marketing purposes. 3 lectures. Prerequisite: Sophomore standing.

IE 202 Motion and Time Study (3)

Principles, tools, and techniques for methods improvement and the setting of time standards. Motion and time study as used by management for planning and control. A study of methods for systems analysis. 3 lectures. For Non-IE Students. Prerequisite: Sophomore standing.

IE 204 Industrial Safety (2)

Fundamental system safety engineering. Discussion of latest Cal-OSHA regulations and procedures, workmen compensation laws, industrial safety practices, and product liability. 2 lectures.

IE 214 Production Control (2)

Coordination of production facilities to meet objectives of customer service, minimum inventory investment, and maximum manufacturing efficiency. Inventory control studies including forecasting, statistical determination of order requirement, planning and scheduling production capacity. 2 lectures. Prerequisite: Sophomore standing.

IE 222 Engineering Analysis (3)

Methods of evaluating variability of engineering design parameters, predicting deviations from expected averages, counting, grouping data for computations. Computation techniques. Expected fit within engineering tolerances and allowable signal fluctuations. 2 lectures, 1 activity. Prerequisite: Math 131.

IE 223 Man-Machine Systems (4)

Principles of motion economy, work simplification, flow charting in work analysis methods, work sampling, micro-motion analysis, and synthetic data. Quantitative analysis of time studies, allowance and performance ratings. Integration of these methods in man-machine systems. 3 lectures. 1 laboratory. Prerequisite: IE 123.
Industrial Engineering

IE 232 Dimensional Metrology (2)
Fundamental theory of dimensional measurement: metrication standards and calibration. Techniques and industrial applications of linear metrology using direct-measuring tools; optical, pneumatic and electronic comparators, light waves and other equipment. 1 lecture, 1 laboratory. Prerequisite: Sophomore standing.

IE 233 Elements of Numerical Control Machining (2)
Theory and principles of manual and computer programming systems for point-to-point machining operations. Application techniques include control tape generation, set up and operations run of machine tools. Verification of control tapes by plotter techniques. Development of computer programs for positioning operations. 1 lecture, 1 laboratory. Prerequisite: ET 151, MP 141.

IE 239 Industrial Costs and Controls (4)
Manufacturing costs in production planning, cost analysis and cost control. Budgeting production costs and analysis of variance from actual costs as principal keys to cost control, inventory valuation, and pricing. Techniques of value analysis/costs reduction. 3 lectures, 1 laboratory. Prerequisite: IE 123.

IE 240 Additional Engineering Laboratory (1-2)
Total credit limited to 4 units, with not more than 2 units in any one quarter. 1 or 2 laboratories.

IE 251 Manufacturing Engineering Laboratory (4)
Theory, principles, and industrial concepts of manufacturing engineering. Properties of materials including cost selection for industrial use. Experimental studies in heat treatment, metals, powder metallurgy, and metrology. Instrumented analysis of cutting tool forces, and numerically controlled machines. 2 lectures, 2 laboratories. Prerequisite: Chem 124.

IE 304 Operations Research (3)
Preliminary study of basic management science tools and techniques. Probability applications, sampling analysis, inventory models, and waiting lines. Application to common production control problems. 3 lectures. Prerequisite: Stat 321.

IE 312 Data Analysis (3)
Applying basic filing systems, tab cards and computers to data collection and analysis. The planning, design, and use of auxiliary files for electronic data processing. Survey of pertinent computer languages. The need for, and usage of, data in managing production systems. 2 lectures, 1 laboratory. Prerequisite: Engr 251.

IE 319 Human Factors Engineering I (3)
Areas covered by human factors. Understanding of man's psychological and physiological characteristics. Human reactions and capabilities related to specific tasks and systems. Design of machines, operations, and work environment to match human capacities and limitations. 3 lectures. Prerequisite: Psy 202 and Junior standing.

IE 334 Numerical Control Machine Processing (2)
Design and management concepts in numerical control of machine tools. Manual programming for continuous path machining, linear and circular interpolation. APT programming techniques and contour machining. Graphical verification of control tapes, operational runs of machine tools. 1 lecture, 1 laboratory. Prerequisite: IE 233.

IE 341 Product Development and Manufacture (4)
Systems-design approach to product conception, prototype development and production design. Production methods, human factors, and planning of integrated manufacturing facilities. 2 lectures, 2 laboratories. Prerequisite: IE 223 or consent of instructor.

IE 343 Facilities Design (4)
Utilization of manufacturing data in the design of production processes and planning industrial facilities. Quantitative analysis of integrated plant arrangement. Product flow, production
Industrial Engineering

line balancing, material handling, warehousing. Computerized methods. Systems approach to optimum facilities design. 2 lectures, 2 laboratories. Prerequisite: IE 251, 223 and Junior standing in engineering.

IE 400 Special Problems for Advanced Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limit to 4 units, with a maximum of 2 units per quarter.

IE 401 Sales Engineering (2)
Concepts and principles of engineering in sales. Role of the professional engineer in the analysis, design, development, production, and final application of a product or system required by the buyer. 2 lectures. Prerequisite: Senior standing in Engineering, or consent of instructor.

IE 402 Technological Assessment (3)
Planning for the future. Dynamic and iterative processes are explored to determine possible consequences of proposed macro-systems. Rational planning and decision making enhanced through predicting plausible outcomes and societal effects. 3 lectures. Prerequisite: Senior standing.

IE 403 Principles of Engineering Economy (3)
Development of methods to assess time value of money through mathematical models for evaluating economic factors in the making of individual or industrial decisions. 3 lectures. Prerequisite: Senior standing in other than engineering.

IE 408 Manufacturing System Optimization (3)
Optimization of waiting line queues. Application of Markov chains and stochastic processes to production control problems. Advanced dynamic programming. Information and statistical analysis of critical path technique, mathematical programming problems and queues using computer analysis tools. 2 lectures, 1 laboratory. Prerequisite: Math 242, Stat 321, IE 304.

IE 409 Manufacturing System Optimization II (3)
Further exploration of optimization models. Stochastic inventory models. Detailed analysis and case studies of industrial systems using advanced operations research methods. 3 lectures. Prerequisite: IE 408.

IE 414 Engineering Economy (3)
Economic analysis of engineering decisions. Rates of return on investments, depreciation, taxes. Application of basic principles and tools of analysis using case studies. 3 lectures. Prerequisite: Math 242, senior standing or consent of instructor.

IE 415 Engineering Economy (2)
Engineering economic decisions; selection and use of interest rates in the decision process. Decision rules and methods of analysis applied to cases in the field of engineering. 2 lectures. Prerequisite: Math 143, Engr 251, junior standing.

IE 417 Advanced Systems Analysis (3)
Analysis of economic value of information to sequential decision processes. Decision making models using Bayes Criteria and mini-max game models. Application of decision theory and information value concepts to production control problems. Cost effectiveness and break even analysis in production problems. 3 lectures. Prerequisite: IE 419.

IE 419 Operations Research (3)
Introductory study of game theory. Linear programming, including transportation and assignment models. Dynamic programming, and schedule sequencing. Computer programming in solution of problems. 3 lectures. Prerequisite: IE 304, Math 242, Stat 321.

IE 420 Industrial Systems (3)
Application of general systems theory to industrial systems. Use of simulation models in industrial problems. Monte Carlo, mathematical, and computer methods. 2 lectures, 1 laboratory. Prerequisite: Math 143, Engr 251, IE 304.
Industrial Engineering

IE 421 Manufacturing Organization (3)
Theory and principles of manufacturing organization systems and sub-systems. Analysis of the processes of production management. Use of systems approach to achieve unification of the production elements in terms of both analysis and synthesis, and interrelation between parts of the enterprise and the whole. 3 lectures. Prerequisite: Senior standing or consent of instructor.

IE 423 Public Problem Project Systems Engineering (3)
Exploration of the difficulties and possible solutions associated with a particular public problem selected by the class made up of non-engineers. Systems engineering and related methods are applied including the use of optimizing models based upon elementary algebra. 3 lectures. Prerequisite: Senior standing, non-engineer.

IE 424 Engineering Test Design and Analysis (3)
Design and statistical analysis of engineering experiments. Experimental methods for evaluation and comparison; accelerated, sequential, and non-parametric tests; interpretation of interference, fatigue, and field data; Weibull renewal analysis and warranty data. 3 lectures. Prerequisite: Stat 321 or equivalent.

IE 425 Reliability Assurance (3)
Reliability mathematical models, mechanical device reliability, electrical device reliability, reliability data, assurance program elements. 3 lectures. Prerequisite: Math 242, Stat 321, CSc 219 or IE 304.

IE 430 Statistical Quality Control (3)
Statistical theory of sampling to analyze output variation. Managerial methods to control attributes of incoming or in-process material. Quantitative risk factors for decisions based on sampling procedures with associated operating characteristics and control charts. Case studies and experiments. 2 lectures, 1 laboratory. Prerequisite: Stat 321.

IE 431 Systems Engineering (3)
Treatment of the systems concept within the national industrial complex involving men and facilities. Quantitative methods of management and planning, including operations research. 2 lectures, 1 laboratory. Prerequisite: Math 143 and upper division standing, or consent of instructor.

IE 437 Human Factors Engineering II (3)
Principles, concepts and theoretical models used in evaluating and maximizing human performance capacities. Development of experimental methods for generating rational data relative to men and machines. Data analysis. 2 lectures, 1 laboratory. Prerequisite: IE 319 and Stat 321 or equivalent.

IE 441, 442 Fundamentals of Supervision (2) (1)
Theory and principles of supervision. Application of fundamental concepts and techniques of supervision provided by assignment in manufacturing laboratories. 2 laboratories, 1 laboratory. Prerequisite: IE 233.

IE 444 Value Engineering (3)
Analysis of design, material, and process to obtain desirable functional performance at minimum cost. Application to manufacturing products, systems, and services. 2 lectures, 1 activity. Prerequisite: IE 343 or consent of instructor.

IE 461, 462 Senior Project (2) (2)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours of total time.

IE 463 Undergraduate Seminar (2)
Preparation, oral presentation, and discussion by students of technical papers on recent engineering developments and/or subject matter pertinent to industrial engineering. 2 lectures. Prerequisite: Senior standing in IE.
IE 470 Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

IE 471 Selected Advanced Laboratory (1-3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. One or three laboratories. Prerequisite: Consent of instructor.

INDUSTRIAL RELATIONS

IR 118 Introduction to Human Relations in Business (3)
Small group dynamics, leadership, communication, motivation and perception. The individual in the business organization. 3 lectures.

IR 311 The Labor Movement in the United States (3)
Labor movement theories, American trade-union development, union management, labor and economic political power, variations in labor movements. 3 lectures. Prerequisite: Junior standing.

IR 314 Industrial Relations (3)
Industrial relations function and its relationships within the business environment. Personnel management and labor relations. Relations among unions, management, and public. 3 lectures. Junior standing.

IR 315 Advanced Personnel Management (3)
Management dealing with planning, organizing, directing, controlling, evaluating functions of procuring, developing, maintaining, and utilizing people in work environment. 3 lectures. Prerequisite: IR 314 or consent of instructor.

IR 316 Labor Contract Administration (3)
Simulation techniques designed to prepare representatives of labor, management, and government agencies to resolve problems involving contracts between unions and companies. 3 lectures. Prerequisite: IR 311 or consent of instructor.

IR 319 Wage and Salary Administration (3)
Functions of management that involve planning, developing, directing, and controlling, and evaluating all phases of employee compensation. Areas included are: job evaluation, employee evaluation, and related activities. 3 lectures. Prerequisite: IR 314 or consent of instructor.

IR 410 Employee Benefits (3)
Employee benefit programs in the private sector. Effect on payroll and other costs, contract negotiations, employee relations. Pensions, hospitalization, insurance, supplemental unemployment benefits, job security, thrift plans, bonuses, severance pay, profit sharing. 3 lectures. Prerequisite: IR 314 or consent of instructor.

IR 412 Collective Bargaining (4)
Collective bargaining and the relationship between management and labor leading to the development of a contract. 4 lectures. Prerequisite: IR 316 or consent of instructor.

IR 413 Labor Law (3)
Federal and state labor policy as expressed in common law, relevant statutes, and executive orders. Effects upon labor, management, minorities, and the public. Current rules in historical context. Understanding important industrial relations and manpower problems. 3 lectures. Prerequisite: IR 311 or consent of instructor.
Industrial Technology

IR 415 Organizational Behavior (3)
Application of behavioral science to management training. Effectiveness of the individual, the small group; intergroup and organizational relationships. Ability of organizations, teams, and individuals to cope with change in a dynamic environment. 3 lectures. Prerequisite: IR 118 or consent of instructor.

IR 518 Seminar in Labor Relations (3)
Comparative relations among union organizations. Policies and practices within the public and private sectors. Current issues. 3 meetings. Prerequisite: IR 584 or consent of instructor.

IR 584 Human Resources Management (4)
Systems approach to understanding total organizational effectiveness with emphasis on development of team skills. Leadership styles, small group dynamics, motivation, communication, perceptual distortion, conflict resolution; attitude change and personal growth are among the primary concept areas examined in the context of human behavior in organizations. 4 lectures. Prerequisite: Mgt 530

INDUSTRIAL TECHNOLOGY

IT 101 Technical Computation (2)
A study of the techniques used in the analysis and solution of typical technical problems. Emphasis on the need for orderly work, checking procedures, handling and presenting scientific data; purpose and presentation of technical reports. 2 lectures.

IT 111 Industrial Education Careers (1)
Survey of career opportunities in Industrial Arts and trade-technical teaching at the secondary school and community college levels. Job entry requirements. Technical and professional preparation. Credential requirements. 1 lecture.

IT 112 Industrial Technology Careers (1)

IT 125 Industrial Wood Processes (2)
Analysis of basic woodworking equipment, processes and materials currently used in lumbering, mill-cabinet, general construction and related industries. Theory and practice in the use of woodworking equipment. 1 lecture, 1 laboratory.

IT 130 Automotive Fundamentals (2)
Principles of operation and familiarity with basic components of the automobile from the consumer viewpoint. Economics of selection, operation, and preventive maintenance. Practical experience, owner inspection, maintenance and repair for beginners. Understanding of pollution control systems. 1 lecture, 1 laboratory.

IT 141 Plastics Processes and Applications (1)
Uses, capabilities, and operational characteristics of plastics machinery and process fabrication equipment. Properties and classes of molds, tools. Plastics processes and applications. Introduction to injection molding, extrusion, compression molding, rotational molding, foaming, and plastic fabrication techniques. 1 laboratory.

IT 200 Special Problems for Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of department head.

IT 222 Power Technology: Sources (4)
Analysis of power sources: natural, steam, internal combustion, continuous combustion, nuclear energy, fuel cells, photo cells, thermal electricity. Transmission of power; clutches, gear trains, wrapped connectors, hydraulics, pneumatics, universal joints, bearings, lubricants. 2 lectures, 2 activities. Prerequisite: Phys 122.
IT 229 Industrial Materials (3)

An investigation of the characteristics, applications and limitations of materials of industry including: plastics, glass, ceramics, rubber, abrasives and adhesives, wood, fuels and lubricants. 2 lectures, 1 activity. Prerequisite: Sophomore standing.

IT 233 Metal Technology (3)

Theory and practice in care and use of hand and machine tools. Applications of welding, forging, foundry, sheet metal, ornamental metal, machine shop and bench metal processes to the fabrication of industrial products. 3 activities. Prerequisite: 4 units from MP 141, 142; Weld 141, 142; MP 143, IE 141

IT 237, 238 Industrial Electricity (3) (3)

Theory and application of basic a.c. and d.c. circuits as they pertain to industry and teaching applications. Magnetic circuits. Principles of motors and generators, instruments, control and control circuits, transformers and circuitry, oscilloscopes. 2 lectures, 1 laboratory.

IT 245 Technical Sketching (2)

Freehand sketching of industrial products using perspective, isometric oblique and orthographic projection. Shading. Basic design. 2 activities. Prerequisite: ET 151

IT 250 Automotive Power (4)

Theory and operation of automotive and other transportation power sources: Four cycle, two cycle, rotary, diesel and turbine internal combustion engines. Application and service of basic fuel, electrical, lubrication and cooling systems. 2 lectures, 2 activities.

IT 304 Product Quality Control (3)

Applications at the supervisory level of the overall quality plan for manufacturing. Quality assurance, testing, shop and field inspection techniques, material review, source inspection, vendor surveillance, and quality audit. 3 lectures.

IT 324 Modern Industrial Finishes (2)

Characteristics and applications of finishes to modern industrial products. Brushing, dipping, spraying, baking, plating, etching. 2 laboratories.

IT 326 Product Evaluation (2)

Procedures in the gathering, preliminary analysis and practical application of quality and reliability field data by industrial sales and service personnel. Principles of value engineering and production quality control techniques in relation to customer needs. 2 activities. Prerequisite: Junior standing.

IT 327 Plastics Technology (2)

Materials, processes and applications of industrial polymers. Basic operations in processing, fabricating and finishing of thermal plastic and thermal setting resins. 1 lecture, 1 activity. Prerequisite: IT 125, Chem 122

IT 331 Industrial Electrical Systems (4)

Industrial applications of electrical concepts in distribution systems, industrial wiring, illumination, motors and controllers. Field trips, 3 lectures, 1 laboratory. Prerequisite: IT 237, Math 131

IT 332 Electronic Control Systems (4)

Automated control devices from an operational and servicing viewpoint. Modular approach to the study of electronic control systems. Field trips. 3 lectures, 1 laboratory. Prerequisite: Phys 122, IT 237

IT 333 Electronic Computer Applications (3)

Fundamentals of analog computers, electronic data processing machines, and numerical control of machine tools. Applications in production supervision, sales, and industrial education, fundamentals of logic and logic circuits, simulation. 2 lectures, 1 laboratory. Prerequisite: IT 237, or consent of instructor.
Industrial Technology

IT 336 Automotive Technology, Engines (3)
Engine overhaul and maintenance, theory and construction. Practical activities with various types of engines, including automotive, marine, and low horsepower power plants. 1 lecture, 2 laboratory. Prerequisite: IT 222, AE 335, 336.

IT 337 Advanced Plastics Processes (3)
Primary plastic processing techniques; principles. Operation of extrusion, thermoforming, rotational molding, injection molding, compression molding, and blow molding equipment. Product diagnosis. 1 lecture, 2 activities. Prerequisite: IT 327.

IT 339 Automotive Technology, Fuel Systems (3)
Fuel systems and fuels used in internal combustion engines. Carburetors, injectors, superchargers, manifolds, pumps, and storage tanks. Emission control systems. Types of fuels and their compounding. 2 lectures, 1 laboratory. Prerequisite: IT 222.

IT 346 Industrial Design (2)
Applications of design principles to the various materials and processes of industry; development of a creative, problem-solving approach to design as it applies to industry. 2 activities. Prerequisite: IT 125, 245, and a minimum of 4 units of manufacturing processes courses.

IT 350 Quality Systems Applications (3)
Philosophy and principles of quality system administration. Relationship to total systems program administration; impact on management information and data requirements. Quality system administration techniques applied to control performance, cost and schedule data, traceability, and retrievability. 3 lectures. Prerequisite: Math 120, Junior standing.

IT 352 Additional Laboratory Problems (1-2)
Advanced instruction in the construction, repair, maintenance, and use of laboratory equipment. Primarily for students intending to become industrial education teachers. Total credit limited to 4 units with not more than 2 units any one quarter. 1 or 2 laboratories. Prerequisite: Consent of instructor.

IT 353, 354, 355 Wood Technology (3) (3) (3)
Application of design principles, materials and construction techniques, furniture manufacturing, machine tool maintenance and mill cabinet work. Materials and methods used in modern industry. 3 activities. Prerequisite: IT 125.

IT 356 Building Construction Techniques (3)
Examination of modern materials and construction methods as applied to home building; mass-production, custom-building and prefabrication. Field study of representative projects; laboratory experience in framing and basic processes. 3 laboratories. Prerequisite: IT 353.

IT 400 Special Problems for Advanced Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

IT 404 Customer Relations (2)
Customer contacts; personal relationships, ethics, legal relationships, service contracts, communication channels. 2 lectures. Prerequisite: Mktg 204. Senior standing or consent of instructor.

IT 405 Industrial Marketing (2)
Investigation of the institutions and channels involved in industrial marketing. Analysis of industrial products, competitors, and consumers. Problems in marketing research, personnel, and management. Individual reports on industrial products, companies or training programs. 2 lectures. Prerequisite: Mktg 204 or 301. Senior standing or consent of instructor.

IT 406 Cost Reduction and Control (3)
Application of cost control procedures at the foreman level. Techniques of cost reduction. Goals in reducing waste of material and defects in workmanship. 3 lectures. Prerequisite: Senior standing.
IT 407  Industrial Product Development (3)
Organization for new industrial product development, linking marketing, operations and technology functions; sources and screening of new product ideas, sizing and evaluation of market prospects, budgeting, pricing, timing, advertising and distribution factors as they relate to new industrial products, internal coordination during product development phases. 3 lectures. Prerequisite: IT 404, 405 or consent of instructor.

IT 408  Industrial Packaging (3)
Principles of industrial packaging development. Packaging of different classes of products. Materials, standards, quality control, economics. Analysis of package configurations, closing features, locking devices and cushioning for military and industry. Material handling considerations, liability implications, recycling factors. 2 lectures, 1 activity. Prerequisite: IT 408 or approval of instructor.

IT 409  Packaging Machinery (3)
Analysis of major types of packaging machinery from a practical, operational and marketing viewpoint. Basic processes utilizing packaging machinery. Specialized operations, contract specifications, selection, operation and maintenance. Field trips to packaging operations. 2 lectures, 1 activity. Prerequisite: IT 408 or approval of instructor.

IT 410  Drafting: Industrial Education (3)
Teaching applications of drafting principles, home planning, sketching, rendering and industrial working drawings. For high school industrial arts drafting teachers. Field trips to industrial drafting offices. 1 lecture, 2 activities. Prerequisite: IT 444 or consent of instructor.

IT 413  Plant Maintenance Management (3)
Maintenance and repair of plant facilities, operation of utility plants and systems and furnishing of utilities services, preventive maintenance, job control systems, and other essential services. 3 lectures. Prerequisite: IT 444 or consent of instructor.

IT 415, 416, 417  Industrial Equipment Selection (3) (3) (3)
Electrical and mechanical equipment making up the utility and production support systems of a modern industrial plant. Technical alternatives available in terms of economic choice for project profitability, capital budgeting in terms of industrial equipment planning. Forecasting of depreciation due to unusual wear, use, and technological obsolescence. 3 lectures. Prerequisite: IT 331, 432, Econ 212.

IT 418  Technical Management Problems (4)
Organization and positions of key personnel in corporate technical management structure; their functions, duties and interfaces with operations, marketing, general management and research/development. Structure and objectives related specifications and proposals with case studies. 3 lectures, 1 activity. Prerequisite: Senior standing, Mgt 311, or consent of instructor.

IT 419  Industrial Internship (2-6)
Part-time industrial experience, with or without pay. Conducted under company and faculty supervision. Guided observations related to technical management. Report of experiences is required at end of quarter. Credit, no credit grading. Prerequisite: Any of the following: IT 326, 331, 332, 333, 346, 404, 405, 407, 413, 433.

IT 422, 423  Construction Equipment (2) (2)
Analysis of major types of construction equipment from a practical marketing viewpoint. Contract specifications, estimating, basic processes utilizing construction equipment, selection of appropriate equipment and equipment operation and maintenance. Field trips. 1 lecture, 1 laboratory. Prerequisite: IT 222, 237.

IT 424  Curriculum and Methods of Industrial Education (3)
Industrial education curriculum and instructional processes. Organization, selection, presentation, application, interpretation and evaluation for teaching automotives, drafting, electronics, graphic arts, industrial crafts, metals, photography, plastics, power mechanics, woodworking. Preparation for student teaching. Field trips. 2 lectures, 1 activity. Prerequisite: Ed 301, 335.
Industrial Technology

IT 426  Automotive Technology, Chassis (3)
Fundamental, technical, and teaching aspects of automotive suspension system, steering, braking, and other control systems. Tires and lubrication. 1 lecture, 2 activities. Prerequisite: IT 250.

IT 427  Automotive Technology, Electronics (3)
Applications of electronics and electrical systems in automotive type equipment including ignition, lighting, starting, charging, auxiliary systems, and control systems. 2 lectures, 1 laboratory. Prerequisite: IT 222, 237, AE 341.

IT 428  Automotive Technology, Power Trains (3)
Advanced applications of clutches, gears, hydraulics, pneumatics, and wrapped connectors. Universal joints, bearings, and lubricants in automotive type equipment. 1 lecture, 2 laboratories. Prerequisite: IT 222.

IT 431, 432  Mechanical Systems (3) (3)
Applications of basic physics to mechanical systems using the English system of units; various component systems. Steam systems, air conditioning and refrigeration systems, pneumatic and hydraulic systems, piping systems. 2 lectures, 1 activity. Prerequisite: Math 131, Phys 122, IT 222.

IT 433  Mechanical Systems (3)
Production equipment and systems, metals, measurement, tooling and finishes. Mass production. Production management. 2 lectures, 1 activity. Prerequisite: Junior standing.

IT 437  Reinforced Polymer Plastics (3)
Mold preparation and production of reinforced plastic products. Standard specifications for reinforced materials and resin systems. 1 lecture, 2 laboratories. Prerequisite: IT 327.

IT 438  Plastics Mold Construction (3)
Properties and characteristics of thermosetting and thermoplastic materials. Analysis and construction of molds and dies for use with reinforced plastics, injection molding, thermoforming processes; extrusion, and compression and transfer molding. Selection of plastics. 1 lecture, 2 activities. Prerequisite: IT 327.

IT 439  Plastics Process Control (3)

IT 441  Metal Production Processes (4)
Study of mass-production techniques; design, production planning, tolerances, jigs and fixtures, interchangeable parts, assembly line. Design and construction of projects suitable for industrial arts metal courses. 1 lecture, 3 activities. Prerequisite: IT 233, 443 or consent of instructor.

IT 443  General Metals (3)
Applications of the various general metal fabrication processes to typical construction problems. Design and construction of instructional projects suitable for the secondary school industrial education program. Maintenance of metalworking equipment. 1 lecture, 2 activities. Prerequisite: IT 233 or consent of instructor.

IT 444  Technical Drawing: Industrial Education (4)
Application of current drafting procedures in preparing complete graphic descriptions of industrial components. Sketching, lettering, instrument drawing. Preparation of work drawings and specifications. Analysis of drafting materials, equipment and processes. 1 lecture, 3 activities. Prerequisite: IT 245, or consent of instructor.
IT 446 Wood Production Processes (2)
Study of mass-production techniques; design, production planning, jigs and fixtures, interchangeable parts, assembly line. Design and construction of projects suitable for industrial arts wood courses. 2 laboratories. Prerequisite: IT 353, 433.

IT 451 Electronics: Industrial Education (4)
Teaching applications of the principles and operation of non-linear devices such as vacuum tubes, semi-conductors and associated solid state components. Programs and experiments for the teaching of electronics at the secondary level. 3 lectures, 1 laboratory.

IT 452 Electronics: Industrial Education (5)
Construction, testing, trouble shooting and repair of electrical and electronic equipment; appliances, radios, amplifiers and television. Use of typical high school electricity-electronics equipment and analysis of procedures. 3 lectures, 2 laboratories. Prerequisite: IT 451 or approval of instructor.

IT 453 Electronics: Industrial Education (3)
Planning, equipping and organizing a high school electricity-electronics industrial arts program. Course objectives and methods of teaching electricity and electronics at the high school level. Field trips to local high schools will be arranged. FCC regulations. 3 lectures. Prerequisite: IT 452.

IT 461, 462 Senior Project (2) (2)
Selection and completion of a project under faculty supervision. Projects are typical of problems graduates must solve in their field of employment. Project results are presented in a formal report. Minimum 120 hours total time.

IT 463 Undergraduate Seminar (2)
Preparation, oral presentation and discussion by students of papers on related professional topics. 2 lectures.

IT 470 Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

IT 471 Selected Advanced Activity (1-3)
Directed group study for advanced undergraduate and graduate students. Class schedule will list topic selected. May be required with IT 470. Total credit limited to 6 units. 1 to 3 activities. Prerequisite: Consent of instructor.

IT 500 Individual Study (1-3)
Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Consent of Department Head, graduate adviser and supervising faculty member.

IT 515 History and Philosophy of Industrial Education (3)
Development of industrial education from its initial conception to the present time. Current philosophical concepts of the field. 3 lectures. Prerequisite: Graduate standing.

IT 520 Organization and Administration of Industrial Education (3)
Case studies of current problems in the administration and organization of industrial arts and industrial-technical education. Problems in industry, financing industrial education, work-experience and adult education programs, and community education. 3 lectures. Prerequisite: Student teaching or consent of instructor.

IT 521 Curriculum in Industrial Education (3)
Basic principles and practices in the preparation of course guides, courses of instruction and related materials for industrial instruction. 3 lectures. Prerequisite: Student teaching or teaching experience in public schools or industry, or instructor approval.
Journalism

IT 522 Facility Planning in Industrial Education (2)
Analysis of major factors in planning and designing industrial education laboratories and related areas. Includes State standards, equipment specifications, and presentation displays. 2 activities. Prerequisite: Student teaching or instructor approval.

IT 527 Trends and Issues in Industrial Education (3)
Guided study and discussions of current and innovative practices in industrial education. Identification of major issues facing the industrial educator. Development of a personal philosophy of industrial education. 3 lectures. Prerequisite: Graduate standing or consent of instructor.

IT 580 Graduate Seminar in Industrial Education (3)
Advanced study and analysis of selected topics and problems in industrial education. 3 meetings. Prerequisite: Instructor's approval.

IT 599 Industrial Education Thesis or Project (5)
Each student will propose, develop and complete a thesis or project involving individual research that is significant to the field of industrial education. Prerequisite: Acceptable academic standing in the master's program in Industrial Arts and consent of the instructor.

JOURNALISM

Jour 118 Journalism in Society (3)
Examination of the mass media, their methods, purposes, and functions. Responsibilities of journalists; importance of media in society, 3 lectures.

Jour 201 Journalism History (3)
Survey of historical influences in the development of today's journalism. 3 lectures.

Jour 203 Reporting I (3)
Techniques of news reporting and writing. Intensive practice in gathering and evaluating information and writing basic news stories. 2 lectures, 1 two-hour laboratory. Prerequisite: Engl 104 or 114, and typing proficiency.

Jour 231 Advertising (3)
Principles of advertising, advertising psychology, salesmanship, copy layout, and production for print and broadcast media. 3 lectures.

Jour 233 Copy Editing (3)
Copy desk work: rewriting, editing, and headlining news copy. Selecting, cropping, and captioning news photos. 1 lecture, 2 two-hour laboratories. Prerequisite: Jour 203.

Jour 302 Law for Journalists (3)
State and federal laws affecting journalists. Hazards of libel and what defenses are recognized; contempt of court, right of privacy; study of postal regulations, regulations in advertising, broadcasting, photography, and business regulatory statutes; ethics and responsibility of the press and broadcast media. 3 lectures.

Jour 304 Reporting II (3)
Experience in advanced reporting and news writing with special attention to public affairs. 2 lectures, 1 two-hour laboratory. Prerequisite: Jour 203.

Jour 312 Public Relations (3)
Principles of public relations and public opinion; methods employed in dissemination of public information by various organizations. 3 lectures.

Jour 323 Photojournalism (3)
Theory of photojournalism. The photograph as a visual statement of fact. Value of the photograph in communication of news in newspapers and magazines. Photographic news assignments. Techniques in developing news picture essays. 2 lectures, 1 laboratory. Prerequisite: Jour 203, Art 322.
Jour 326 Broadcast Announcing (3)
Radio and television announcing of news, sports, special events, commentary, features, commercials, and talk and discussion. 1 lecture, 2 laboratories. Prerequisite: Sp 200.

Jour 333 Broadcast News I (3)
Radio news course with emphasis on live and taped interviews, newscast production and presentation, in depth reporting, and broadcast newswriting style. 2 lectures, 1 two-hour laboratory. Prerequisite: Jour 203.

Jour 351 Journalism Practice (2)
Credit arranged by sections as indicated by subtitle for students holding editorial, advertising, or photographic positions on such departmental publications as Mustang Daily, or radio station KCPR, closed circuit television, or other similar supervised experience. 2 laboratories. Total credit limited to 6 units. Prerequisite: Instructor's permission.

Jour 400 Special Problems for Advanced Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of instructor.

Jour 401 International Press (3)
Global communications facilities and operations; world transmission of information; survey of world wire services and international print and broadcast news media. Analysis of press operations under varying government ideologies. 3 lectures. Prerequisite: Junior standing.

Jour 406 Magazine Writing (3)
Feature writing techniques. Study of markets for nonfiction articles; practice in research and preparation of articles. 3 lectures. Prerequisite: Jour 203 or consent of instructor.

Jour 413 Advanced Public Relations (3)
Methods employed in dissemination of public information by organizations. Survey of media, case histories, formation and measurement of public opinion. 3 lectures. Prerequisite: Jour 312.

Jour 425 Advertising Layout and Copywriting (2)
Study of advertising typography and illustration, application of production processes in making of layouts and writing of copy. 1 lecture, 1 two-hour laboratory.

Jour 427 Magazine Editing (3)
Organization, editing and production of magazines. 2 lectures, 1 two-hour laboratory. Prerequisite: Jour 406.

Jour 432 Broadcast News II (3)
Video tape and filmed television news interviews, reports, and features. Television continuity and newswriting. Production of television public affairs broadcasts. 2 lectures, 1 laboratory. Prerequisite: Jour 333.

Jour 434 Advanced Editing (3)
Daily experience and responsibilities in editing and rewriting news and feature stories. Practical application of headline writing and page makeup principles. 1 lecture, 2 two-hour laboratories. Prerequisite: Jour 233, 304.

Jour 444 Media Internship (4)
Application of techniques on daily basis with media under supervision of department faculty. Prerequisite: Junior standing in Journalism.

Jour 460 Senior Project (3)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 90 hours total time.
Landscape Architecture

Jour 470 Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

LANDSCAPE ARCHITECTURE

LA 201 Introduction to Landscape Architecture (2)
Survey of the profession of landscape architecture from small space design to regional planning. Relationships between landscape architects and society and professionals in related fields. 2 lectures. Prerequisite: Landscape Architecture major or consent of instructor.

LA 231 Landscape Architecture Practice (3)
Introduction to basic principles and methods of landscape architectural construction drawings. 3 laboratories. Prerequisite: Arch 106, ArcE 311 or consent of instructor.

LA 240 Additional Landscape Architecture Laboratory (1-2)
Total credit limited to 4 units with not more than 2 units in any one quarter. 1 or 2 laboratories.

LA 301 Landscape Architectural Theory (3)
Landscape architecture and the concepts and physical planning of selected periods in history. Evaluation of spatial and ecological organization of man-made environments. 3 lectures. Prerequisite: LA 201 or consent of instructor.

LA 317 History of Landscape Architecture (3)
Historical evaluation of man’s interaction with outdoor space. Analysis of influences that direct, perpetuate, and form the landscape. 3 lectures. Prerequisite: Engl 104.

LA 341, 342, 343 Landscape Practice (2) (2) (2)
Theory and application of working drawings, specification, cost estimation, codes, regulations, and contractual agreements. Landscape architecture practice as a profession. 2 laboratories. Prerequisite: LA 231. Concurrent: LA 351, 352, 353.

LA 351, 352, 353 Design for Landscape Architects (5) (5) (5)

LA 400 Special Problems for Advanced Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

LA 401 Principles of Landscape Architecture (2)
For allied fields: Historical development of exterior spaces. Site analysis and ecological influences. Design principles and landscape materials. 2 lectures. Prerequisite: 3rd year standing and consent of instructor.

LA 441 Professional Practice (3)
Office organization, contract documents and specifications. Ethics, problems and practices in the profession of landscape architecture. 3 seminars. Prerequisite: LA 343.

LA 451, 452, 453 Design for Landscape Architects (5) (5) (5)
Continuation of LA 353 emphasizing individual initiative and responsibility in solving problems of increased complexity. 5 laboratories. Prerequisite: LA 343, 353, AE 337.

LA 461, 462 Senior Project (2) (2)
Selection and completion of a comprehensive project under faculty supervision. Problems to involve the student’s technical and creative skills. To be completed in two consecutive quarters. 120 hours minimum total time. Prerequisite: LA 343, 353.
LA 470  Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and
graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1–3
lectures. Prerequisite: Consent of instructor.

LA 471  Selected Advanced Laboratory (1-3)
Directed group laboratory study of selected topics for advanced students. Open to under-
graduate and graduate students. Class schedule will list topic selected. Total credit limited to
6 units. 1–3 laboratories. Prerequisite: Consent of instructor.

LIBRARY

Lib 101  Library Instruction (1)
Instruction and practice in the use of the card catalog, reference books, periodical indexes,
government documents, and other library materials. Development of student independence
and initiative in using the library as a source of information. 1 lecture.

Lib 301  Library Resources and Literature Searches (1)
Sources of information in major subject fields. Reference materials, bibliographic aids,
indexing and abstracting tools, periodicals, serials, and other sources. Techniques used in
literature searches and preparation of bibliographies. Class schedule will list major subject area
covered. Total credit limited to 3 units. 1 lecture. Prerequisite: Junior, senior or graduate
standing or consent of instructor.

MANAGEMENT

Mgt 200  Special Problems for Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit
limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department
head.

Mgt 201  Principles of Management (3)
The management process involving organization, decision-making, and managerial activities
fundamental to all management levels and functional areas. Application to business firms,
governmental agencies, hospitals, benevolent groups, and colleges. 3 lectures. For nonbusiness
majors.

Mgt 206  Principles of Purchasing (3)
The purchasing function applied to manufacturing, retailing, and food-service institutions.
The purchasing function and its interdependence with other functional areas of the organiza-
tion. 3 lectures. For nonbusiness majors.

Mgt 302  International Business Management (4)
Organization and operation of foreign business and multinational firms. Case studies dealing
with differing cultural backgrounds, national interests, and economic pressures. 4 lectures.
Prerequisite: Mgt 312 and junior standing.

Mgt 311  Industrial Management (4)
Organization and functioning of management in industry. Planning, direction, and control
of the business enterprise in terms of policy formation, organizational structure, finance, sales,
procurement, plant location, facilities and production processes. 4 lectures. Prerequisite: Junior
standing.

Mgt 312  Management Process (4)
Managerial functions and processes in modern organizations. Development of management
skills, application of functional imperatives, and analysis of different types of management
approaches. 4 lectures. Prerequisite: Junior standing.
Management

Mgt 321, 322  Management Applications of Data Processing (3) (3)
Design of computer-based methods for management control and evaluation. Applications of data processing systems, planning, programming, problem solving, and analysis. Flow charting, audit trails, file organization. 2 lectures, 1 two-hour laboratory. Prerequisite: CSc 140, COBOL programming ability; Actg 131 or 221 or consent of instructor.

Mgt 323  Simulation of Management Problems (3)
Computer-based simulation of business problems for analysis and decision-making. Model building, Model programming. Program applications and problem solving. 2 lectures, 1 two-hour laboratory. Prerequisite: Mgt 321.

Mgt 331  Organization Theory (4)
Concepts of power, authority, and influence; communications, delegation and decentralization, decision and planning theory; formal organization structures, group decision making, considerations of values, social issues, and future trends in organizations. 4 lectures. Prerequisite: Mgt 321.

Mgt 341  Planning and Decision Theory (4)
Development of a theory of planning. Process of planning, role of participants in planning, the auxiliary functions. Integration into a general theory of decision making, with behavioral and quantitative aspects. 4 lectures. Prerequisite: Mgt 312.

Mgt 400  Special Problems for Advanced Undergraduates (1-2)
Individual investigation, research studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Senior standing or consent of instructor.

Mgt 413, 414  Business Strategy and Policy (4) (4)
Analysis of policy making processes and administration from industrial—production (Management 413) and general management—strategy (Management 414), points of view. Problems analysis, decision making process, administration and control. Case study and continuous appraisal of policies and objectives under varying conditions. Capsheaf of the core curriculum. 4 lectures. Prerequisite: FPM 342, Mgt 312, IR 415.

Mgt 418  Quantitative Methods and Controls in Business (3)
Basic principles of quantitative controls as applied to the fundamental operations of business. For the senior student who needs descriptive and operational knowledge as a background for application in business analysis and decision. 3 lectures. Prerequisite: Senior standing or consent of instructor.

Mgt 430  Internship (4-8)
Business internship to permit student to correlate experience and academic knowledge. Placement as an employee in a business firm approved by the department head. Periodic written progress reports will be required, including collateral reading correlating the work experience with the literature in the area; research reports, and a final report. Prerequisite: Approval of the department head. Credit—no credit.

Mgt 460  Senior Project (2)
Selection and completion under faculty supervision of an investigative project typical of problems graduates must solve in their career field entry positions. Required minimum of 60 hours. Analytical formal report is required. Prerequisite: Bus 419.

Mgt 470  Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

Mgt 488  Small Business Management (4)
Application of management knowledge and skills to the specific managerial problems involved in planning and operating the smaller company; growth strategies; the art of securing

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performance; changing the organization structure to match growth; recruiting and compensating new personnel. 4 lectures. Prerequisite: Senior standing.

Mgt 500 Independent Study (1-3)
Advanced study planned and completed under the direction of a departmental faculty member. Open only to graduate students demonstrating ability to do independent work. Prerequisite: Formal petition with approval.

Mgt 513 Operations Management (4)
Analytical tools applied to problems in operations and production systems. Emphasis on operations planning, control, and systems design. 4 lectures. Prerequisite: Mgt 530, IR 584.

Mgt 527, 528 Quantitative Methods and Applications (4) (4)
Introduction to mathematical reasoning as applied to deterministic and nondeterministic management problems. Sequential procedure for qualitative pre-analysis of a management problem, creation of a mathematical description of the problem. Search for an analytical solution, and final interpretation of the results. 4 lectures. Prerequisite: Graduate standing.

Mgt 530 Management and Organization Theory (4)
Examination of major theories and conceptual ideas relating to the operating needs of complex organizations; historical development of theory and practice. Current issues and actual cases. 4 lectures. Prerequisite: Graduate standing.

Mgt 581, 582, 583 Seminar in Managerial Strategy and Policy (4) (4) (4)
An integrating seminar; application of analytical concepts and planning strategy under dynamic functional and environmental conditions. Case studies, simulation, guest lecturers, etc. 4 meetings. Prerequisite: Graduate standing.

MANUFACTURING PROCESSES

MP 127 Manufacturing Processes Fundamentals (2)
Survey of materials and manufacturing processes. Possibilities and limitations of these processes. Application to fabrication of industrial products. Limited experience in conventional machine tool operation and use of semiprecision measuring tools. For non-engineering majors. 1 lecture, 1 laboratory.

MP 137 Introduction to Skills (2)
Technical vocabulary, English measuring system, blueprint reading, American industrial practice, classification of industrial skills. Introduction to modern American industrial processes including machining, welding, casting, and sheet metal working. Designed for international students. 1 lecture, 1 laboratory.

MP 141 Manufacturing Processes: Turning I (1)
Uses, capabilities, and operational characteristics of lathe type machine tools, including conventional and numerical control. Properties and classifications of tool and work materials. Tool geometry and its relationship to the mechanics of chip formation. External and internal turning problems. Linear measurements in quality control. 1 laboratory.

MP 142 Manufacturing Processes: Milling I (1)
Uses, capabilities, and operational characteristics of milling type machine tools. Plane surfacing problems, measurement of relative angular attitudes. Standard classification of tool types. Tool geometry of the rotational tool and its effect on the physics of metal cutting. Introduction to numerical control. 1 laboratory.

MP 143 Manufacturing Processes (1)
Relationships between engineering design and production fabrication. Hole forming by punching, piercing, and non-traditional methods including numerical control. Forming and assembling of gauge metal components; physical characteristics of commonly used metals; engineering and economic significance of various production techniques. 1 laboratory.
Manufacturing Processes

MP 144 Manufacturing Processes: Turning-Milling (2)
Combination of MP 141 and MP 142 allows students to complete two units of manufacturing processes with one instructor in one quarter. 2 laboratories.

MP 145 Manufacturing Processes (2)
Combination of MP 143 and 151 allows students to complete two units of manufacturing processes in one quarter with one instructor. 2 laboratories.

MP 151 Drilling Technology (1)
Fundamentals of drilling machine operation, including point-to-point numerical control drilling. Tool classification, selection, and sharpening, use of hand tools, basic layout procedures. Physical properties of metals. 1 laboratory.

MP 153 Manufacturing Processes: Turning II (1)
Advanced problems of lathe type machine tools, both manually and automatically controlled. Evaluation of cutting tool performance and material machinability by use of strain gage tool dynamometer. American Standard Association charts, data, and material classifications. Optical instrumentation for quality control. 1 laboratory. Prerequisite: MP 141.

MP 155 Manufacturing Processes: Grinding (1)
Survey of abrasive machining and finishing. Selection and care of grinding wheels. Fundamental principles, use, capabilities, operational characteristics and safety standards employed in abrasive machining and finishing. 1 laboratory. Prerequisite: MP 153.

MP 224 Advanced Machining Technology (4)
Theory and operational problems of manual and automatic machine tools. Evaluation of cutting tool geometry, machinability, and tool performance with conventional and exotic materials and processes. 2 lectures, 2 laboratories. Prerequisite: MP 144.

MP 240 Additional Engineering Laboratory (1-2)
Advanced production and toolroom problems. Design and construction of laboratory tooling and instrumentation. Individual and group investigation of selected problems. Total credit limited to 4 units, not more than 2 units per quarter. 1 or 2 laboratories. Prerequisite: MP 155 or consent of instructor.

MP 243 Electronic Assembly Techniques (1)
Fabricating electronics and electrical units. Soldering techniques, production soldering. Printed circuit techniques, electrical connectors, cabling processes, and component assembly. 1 laboratory. Prerequisite: MP 143, ET 153 or 156, Weld 151.

MP 254 Manufacturing Processes Milling II (1)
Advanced operations on conventional and numerical control milling machines. Application of milling machine accessories, fixtures and attachments. Increased emphasis on quality control. Drilling machine, metal cutting band saw, and hobbing mill. 1 laboratory. Prerequisite: MP 142, IE 233.

MP 321, 322, 323 Tool Design (3) (3) (3)
Design of manufacturing tools such as jigs, fixtures, and dies. Material selection, tolerance balancing, and quality control requirements as economic design factors. Field trips to manufacturing centers. 2 lectures, 1 laboratory. Prerequisite: MP 224, ET 344 or permission of instructor.

MP 324 Machine and Production Analysis (2)
The integrated manufacturing process. Adapting methods of fabrication based on machine and process availability, production control, and cost estimates. 1 lecture, 1 activity. Prerequisite: IE 201, 214, MP 144, Weld 259.

MP 325 Abrasive Machining and Finishing (2)
History and manufacture of grinding wheels, their selection and care. Fundamental principles, uses, capabilities, and operational characteristics employed in abrasive machining and finishing. Characteristics of grinder fluids. Safety standards, fixturing, and mounting of magnetic and nonmagnetic materials. 1 lecture, 1 laboratory. Prerequisite: MP 224, 254.

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MP 421 Industrial Numerical Control (3)
Contouring computations, dimensioning for contouring and circular interpolation, tool offset calculations; M-functions covering control of feeds, speeds, etc. Calculation of stresses on work piece, fixtures, machine, and tooling. Positioning accuracy tolerances and repeatability tolerances. 2 lectures, 1 laboratory. Prerequisite: IE 234.

MP 434, 435, 436 Tool and Manufacturing Engineering (3) (3) (3)
Construction and testing of jigs, fixtures, dies, and special tools for production. Design, engineering, and economical application of conventional and specialized machine tools. Field trips to manufacturing centers. 1 lecture, 2 laboratories. Prerequisite: MP 323.

MARICULTURAL ENGINEERING
MarE 222 Maricultural Engineering Practices (4)
Engineering practices in the search, capture, planting, cultivation harvest and handling of food and fiber from marine and fresh water sources. 3 lectures, 1 laboratory.

MarE 223 Maricultural Engineering Laboratory (3)
Practical experience in mariculture marine safety and introduction to support equipment used in research and production operations. 1 lecture, 2 laboratories.

MarE 233 Marine Surveying and Topography (4)
Practical instruction in marine surveying and topography to permit the student to define locations. Surface and ocean floor drift of floating fauna and flora as affected by currents and topography. 3 lectures, 1 laboratory. Math 115 or equivalent.

MarE 234 Marine Propulsion Equipment (2)
Repair, trouble shooting, and maintenance of marine engines. Outboard and inboard installations. Engine controls and instruments. Marine electrical systems. Propulsion and steering systems. Hydraulic systems in marine applications. 1 lecture, 1 laboratory.

MARKETING
Mktg 204 Marketing Principles (4)
Basic marketing institutions and functions they perform in the marketing process. Management of marketing in the economic, socio-cultural, and political-legal environment. 4 lectures. Prerequisite: Econ 201 or 211 or equivalent or consent of instructor. For nonbusiness majors.

Mktg 301 Marketing Analysis (4)
The environment of marketing decisions and demand analysis. Modern methods of marketing problem definition, investigation, information management, and problem solving. 4 lectures. Prerequisite: Econ 212, Econ 221-2, and Stat 212 or equivalents.

Mktg 302 Marketing Information and Analysis (4)
Information management for marketing decisions. Quantitative and qualitative research techniques for collection and analysis of marketing information. 4 lectures. Prerequisite: Mktg 301 or consent of instructor.

Mktg 303 Consumer Behavior (4)
Application of behavioral science concepts as guides for marketing management, problem analysis and decision making. Cultural, social-psychological, and economic frameworks of consumer motivation, buying behavior, and consumption behavior. 4 lectures. Prerequisite: Psy 202 or equivalent, Mktg 301 or consent of instructor.

Mktg 304 Physical Distribution (4)
Logistical systems approach to the physical movement of goods and services through time and space from original producers to ultimate consumers. Channels of distribution to industrial and consumer markets. Location analysis, packaging and packing, inventory management, loading and unloading, material handling, transportation. 4 lectures. Prerequisite: Mktg 301 or consent of instructor.
Mktg 305 Marketing Communications (4)
Marketing management methods of communicating with industrial and consumer markets, distribution-channel members, suppliers, government and public organizations. Communications media available; their uses and limitations. 4 lectures. Prerequisite: Mktg 303 or consent of instructor.

Mktg 406 Marketing Management (4)
Policymaking and decisionmaking applications in the planning, organizing, operating, controlling and evaluating of individual products and brands. 4 lectures. Prerequisite: Mktg 302 or consent of instructor.

Mktg 466 Marketing Problems Seminar (4)
Application of modern methods to the exploration and analysis of current and potential marketing trends, opportunities, and problems. 4 meetings. Prerequisite: Senior standing, Mktg 406 or consent of instructor.

Mktg 470 Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

Mktg 508 Marketing Management I (4)
Detailed analysis of marketing management, policy planning or strategy formulation, organizing, directing and coordinating marketing activities. 4 lectures. Prerequisite: Mktg 204 or equivalent.

Mktg 509 Marketing Management II (3)
Application of quantitative tools, introduced in previous quarters of the program, to marketing problems. 3 lectures. Prerequisite: Mktg 508 or consent of instructor.

MATHEMATICS

Math 100 Mathematics for General Education (3)
Elementary topics in mathematics and the nature of mathematics. Intended to provide an appreciation of the aesthetic and cultural values of mathematics. For students not needing the specific mathematical skills required in scientific applications. 3 lectures.

Math 102 Agricultural Mathematics (3)
Percentage problems in soils, dairy, horticulture, poultry, feeds; discount and interest, equations, formulas, linear measurements, areas, volumes and proportions. 3 lectures.

* Math 103 Agricultural Mathematics (3)
Use of exponents, logarithms and trigonometric functions; basic land descriptions; work, horsepower and efficiency, pressure; standard deviation. Not open to students with credit in Math 120. 3 lectures. Prerequisite: Math 102.

Math 105 Pocket Electronic Calculators (1)
Operation of multi-function pocket electronic calculators including all operations and memory and stack registers. Applications of the calculator to problems in mathematics and engineering. 1 lecture.

* Math 109 Introduction to College Mathematics (3)
Basic mathematical skills needed in science courses; consumer mathematics. Percentage, ratio and proportion, linear equations, exponents, logarithms, simple interest, and discount. 3 lectures.

* Not open to students having credit in Math 141 or equivalent.
Mathematics

Math 110  Finite Mathematics for General Education (3)
Symbolic logic; sets and subsets, including set operations; permutations and combinations; elementary probability theory through Bayes Theorem; vectors and matrices. 3 lectures. Prerequisite: One year of high school algebra.

Math 111  Mathematics for Life Sciences (3)
Mathematical models in the life sciences, discrete probability, vectors and matrices. Not open to students with credit in Math 110. 3 lectures. Prerequisite: One year of high school algebra.

* Math 113  Algebra (3)
Systems of integers: fractions; polynomials and factoring; linear equations and systems of linear equations; exponents and radicals. Exercises in problems applied to agriculture. Intended for agricultural majors. Not open to students with credit in Math 114, 118, 120, or courses for which these are prerequisites. 3 lectures. Prerequisite: One year of high school algebra.

* Math 114  College Algebra (3)
Quadratic equations; graphical functions; inequalities; exponential and logarithmic functions; progressions; applications to agricultural problems wherever applicable. This course primarily intended for agricultural majors. Not open to students with credit in Math 118 or 120 or courses for which they are prerequisites. 3 lectures. Prerequisite: Math 113 or equivalent.

* Math 115  Trigonometry for Agriculture (3)
Trigonometric functions of acute angles and related angles; graphs, radian measure, fundamental identities, functions of two angles, applications of right and oblique triangles, and logarithmic applications. Not open to students with credit in Math 119 or 120 or courses for which they are prerequisites. 3 lectures. Prerequisite: Math 114 or equivalent.

* Math 118  Pre-Calculus Algebra (4)
Pre-calculus college algebra without trigonometry. Special products and factoring; exponents and radicals; partial fractions; fractional and quadratic equations; determinants; systems of equations; graphing; inequalities and absolute value; mathematical induction; binomial theorem; logarithms; complex numbers. Not open to students with credit in Math 120. 4 lectures. Prerequisite: Math 113 or equivalent.

* Math 119  Analytical Trigonometry for Engineers (3)
Rectangular and polar coordinates; trigonometric functions, fundamental identities; inverse trigonometric functions and relations; complex numbers. Not open to students with credit in Math 115 or Math 120. 3 lectures. Prerequisite: Math 118 or equivalent.

* Math 120  College Algebra and Trigonometry (5)
An integrated review course in college algebra and trigonometry covering function concept and symbols, rectangular co-ordinates, trigonometric functions, linear and quadratic functions, inequalities, analysis of trigonometric functions, inverse trigonometric functions, exponential and logarithmic functions, systems of equations and complex numbers. 5 lectures. Prerequisite: 1½ years of high school algebra and trigonometry.

* Math 131, 132, 133  Technical Calculus (4) (4) (4)
Functions, their graphs and limits; techniques and applications of differential and integral calculus; introduction to applied differential equations. Designed principally for technology students and others interested in an applied three-quarter calculus sequence. 4 lectures. Prerequisite: Math 118 and 119 or equivalent.

Math 141  Analytic Geometry and Calculus (4)
Introduction to analytic geometry and calculus. 4 lectures. Prerequisite: Math 118 and 119 or equivalent.

Math 142  Analytic Geometry and Calculus (4)
Continuation of analytic geometry and calculus. 4 lectures. Prerequisite: Math 141.

* Not open to students having credit in Math 141 or equivalent.
Mathematics

Math 143 Analytic Geometry and Calculus (4)
Contuation of analytic geometry and calculus. 4 lectures. Prerequisite: Math 142.

Math 204 Mathematics of Matrices (3)
Matrices, inverses, linear systems, characteristic values, applications. 3 lectures. Prerequisite: Math 141 or consent of instructor.

Math 210 Finite Mathematics for Business (3)
Application of matrix theory to systems of equations and Markov chains; linear inequalities; linear programming; the simplex method and duality; mathematics of finance. Not open to students with credit in Math 211. 3 lectures. Prerequisite: Math 110.

Math 211 Mathematics for Life Sciences (3)
Discrete and continuous models in the life sciences, linear programming, Markov chains and difference equations. Not open to students with credit in Math 210. 3 lectures. Prerequisite: Math 111.

Math 221 Calculus for Business and Economics (4)
Polynomial calculus for optimization and marginal analysis; partial derivatives and elementary integration. Not open to students with credit in Math 143, Math 133 or equivalent. 4 lectures. Prerequisite: Math 210.

Math 241 Analytic Geometry and Calculus (4)
Continuation of analytic geometry and calculus. 4 lectures. Prerequisite: Math 143.

Math 242 Differential Equations (4)
Introduction to differential equations. Differential operators. 4 lectures. Prerequisite: Math 241.

Math 248 Methods of Proof in Mathematics (3)
Methods of proof (direct, contradiction, conditional, contraposition); examples from set theory; quantified statements and their negations; functions, indexed sets, set functions; proofs in analysis; proof by induction; equivalence and well-defined operations and functions; the axiomatic method. 3 lectures. Prerequisite: Math 241.

Math 304 Vector Analysis (4)

Math 312 Linear Algebra (4)
Vector spaces, inner products, linear transformations, linear independence, matrix algebra, linear algebraic systems, determinants, eigenvalues, eigenvectors, applications. 4 lectures. Prerequisite: Math 241.

Math 313 Linear Algebra (4)
Bilinear and quadratic forms, spectral decomposition, canonical forms, multilinear algebra, tensors, applications. 4 lectures. Prerequisite: Math 312.

Math 318 Advanced Engineering Mathematics (4)
Theory and applications of Laplace transforms; Fourier series and transform; matrices. 4 lectures. Prerequisite: Math 242.

Math 319 Partial Differential Equations (3)
Separation of variables. Orthogonal functions; Bessel functions, Legendre polynomials. Boundary value problems. Applications in vibrating strings and membranes, heat flow, potential theory. 3 lectures. Prerequisite: Math 318.
Mathematics

Math 327 Modern Elementary Mathematics (3)
Introduction to number systems. Natural numbers, whole numbers, and integers. Sets, relations, whole numbers, finite operational systems, numeration, and elementary number theory. 2 lectures, 1 activity. Prerequisite: One year of high school algebra, one year of high school geometry, three units of college mathematics and at least junior standing.

Math 328 Modern Elementary Mathematics (3)
Continued study of number systems. The rational and real numbers. Functions and introduction to probability and statistics. 3 lectures. Prerequisite: Math 327.

Math 329 Modern Elementary Mathematics (3)
Intuitive geometry. Incidence, separation, symmetries, networks, polygons, polyhedra, surfaces, congruence and similarity transformations, constructions, measurement, the metric system, graphs and other topics. 3 lectures. Prerequisite: Math 328.

Math 335 Graph Theory (3)
Sets, permutations and combinations, finite graphs and digraphs, Euler paths and Hamiltonian paths, matrix representation of graph, connectedness, isomorphism, planar graphs, trees, applications. 3 lectures. Prerequisite: At least junior standing.

Math 336 Combinatorial Mathematics (3)
Permutations and combinations; generating functions; recurrence relations; inclusion and exclusion; Polya's theory of counting; transport networks; matching theory; block design. 3 lectures. Prerequisite: Math 143 or equivalent.

Math 341 Theory of Numbers (3)
Properties of numbers. Euclid's Algorithm, greatest common divisor, least common multiple, indeterminate equations, prime numbers, congruences; emphasis toward the teaching of secondary mathematics. 3 lectures. Prerequisite: At least junior standing and Math 141.

Math 381, 382 Modern Algebra (4) (4)
Fundamental algebraic structures and types of algebras, including operations within them and relations among them. Groups, rings and fields. 4 lectures. Prerequisite: Math 248.

Math 400 Special Problems for Advanced Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of the department head.

Math 403 Secondary School Mathematics (3)
A study of the mathematical content of secondary school courses, with particular emphasis on the new curricular materials that have been introduced into the secondary school courses. 3 lectures. Prerequisite: At least junior standing.

Math 408 Functions of a Complex Variable (4)
Elementary analytic functions and mapping; Cauchy's Integral Theorem; Power series; Theory of residues and evaluation of integrals; harmonic functions. 4 lectures. Prerequisite: Math 242.

Math 409 Complex Analysis (4)
Further development of analytic function theory. Additional topics in calculus of residues, conformal mapping and the Poisson Integral. 4 lectures. Prerequisite: Math 408.

Math 412, 413, 414 Advanced Calculus (3) (3) (3)
Introduction to concepts and methods basic to real analysis. Topics such as real number system, continuity, uniform continuity, differentiation, the integral, uniform convergence, partial differentiation, implicit and inverse function theorems. 3 lectures. Prerequisite: Math 248.
Mathematics

Math 424 Organizing and Teaching Mathematics (3)
Organization, selection, presentation, application and interpretation of subject matter in mathematics. For students who will be teaching in secondary schools. 3 lectures. Prerequisite: Math 403.

Math 431, 432 Mathematical Optimization I-II (3) (3)
Classical optimization: max/min of functions, linear and nonlinear optimization problems, duality, constrained optimization. Model building and applications to various fields. 3 lectures. Prerequisite: CSc 219 or consent of instructor.

Math 435 Teaching Mathematics in the Elementary School (3)
Development of mathematical concepts; the discovery or laboratory approach to learning and the role of manipulative or visual materials; teaching the mathematical rationale of fundamental operations; necessity for a sequential and organized program; the newer curricular materials and their place in the total program; problem solving; evaluation. 3 lectures. Prerequisite: Ed 335 and Math 327 or consent of instructor.

Math 437 Game Theory (3)
Definition of a matrix game and the minimax theorem. Optimal strategies for matrix games; discrete games. Mathematical formulation of problems and solutions. 3 lectures. Prerequisite: Math 204 or 210 or 312.

Math 442 College Geometry (3)
Modern development of the basic concepts of plane and solid Euclidean geometry including a coordinate treatment; selected topics in advanced Euclidean geometry. 3 lectures. Prerequisite: Math 248 and at least junior standing.

Math 443 Non-Euclidean Geometry (3)
Review of attempts to prove Euclid's fifth postulate as a point of departure in the discovery of non-Euclidean geometry; building an axiom system free of intuitive prejudice; hyperbolic plane trigonometry. Particularly appropriate for the prospective or in-service teacher. 3 lectures. Prerequisite: Math 442.

Math 444 Projective Geometry (3)
Geometric and algebraic treatment of such topics as primitive forms, ideal elements, incidence and duality. Certain geometric properties preserved by projections; and construction of special figures. 3 lectures. Prerequisite: at least junior standing. Math 442 recommended.

Math 456 Fundamental Concepts of Analysis (3)
Metric spaces with careful definitions of types of limits, properties of continuous functions; various aspects of differentiation; integrals defined in terms of step functions, properties extended to integrals of bounded functions in general. Not open to students with credit in Math 412. 3 lectures. Prerequisite: Math 381.

Math 459 Undergraduate Seminar (2)
Reports and discussions by students, through seminar format, on topics in mathematics education, applied mathematics, or finite mathematics. 2 activity periods. Prerequisite: Math 242 and either Math 312 or Math 381.

Math 461, 462 Senior Project (2) (2)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time. Prerequisite: Math 459.

Math 470 Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: consent of instructor.
Math 505 Foundations of Mathematics (3)

Development of the primitive materials and concepts necessary to an understanding of the axiomatic method dealing with sets and logic. 3 lectures. Prerequisite: Graduate standing or consent of instructor.

Math 506 Topics in Modern Algebra (3)

Topics selected from group theory, ring theory, unique factorization, group representation, module theory and linear algebra. 3 lectures. Prerequisite: Math 382 and 312 or equivalent and graduate standing.

Math 507 Structure of Geometry (3)

Transformations and geometries; affine, topological and analytic. Appropriate for the prospective or in-service teacher. 3 lectures. Prerequisite: Graduate standing or consent of instructor; Math 442 recommended.

Math 508 Introduction to Topology (3)

Basic ideas of general topology, metric spaces, homeomorphisms and the separation axioms. 3 lectures. Prerequisite: Math 412 or Math 456, and graduate standing or consent of instructor.

Math 509 History of Mathematics (3)

A study of men, concepts and techniques prominent in the evolution of mathematics from earliest times to the present. Appropriate for prospective and in-service teachers. 3 lectures. Prerequisite: Graduate standing or consent of instructor.

Math 510, 511 Survey of Modern Mathematics (3)

Selected topics from the field of modern mathematics: projective, and synthetic geometry, topology, logic, matrices, vectors, theory of games, probability, linear and modern algebra and convex sets, Boolean algebras, graph theory, Lattice theory, geometry of complex numbers. 3 lectures. Prerequisite: Graduate standing or consent of instructor.

Math 512, 513 Partial Differential Equations of Physical Systems (3)

Partial differential equations of first and second order. Laplace's equation, wave equation, diffusion equation and others; methods for their analytical solution. 3 lectures. Prerequisite: Math 318 and graduate standing or consent of instructor.

Math 515 Real Analysis (3)

Introduction to Lebesgue measure and integration, convergence theorems, $L_1$ spaces, Radon-Nikodym theorem and Fubini's theorem. 3 lectures. Prerequisite: Math 413 and 508 or consent of instructor.

Math 516 Linear Operators (3)

Linear spaces, operator theory and operational calculus. Applications to differential equations, integral equations, transforms and Fourier analysis. 3 lectures. Prerequisite: Math 515 and graduate standing or consent of instructor.

Math 518 Advanced Ordinary Differential Equations (3)

Existence, continuation and dependence on parameters of solutions. Linear systems, initial and boundary value problems. Self-adjoint eigenvalue problems. 3 lectures. Prerequisite: Math 318 and graduate standing or consent of instructor.

Math 540 Foundations for Quantitative Methods (4)

Intensive foundation course for the MBA program. Optimization of functions of one and several variables; elements of matrix theory applied to linear programming, duality, transportation and assignment problems, and other topics in decision theory for business and economics. 4 lectures. Prerequisite: Graduate standing.

Math 580 Seminar (1-2-3)

Built around topics in advanced mathematics chosen according to the common interests and needs of the students enrolled. Each seminar will have a subtitle according to the nature of the content. 1, 2, or 3 meetings. Total credit limited to 6 units. Prerequisite: Graduate standing and consent of instructor.
Mechanical Engineering

Math 593  Seminar Topics in Applied Mathematics (3)
One or two topics such as variational calculus, integral transforms, singular integral equations, optimization. Pontryagin's maximum principle, Lyapunov stability, approximation theory. Class schedule will list topics selected. Total credit limited to 6 units. 3 lectures. Prerequisite: Graduate standing or consent of instructor.

Math 596  Thesis (3) (3)
Serious research endeavor devoted to the development, pedagogy or learning of mathematics. Prerequisite: Graduate standing and consent of instructor.

MECHANICAL ENGINEERING

ME 134  Mechanical Systems (4)
Analysis, synthesis, and testing of mechanical systems, their components and instruments. 2 lectures, 2 laboratories.

ME 136  Thermal Systems (3)
Analysis and synthesis of thermal systems, their components and instruments. 2 lectures, 1 activity. Corequisite: ME 146.

ME 146  Thermal Systems Laboratory (1)
Testing of thermal systems, their components and instruments. 1 laboratory. Corequisite: ME 136.

ME 200  Special Problems for Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of department head.

ME 205  Statics (3)
Statics by scalar methods. Includes forces, couples, resultants, equilibrium, trusses, cables, friction, centroids, and moments of inertia. For Engineering Technology students. 2 lectures, 1 activity. Prerequisite: Phys 121, Math 132, or Phys 131, Math 142.

ME 206  Dynamics (4)
Dynamics by scalar methods. Includes kinematics (both absolute and relative motion of particle and bodies) and kinetics, force, mass, acceleration, work and energy, and impulse and momentum. For Engineering Technology students. 3 lectures, 1 activity. Prerequisite: ME 205 or ME 211.

ME 211  Engineering Mechanics (3)
Analysis of forces on engineering structures in equilibrium. Properties of forces, moments, couples, and resultants. Equilibrium conditions, friction, centroids, area moments of inertia. Introduction to mathematical modeling and problem solving. Vector mathematics where appropriate. 2 lectures, 1 activity. Prerequisite: Math 143 (or concurrently), Phys 131.

ME 212  Engineering Mechanics (4)
Analysis of motions of particles and rigid bodies encountered in engineering. Velocity, acceleration, relative motion, work, energy, impulse, and momentum. Further development of mathematical modeling and problem solving. Vector mathematics where appropriate. 3 lectures, 1 activity. Prerequisite: Math 241 (or concurrently), ME 211.

ME 234  Mechanical Engineering Systems (4)
Analysis, synthesis and testing of thermal systems, their components and instruments. For qualified transfer students. 3 lectures, 1 laboratory. Prerequisite: Approval of department head.

ME 237  Mechanical Engineering Systems (4)
Analysis, synthesis and testing of mechanical systems, their components and instruments. For transfer students only. 2 lectures, 2 laboratories. Prerequisite: Math 143.
ME 301 Thermodynamics (4)

ME 302 Thermodynamics I (3)
Properties and fundamental relations for processes involving gases and vapors. First and second laws of thermodynamics. 3 lectures. Prerequisite: Phys 132, Math 143, Chem 125.

ME 303 Thermodynamics II (3)
Power and refrigeration cycles. Property relations for real gases. Mixtures of gases and vapors, psychrometry. 3 lectures. Prerequisite: ME 302, Engr 251.

ME 310 Nuclear Reactor Engineering I (4)
Introduction to nuclear energy, reactor physics, basic power plant design and operation. Radioactivity experiments and analog simulation methods. 3 lectures, 1 laboratory. Prerequisite: Chem 125.

ME 311 Fluid Mechanics (3)
Basic principles of fluid flow. Fluid statics, kinematics of fluid flow, momentum equation, viscosity, and fluid friction. Incompressible flow in pipes, flow measurement, flow machinery, and lubrication. For Engineering Technology students. 3 lectures. Prerequisite: Phys 122, ME 206 or 212.

ME 316 Mechanical Vibrations (3)
Free vibration, damping, transient and steady state response to forced vibrations. Engineering methods, single and multiple degrees of freedom. 3 lectures. Prerequisite: Math 318, ME 212.

ME 317 Vibrations Laboratory (1)
Experimental studies of the dynamic behavior of structures and machines. Instrumentation methods utilized in field and laboratory. Analog techniques. 1 laboratory. Concurrent: ME 316: Prerequisite or concurrent: EE 201.

ME 324 Kinematics (4)
The study of motion in machine parts. Displacements, velocities, and accelerations in linkage, cams, gears, and other mechanisms. 2 lectures, 2 two-hour laboratories. Prerequisite: ET 141, ME 212.

ME 327 Introduction to Design (5)
Design of machine parts by stress and deflection. Effects of fluctuating stresses and stress concentration. Design of gears, clutches, brakes, bearings, shaft and other machine parts. Modern industrial design practice using standard components and design layout drawings. 4 lectures, 1 laboratory. Prerequisite: Aero 207, Aero 229 (or concurrent), ET 141, Met 306.

ME 341, 342 Fluid Mechanics (3) (4)
Fluid statics. Conservation equations of fluid dynamics. Viscous flow, boundary layer concepts, lift and drag, compressible flow, turbomachinery. ME 341: 3 lectures. Prerequisite: ME 212. ME 342: 4 lectures. Prerequisite: ME 341, Engr 251.

ME 343 Thermodynamics Laboratory (1)
Experimental methods applied to the evaluation of machine performance, processes and verification of theory. Thermodynamic processes, heat transfer characteristics, and combustion phenomena. Planning experiments, interpretation of results, preparation of reports. 1 laboratory. Prerequisite: ME 303, EnvE 313.

ME 344 Internal Combustion Engine (3)
ME 345  Fluid Mechanics Laboratory (1)
Fluid mechanics experiments in pipe flow, flow measurement, turbomachinery, lift and drag, nozzle flow, and applications of the conservation equations of fluid mechanics. 1 laboratory. Prerequisite: ME 341.

ME 351  Dynamics of Ground Vehicles (3)
Application of the principles of dynamics and aerodynamics to ground vehicle behavior. Braking, acceleration, cornering, directional stability. Suspension systems. Power train characteristics. Air and rolling resistance. 3 lectures. Prerequisite: ME 316, 342.

ME 400  Special Problems for Advanced Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

ME 401, 402  Stress Analysis (4) (4)
Finite-element stress analysis, computer programs, elasticity. Beams, shrink fits, thick walled pipes, torsion, stress concentrations. Experimental stress analysis. 3 lectures, 1 laboratory. Prerequisite: Aero 207, Math 318, Engr 251.

ME 410  Nuclear Reactor Experiments (3)
Experiments using the AGN-201 nuclear reactor. Flux traverse, power calibration, control rod calibration, and period measurement. 2 lectures, 1 laboratory. Prerequisite: Phys 210.

ME 411  Nuclear Reactor Engineering II (4)
Reactor thermal and hydraulic design. Heat transfer in and from reactor elements. Pressure drop and heat transfer in two-phase flow. 4 lectures. Prerequisite: ME 341, EnvE 313, Chem 125.

ME 412  Nuclear Reactor Engineering III (4)
Advanced thermal and fast type nuclear power plants; engineering design and operational characteristics, safety and environmental considerations. Operational experiments with training-type nuclear reactor. 3 lectures, 1 laboratory. Prerequisite: ME 411, Phys 421.

ME 415  Energy Conversion (3)
Mechanical engineering aspects of energy sources, conversion and storage. Fuels and other resources, solar energy, and energy storage systems. Recommended as a complement to EE 414. 3 lectures. Prerequisite: ME 302.

ME 417  Advanced Vibrations (4)
Vibration of complex engineering systems. Inertia and stiffness matrices. Natural frequencies and normal modes. Approximate solutions and computer techniques. Response to transient and periodic inputs. 3 lectures, 1 laboratory. Prerequisite: ME 316, Engr 251.

ME 422  Mechanical Control Systems (4)
Analytical modeling and compensation of mechanical control systems. Design of mechanical, hydraulic and fluid systems using analog and digital simulation techniques. 3 lectures, 1 laboratory. Prerequisite: ME 316, 317.

ME 424, 425  Design of Piping Systems (4) (4)
Functions, requirements, and design of piping systems, including safety and economic considerations for power, chemical, and process plants. Welding and other forms of joint construction, materials specifications, sizing, layout, flexibility, support, insulation, and cost estimation of water, steam, air, gas, and corrosive and viscous fluid systems. Philosophy, background, and requirements of principal governing National Codes. 3 lectures, 1 laboratory. Prerequisite: Aero 207, ME 341, Engr 251.

ME 426  Engineering Analysis of Dynamic Systems (4)
Lagrangian mechanics. Studies of advanced problems in the kinematics and kinetics of engineering systems. 4 lectures. Prerequisite: ME 316, Engr 251.
ME 428  Design (4)
Basic design techniques such as brainstorming, feasibility studies, models, case studies, design decisions and compromises. Industrial participation design program. 2 lectures, 2 laboratories. Prerequisite: ME 324, 327, Engr 251.

ME 431  Mechanical Design Technique (4)
Comprehensive study of design methods. Design factors, including market value, productibility, serviceability, utility, style. Analysis of useful ideas and their integration into a practical design in the form of an engineering layout drawing. 3 lectures, 1 laboratory. Prerequisite: ME 317, 324, 327.

ME 435  Petroleum Production Development (4)
Theory and practice of oilwell planning, drilling and completion applied to the development of new oil production. Planning and operation of offshore deep water drilling systems. 4 lectures. Prerequisite: ME 327.

ME 436  Petroleum Reservoir Engineering (4)
Reservoir mechanics of primary depletion and secondary recovery operations. Techniques for realizing maximum ultimate recovery. 4 lectures. Prerequisite, ME 341.

ME 438  Heat Exchanger Design (4)
Theory and application of numerical, analytical, and experimental methods to selected heat transfer problems. Application of principles of conduction, convection, condensation, and boiling heat transfer, stress, and vibrations to design of heat exchange equipment. 4 lectures. Prerequisite: ME 342, EnvE 313, ME 303, Engr 251.

ME 440  Thermal System Design (4)
Techniques used to design thermal systems. Economic considerations, mathematical modeling, and simple optimization techniques in performance analysis of thermal systems. 4 lectures. Prerequisite: ME 302, 341, EnvE 313.

ME 441  Advanced Thermodynamics (4)
Maxwell relations, clapeyron equation, activity, activity coefficient, and fugacity. Phase and chemical equilibrium. Selected modern applications of thermodynamics. 4 lectures. Prerequisite: ME 303.

ME 442  Dynamics and Thermodynamics of Compressible Flow (4)
Control volume analysis of fluid-thermo equations for one dimensional, compressible flow involving area change, normal shocks, friction, and heat transfer. Two-dimensional supersonic flow including linearization, method of characteristics, and oblique shocks. One-dimensional constant area, unsteady flow. 4 lectures. Prerequisite: Math 242, ME 303, 342.

ME 443  Turbomachinery (4)

ME 444  Combustion Engine Design (4)
Application of design parameters to the various engine cycles. Aspects of the combustion processes. Energy conversion including losses and cooling. Static and dynamic loading: 3 lectures, 1 laboratory. Prerequisite: ME 303.

ME 445  Convective Heat and Mass Transfer (4)
Forced convection in laminar and turbulent flow, free convection, diffusion, combined heat and mass transfer. 4 lectures. Prerequisite: ME 341, EnvE 313.

ME 446  Design of Fluid Power Systems (4)
Energy transmission and control by fluid systems. Load analysis, performance specification, and system development for fluid power. Fluidics. 4 lectures. Prerequisite: ME 342.
Metallurgical Engineering

ME 449 Energy Conversion Laboratory (1)
Testing direct energy conversion equipment. Advanced laboratory requiring student to formulate procedures and design experiments. 1 laboratory. Prerequisite: ME 415.

ME 461, 462 Senior Project (2) (2)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time. Prerequisite: Senior standing.

ME 463 Undergraduate Seminar (2)
New developments, policies, practices, and procedures are discussed through regular seminar. Each individual is responsible for the development and presentation of a topic in his chosen field. 2 meetings. Prerequisite: Senior standing.

ME 470 Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

METALLURGICAL ENGINEERING

Met 121 Introduction to Metallurgical Engineering (2)

Met 200 Special Problems for Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of department head.

Met 222 Physical Metallurgy (4)
Lattice structures, cooling curves, alloy systems. Mechanical test methods, strength, ductility, modulus of elasticity. Heat treatment, isothermal transformation diagrams. Application of principles for selection of metals for corrosion resistance. Other engineering metals, including tool steel, stainless steel and cast iron. 3 lectures, 1 laboratory.

Met 223 Nonferrous Alloys (2)
Basic theory of major alloy systems involving nonferrous metals, such as aluminum, titanium and copper. Emphasis on phase relations, mechanical properties, processing and procurement. Heat treatment and precipitation hardening. 1 lecture, 1 laboratory. Prerequisite: Met 222.

Met 235 Metallurgy for Engineering Technology (4)
Physical and mechanical properties of metals and alloys. Selection, heat treatment, and use of metals and alloys. Steel, cast iron, stainless steel, and non-ferrous alloys. Fabrication problems and their solution. 3 lectures, 1 laboratory. Prerequisite: Sophomore standing in Engineering Technology.

Met 301, 302, 303 Theory of Materials (4) (4) (4)
Fundamentals of material science; concepts and problems relating structure of metals to their behavior in use. Uniaxial and complex static stresses; effects of temperature and rate of loading; elastic and plastic deformation; electrical, magnetic, and thermal behavior; fatigue and creep. Statistical evaluation of experimental data. 3 lectures, 1 laboratory. Prerequisite: Math 241, Phys 133, ME 211, Chem 125; Engr 251, or consent of instructor.

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Met 306 Materials Engineering (3)

Structure of matter. Physical and mechanical properties of materials including metals, alloys, ceramics, insulating materials, semi conductors and polymers. Equilibrium diagrams. Heat treatments, material selection and corrosion prevention. 3 lectures. Prerequisite: Sophomore standing in major, Physics 132, Chem 124 or instructor's permission.

Met 324, 325, 326 Metallurgical Engineering (4) (4) (4)


Met 341 Materials Engineering Laboratory (1)

Laboratory experiments with materials. Heat treating of steel and aluminum alloys and mechanical evaluation. Identification of microstructures, corrosion testing, cold working and annealing, cooling curves and impact testing. 1 laboratory. Prerequisite or concurrent: Met 306.

Met 400 Special Problems for Advanced Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

Met 421, 422, 423 Advanced Theory of Materials (4) (4) (4)

Metallurgical thermodynamics; solid state transformations, mechanisms and kinetics. Theory of alloying, diffusion, dislocations, strengthening mechanisms, plastic deformation and strengthening, precipitation hardening, martensitic reactions, and solidification. Metallurgical computations. 4 lectures. Prerequisite: Met 303, 326, Chem 306.

Met 424, 425, 426 Applied Metallurgical Engineering (4) (4) (4)

Tool and complex alloy steels. Fracture mechanics. Fatigue, stress corrosion, galvanic corrosion, gas-metal interaction, corrosion control. X-ray diffraction, polymers, ceramics. Investigation of actual service failures; advanced metallography and photomicrography; preparation of formal engineering reports. 2 lectures, 2 laboratories. Prerequisite: Met 303, 326, Chem 326.

Met 434 Welding Engineering (3)

Weldability studies of high strength, low alloy steels and the important metallurgical aspects of welded fabrication. 1 lecture, 2 laboratories. Prerequisite: Met 306.

Met 435 Welding Engineering (3)

Principles of welded pressure vessel design and fabrication in accordance with governing codes. Material selection, process selection, procedure. Performance qualifications of pressure vessels; cost estimating. 1 lecture, 2 laboratories. Prerequisite: Met 434.

Met 436 Welding Engineering (3)

Weldability and metallurgical studies of aluminum and aluminum alloys, stainless and heat resisting steels, and titanium and titanium alloys. Principles of process selection. 1 lecture, 2 laboratories. Prerequisite: Met 435.

Met 461, 462 Senior Project (2) (2)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

Met 463 Undergraduate Seminar (2)

Preparation, oral presentation, and discussion by students of technical papers on recent engineering developments. 2 lectures. Prerequisite: Senior standing.

Met 470 Selected Advanced Topics (1–3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.
Music

Met 471 Selected Advanced Laboratory (1–3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. One to three laboratories. Prerequisite: Consent of instructor.

MILITARY SCIENCE

MSc 101 (MS-1) U.S. Defense Establishment (1)
Nature of conflict and war; international power factors and balance of power concept; organization and functions of the U.S. defense establishment; roles of the military departments. 1 lecture.

MSc 102 (MS-1) Military History (1)
Overview of American military history from the colonial period to 1902; application of the principles of war to significant battles and campaigns; evolution of weapons and tactics. 1 lecture.

MSc 103 (MS-1) Military History (1)
Overview of American military history from 1902 to the present; application of the principles of war to significant battles and campaigns; evolution of the military establishment; evolution of weapons and tactics. 1 lecture.

MSc 201 (MS II) Orienteering (2)
Principles of orienteering and land navigation; military map system; techniques of orientation and navigation using maps and compass. 2 lectures.

MSc 202 (MS II) Small Unit Leadership (2)
Principles of tactics and operations; organization of small units and their employment; field orders and instructions; small unit leadership techniques. 2 lectures.

MSc 203 (MS II) Leadership and Management (2)
Principles of leadership; principles of resource management; group goal attainment focusing on leader, group, and situational needs. 2 lectures.

* MSc 301, 302, 303 (MS III) Advanced Leadership and Management (3) (1) (4)
Personnel management problems and techniques of motivation as applied to a military environment; techniques and methods of instruction; tactical problems and techniques adaptable to the small military organization; military communications. MSc 301: 3 lectures. MSc 302: 1 lecture. MSc 303: 4 lectures.

* MSc 401, 402, 403 (MS-IV) Seminar in Selected Leadership Topics (4) (3) (1)
Role of the United States Army in world change and its implications. Theory and dynamics of the military team; analysis of administrative/staff operations and procedure. Philosophy, purpose and administration of military law and military justice system. MSc 401: 4 lectures. MSc 402: 3 lectures. MSc 403: 1 lecture.

MUSIC

Mu 101 Theory I (3)
Elements of music theory covering: notation, construction of major and minor scales and keys, signatures, intervals, diatonic triads, triad forms, inversions, study of meter and rhythm, elementary ear training. 3 lectures.

Mu 111 Beginning Piano (1)
Beginning piano for student with no background in keyboard instruments. Includes fundamentals of notation, keyboard techniques, tone production, sightreading and facility. 1 activity.

* Students who are participants in the ROTC program are required to take for no additional academic credit one hour of field instruction in applied leadership and management.
Music

Mu 112, 113  Class Piano (1) (1)
A continuation of Mu 111. Piano for students with the ability to play a simple Bach or Mozart Minuet. Prerequisite: Mu 111 or equivalent. 1 activity.

Mu 131  Guitar (1)
Fundamentals of guitar technique and performance including elements of both classical and folk guitar. Designed to meet the needs of the public school teacher. No previous experience necessary. 1 activity.

Mu 141  University Jazz Band (Collegians) (1)
Limited to those who have had considerable experience playing musical instruments. Students have an opportunity to play for various entertainments, dances, community programs, several tours and the Home Concert. 1 laboratory. Total credit limited to 6 units. Prerequisite: Permission of instructor.

Mu 144  Symphony Orchestra (1)
Open to any college student whose technique is adequate. In addition to standard repertory, the orchestra emphasizes unusual or rarely performed works. Select members of the orchestra are given additional opportunities to perform chamber music. 1 laboratory. Prerequisite: Consent of instructor. Total credit limited to 6 units.

Mu 147  Instrumental Ensembles (1)
Open to qualified musicians. Rehearsal and public performances in trios, quartets, and quintets. 1 activity. Prerequisite: permission of the instructor. Total credit limited to 6 units.

Mu 151  Band (1)
Limited to those students who have had experience with band instruments. The band plays for many college functions, assemblies, athletic games, and rallies, and makes at least one trip each year. Smaller groups are organized from the band for special functions. 1 laboratory. Total credit limited to 6 units.

Mu 154  Men's Glee Club (1-2)
Four- to eight-part vocal compositions; fundamentals of breathing, tone production, diction, and interpretation. Quartets, small groups, and soloists are developed, for which additional credit may be given. The club sponsors an annual spring tour and Home Concert. Tryouts in fall only. 1 or 2 laboratories. Total credit limited to 12 units. Prerequisite: Permission of instructor.

Mu 155  University Singers (1)
Study and public performance of music for mixed voices from the sixteenth century to the present. Total credit limited to 6 units. 1 laboratory. Prerequisite: Permission of instructor.

Mu 157  Women's Glee Club (1-2)
Choral literature for women's voices; independence and skill in part singing; care and development of the voice; choral interpretation; performances in public concerts, campus functions, and the annual Home Concert. Small groups and soloists may earn additional credit. 1 or 2 laboratories. Prerequisite: Permission of the instructor. Total credit limited to 12 units.

Mu 203  Theory II (3)
Structure of tonality in music of Western civilizations, four-part writing of triads in root position and inverted, cadences and melodic structure, harmonic progressions, harmonization of a melody and nonharmonic tones. 3 lectures. Prerequisite: Mu 101 or consent of instructor.

Mu 204, 205, 206  Appreciation (3) (3) (3)
Introduction to the elements and concepts of music, leading to greater understanding of art music. Discussion of the styles, forms, and specific composers in Western music. May be taken in any order. 3 lectures.
Music

**Mu 208 Ethnic Music of the World (3)**
Contemporary concepts of ethnomusicology. Discussion of folk music of the world by geographic area. History and development of musical instruments. May be repeated to 6 units. 3 lectures.

**Mu 209 History and Literature of Jazz (3)**
Survey of jazz from the 1920's to the present; its historical background and development in the United States. Big bands, combos, and soloists. Extensive use of recordings and live presentations. 3 lectures.

**Mu 211, 212, 213 Class Piano (1) (1) (1)**
Intermediate level piano techniques with emphasis on style, interpretation, sight-reading, basic performance practices, and the solution to general musical problems. The classes proceed progressively. Total credit in each course limited to 2 units. 1 activity. Prerequisite: One year of piano or equivalent.

**Mu 231 Instruments—Theory and Performance (1)**
Study of the fundamentals of playing and teaching woodwind, brass, string, and percussion instruments. Separate sections arranged with instructor. Total credit limited to 6 units. 1 activity.

**Mu 237, 238, 239 Voice—Theory and Performance (1) (1) (1)**
Study of the fundamentals of singing; breathing, posture, diction, development of voice, resonating chambers, vocal interpretation, sight singing. 1 activity.

**Mu 301 Music for Children (3)**
Development of basic music proficiency; singing, conducting, playing simple instruments, accompaniment, rhythmic activities. Assumes a knowledge of music fundamentals. 3 lectures. Prerequisite: Mu 101.

**Mu 303 Theory III (2)**
The dominant seventh chord, nondominant seventh chord, modulation, augmented sixth chord, and neapolitan sixth chord. 3 lectures. Prerequisite: Mu 203 or consent of instructor.

**Mu 306 Ethnic Music of the World (3)**
Advanced study of ethnic music. May be repeated to 6 units. 3 lectures. Prerequisite: Mu 208 or permission of instructor.

**Mu 308, 309 Conducting (2) (2)**
Principles and techniques in conducting with experience in score reading. 2 lectures. Prerequisite: Mu 101 or equivalent.

**Mu 311, 312, 313 Class Piano (1) (1) (1)**
Designed for the advanced student able to play a Mozart or Beethoven sonata. Emphasis on general knowledge of piano literature, interpretation, style, and performance practices. Admission to the class by audition. Fall quarter emphasis, Baroque keyboard literature; winter quarter, Classic; spring quarter, Romantic and Contemporary. Total credit in each course limited to 2 units. 1 activity.

**Mu 331 Instruments (1)**
Study of the fundamentals of playing and teaching woodwind, brass, string, and percussion instruments. Continuation of Mu 231. Total credit limited to 6 units. 1 activity.

**Mu 337, 338, 339 Voice (1) (1) (1)**
Study of the fundamentals of singing; breathing, posture, diction, development of voice, resonating chambers, vocal interpretation, sight singing. Continuation of Mu 237, 238, 239. 1 activity. Prerequisite: One year of voice or equivalent.
Mu 341 University Jazz Band (Collegians) (1)
Limited to those who have had two years of Jazz Band experience. Students have an opportunity to play for various university entertainments, dances, community programs, several tours and the Home Concert. 1 laboratory. Total credit limited to 6 units. Prerequisite: Two years of University Jazz Band participation.

Mu 344 Symphony Orchestra (1)
Open to any college student whose technique is adequate. In addition to standard repertory, the orchestra emphasizes unusual or rarely performed works. Select members of the orchestra are given the additional opportunities to perform chamber music. Total credit limited to 6 units. 1 laboratory. Prerequisite: Two years of orchestra participation.

Mu 347 Instrumental Ensemble (1)
Open to qualified musicians. Rehearsal and public performance in trios, quartets, quintets. Total credit limited to 6 units. 1 activity. Prerequisite: Permission of instructor.

Mu 351 Band (1)
Limited to those students who have had two years of band. The band plays for many college functions, assemblies, athletic games, and rallies, and makes at least one trip each year. Smaller groups are organized from the band for special functions. Total credit limited to 6 units. 1 laboratory. Prerequisite: Two years of band participation.

Mu 354 Men's Glee Club (1–2)
Four- to eight-part vocal compositions; fundamentals of breathing, tone production, diction, and interpretation. Quartets, small groups, and soloists are developed, for which additional credit may be given. The club sponsors an annual spring tour and Home Concert. Tryouts in fall only. 1 or 2 laboratories. Total credit limited to 12 units. Prerequisite: Two years of Glee Club participation.

Mu 355 University Singers (1)
Study and public performance of chamber music for mixed voices from the sixteenth century to the present. Total credit limited to 6 units. 1 laboratory. Prerequisite: Permission of instructor.

Mu 357 Women's Glee Club (1–2)
Choral literature for women's voices; independence and skill in part singing; care and development of the voice; choral interpretation; performances in public concerts, campus functions, and the annual Home Concert. Small groups and soloists may earn additional credit. 1 or 2 laboratories. Total credit limited to 12 units. Prerequisite: Two years of Glee Club participation.

Mu 404, 405, 406 History of Music (2) (2) (2)
Intensive study of a selected topic in music history each quarter through the use of readings, recordings, and scores. Prior completion of at least one quarter of music appreciation is recommended. 2 lectures.

Mu 407 Form and Analysis (3)
Intensive survey of musical forms from the 17th century to the 20th century. Analysis of musical structure, melodic invention and elaboration. 3 lectures. Prerequisite: Mu 303 or consent of instructor.

Mu 436 Music Concepts (3)
Creative approach to history, theory, appreciation, and criticism of music. Currently employed materials in the light of new musicological findings. Development of original musical themes utilizing scalar, chordic, and pentatonic approaches. 3 lectures. Prerequisite: Mu 301 or consent of instructor.

Mu 438 Advanced Voice—Theory and Performance (1)
Selected readings in the theory of voice production. Study of many types of vocal literature. 1 activity. Prerequisite: Mu 337.
NATURAL RESOURCES MANAGEMENT

NRM 101 Introduction to Natural Resources Management (3)

Natural resources of the United States: forests, minerals, water, wildland and wildlife. Development, management, and utilization of our natural resources for the continuous benefit of man and conservation of the resources. 3 lectures.

NRM 112 Recreation Systems and Management (3)

Introduction to national, state, county, city and private park systems. History, policy and principles of the formation, administration and functioning of recreational units at the park, district and regional levels. 3 lectures.

NRM 120 Introduction to Fisheries and Wildlife Management (3)

Survey of fisheries and wildlife resources and management practices. Relationships to recreational values, land management, food production, and preservation. 3 lectures.

NRM 130 Forest Resources (3)

Fundamentals of forestry including basic silviculture, forest protection, and multiple use of forest lands for water production, forage, recreation, wildlife, and timber. 3 lectures.

NRM 206 Resource Planning (3)

Analysis and development of plans for land resource uses including survey and inventory application of multiple use principles. Projection of use demands, economic evaluations, and priority assessments. 3 lectures. Prerequisite: NRM 101 or 130.

NRM 207 Resource Survey (3)

Survey, inventory and assessment techniques used for evaluation of physical, biological and cultural resource features of a land area. Interpretation and correlation of geology, soils, topographic, climatic, vegetative and cultural maps. 2 lectures, 1 laboratory. Prerequisite: NRM 206.

NRM 210 Lake Management (4)

Practices and management of recreational lakes to provide maximum use, to reduce aquatic pests, to provide necessary water quality, and to attract or produce aquatic animals associated with hunting and fishing preserves, farm ponds, and ornamental and recreational waters. 3 lectures, 1 laboratory. Prerequisite: NRM 207.

NRM 230 Dendrology (4)

Identification, classification, silvical characteristics, distribution, environmental requirements and economic importance of trees in parks, forest and wildlife areas of the United States. Emphasis on California species. 2 lectures, 2 two-hour laboratories. Prerequisite: Bot 123.

NRM 302 Natural Resources Policy (3)

Historical development and significance of natural resource policies including changing patterns between private and public enterprise and federal, state, and local government in resource management. 3 lectures. Prerequisite: NRM 101 or 130.

NRM 303 Resource Law Enforcement (3)

Law enforcement applied to natural resource conservation. Development of laws; laws of arrest, search, and seizure; rules of evidence; court structure; and court procedures. Laws of parks, forestry, wildlife, and water quality control. 3 lectures.

NRM 304 Ecology of Resource Areas (4)

Dynamics of environmental relationships in natural and developed resource areas, and the effects caused by man through his practices of preservation, recreation, and resource utilization. 3 lectures, 1 laboratory. Prerequisite: one quarter of life science, natural resources, or consent of instructor.
NRM 311 Environmental Interpretation (3)
Interpretation of the biological, physical and aesthetic values of the natural elements of our environment; organization and presentation of interpretive materials by oral, written, and display methods of communication. 2 lectures, 1 laboratory. Prerequisite: NRM 304.

NRM 320 Fishery Resource Management (4)
Management of recreational and commercial fisheries to produce sustained annual crops of fishes. Survey, inventory, and evaluation techniques used for the management of a fishery. Methods of manipulating fish populations and the aquatic habitat. 3 lectures, 1 laboratory. Prerequisite: NRM 304.

NRM 325 Wildlife Habitat Management (4)
Habitat development, management and protection on land and water areas that support wildlife. Management of habitat occurring on agricultural lands, park and recreation lands, and wildlands. 3 lectures, 1 laboratory. Prerequisite: NRM 304.

NRM 326 Forest Protection (3)
Impact and losses to forested areas caused by physical and biotic agents other than fire; relation of direct and indirect control practices to forest management. 3 lectures. Prerequisite: NRM 304 or consent of instructor.

NRM 330 Resource Fire Control (3)
Fire behavior and effects; prevention, and control in the chaparral, grasslands, and wooded areas of forests, parks, and wildlands; fire danger measurement; prescribed use in management; policy and objectives. 3 lectures.

NRM 331 Fire Theory (3)
Formulation and application of initial attack and suppression of fire, based on evaluation of fire conditions. 1 lecture, 2 laboratories. Prerequisite: NRM 330 or consent of instructor.

NRM 332 Forest Products (4)
Manufacturing and marketing of wood products, wood identification, study of wood structure and mechanical properties. 3 lectures, 1 laboratory. Prerequisite: Phys 104, NRM 102, 230.

NRM 334 Forest Mensuration (4)
Methods and principles of measurement for contents of trees, stands and felled timber, construction and use of volume tables, use of statistical measures, and growth projection. 2 lectures, 2 two-hour laboratories. Prerequisite: Math 115, Stat 212 or equivalent.

NRM 400 Special Problems for Advanced Undergraduates (1–2)
Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of department head.

NRM 401 Applied Resource Economics (3)
Application of analytical economic methods to forest, marine, recreation, and wildlife resources development and utilization. Effect of time on rate of resource use; external effects of multiple uses of a common property resource; decision making involving multiple uses of a single resource system; recreation resource valuation in the absence of a market established price. 3 lectures. Prerequisite: Econ 211.

NRM 403 Resource Law Methods (3)
Problems, situations, and techniques in natural resource law enforcement. Patrol procedures; evidence collection and preservation; case presentation; human and public relations. 3 lectures. Prerequisite: NRM 304.

NRM 405 Applied Resource Analysis (4)
Evaluation of environmental responses to resource management programs; preparation, implementation, and coordination of environmental activities in terms of multiple-use management. Computer analysis techniques, applied interpretation of aerial photographs, standard measurement criteria, and interpretation of measurements. 3 lectures, 1 laboratory. Prerequisites: NRM 304.
Natural Resources

site: NRM 304, Stat 212.

NRM 406 Natural Resources Administration (4)
Administration of private and public resource units, including planning, budgeting, organizing, programming, staffing and maintaining the units. 3 lectures, 1 laboratory. Prerequisite: NRM 207 and senior standing.

NRM 410 Water Oriented Recreation (4)
Practices of management of water oriented outdoor recreation on private and public waters. Consideration of shoreline development, water surface time and space zoning, and underwater development. 3 lectures, 1 laboratory. Prerequisite: NRM 304.

NRM 411 Advanced Environmental Interpretation (3)
Implementation of interpretive programs for parks, forests and other wildlands; program planning, organization, and development. Planning and operation of interpretive visitor centers. 2 lectures, 1 laboratory. Prerequisite: NRM 311.

NRM 412 Site Development and Maintenance (4)
Basic planning and design principles of selected outdoor recreation sites. Area layout, facility design, construction, and maintenance of structures, grounds, roads, and trails. 3 lectures, 1 laboratory. Prerequisite: NRM 207.

NRM 420 Culture of Warmwater Fishes (4)
Management of a production fish hatchery. Facility design, water supply, quality, and control; production regimen; and process methods for warmwater game, food, and bait fishes. 3 lectures, 1 laboratory. Prerequisite: NRM 320.

NRM 421 Culture of Coldwater Fishes (4)
Propagation and production of trout, salmon, and other cold-water fishes. Site selection, design and operation of hatcheries; raceways and closed system production units. Spawning, feeding, harvesting, and transportation techniques used in the culture of coldwater fishes. 3 lectures, 1 laboratory. Prerequisite: NRM 320.

NRM 424 Wildlife Preserve Management (3)
Methods and principles for managing shooting and fishing preserves to provide quality sport hunting and fishing. Preserve construction, habitat manipulation, stocking, and regulations. Socio-economic considerations of preserve management. 3 lectures. Prerequisite: NRM 320 or NRM 325 or Cons 431.

NRM 426 Resource Population Dynamics (3)
Growth, fluctuations, balance, and natural mechanisms for control of wild animal populations. 3 lectures. Prerequisite: Stat 212, NRM 320 or 325.

NRM 427 Marsh Management (4)
Land, plant, and water management on wetlands to provide suitable habitat for wildlife. Techniques to minimize predation of farm crops by wildlife. Regulation of multiple-use recreation on public and privately controlled wetlands. 3 lectures, 1 laboratory. Prerequisite: NRM 325.

NRM 430 Silviculture (3)
Interaction of forest and chaparral plant communities within the environment; influence of external factors upon wildlands, particularly those suited to outdoor recreation and wildlife production; growth and development of individual plants; origin, development, cultural practices and tolerance of forest and chaparral plant communities. 3 lectures. Prerequisite: NRM 230 or consent of instructor.

NRM 432 Community Forestry (3)
Establishment and management of city forests, wood lots, small forest holdings, shelter belts, and plantings for erosion control, wildlife enhancement, and pollution abatement. Management of forest areas requiring special attention because of heavy recreational use. 2 lectures, 1 laboratory. Prerequisite: NRM 230.
NRM 433 Forest Practices (4)
Methods of organizing forest resources for sustained yield management; regulation of annual cut, determination or rotation and cutting cycles, and preparation of working plans. 3 lectures, 1 laboratory. Prerequisite: NRM 430.

NRM 435 Forest Valuation (3)
Wildland and timber appraisal, wildland taxation. Financial and business aspects of forestry. Economic alternatives in addition to timber production. 3 lectures. Prerequisite: NRM 401, 430.

NRM 440 Watershed Management (4)
Principles and methods of management of chaparral, range, and forest land for optimum production and regulation of water yields and resource utilization and protection. 3 lectures, 1 laboratory. Prerequisite: SS 121, and NRM 304 or Bio 325.

NRM 441 Forest and Range Hydrology (3)
Influence of forest and range vegetation on wildland water resources. Techniques of managing wildlands for increases in usable water yields. 3 lectures. Prerequisite: NRM 440.

NRM 461, 462 Senior Project (2) (2)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

NRM 463 Undergraduate Seminar (2)
Study and oral presentation of current developments and problems in the subject field. Discussion of recent findings and research and their application. 2 lectures.

NRM 470 Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

NRM 471 Selected Advanced Laboratory (1–3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. One to three laboratories. Prerequisite: Consent of instructor.

NRM 502 Resource Conservation (3)
Conservation developments for broad treatment of land, water, mineral, forest, range, and wildlife resources. 3 lectures. Prerequisite: Graduate status and consent of instructor.

ORNAMENTAL HORTICULTURE
OH 124 Horticulture Drafting (2)
Techniques and standards used in drafting for horticulture construction working drawings, and techniques of sketching and perspective drawings used by the industry. 1 lecture, 1 laboratory.

OH 125 Commercial Floral Design Practices (3)
Theory, techniques, and skills currently practiced in the floral design industry. Construction of basic floral products for resale, cut flower processing, industry sales practices, merchandising and packaging. 1 lecture, 2 laboratories.

OH 126 Ornamental Horticulture Construction (2)
Construction and repair of projects and equipment, using materials and methods unique to ornamental horticulture. Design and construction of simple irrigation systems related to the broad horticulture field. 1 lecture, 1 laboratory. Prerequisite: AE 121.
Ornamental Horticulture

OH 131, 132, 133 Fundamentals of Ornamental Horticulture (4) (4) (4)

Ornamental horticulture as a career. Preview of nursery, floriculture and landscape industries. Discussion of student projects and project records. Commercial nursery operations and garden practices. Environment and plant growth. Basic floral design principles. Field trip required. 3 lectures, 1 laboratory. Prerequisite: Courses will be taken in sequence.

OH 145 Bonsai Culture (2)

Study of the philosophy, history, training, culture, production, and care of the Japanese Bonsai. 1 lecture, 1 activity.

OH 152 Landscape Maintenance (3)

Maintenance of trees, shrubs, ground covers, cultural requirements, irrigation, pruning, fertilizing. Repair of irrigation systems, equipment. Landscape maintenance industry. 2 lectures, 1 laboratory. Prerequisite: OH 126 or permission of instructor.

OH 200 Special Problems for Undergraduates (1–2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of department head.

OH 223 Principles of Landscape Design (4)

Basic principles of design related to landscape problems. 2 lectures, 2 laboratories. Prerequisite: OH 124.

OH 225 Floriculture Grades and Standards (3)

Grades and standards for cut flowers, potted plants, and other ornamentals. Use of score cards in evaluating florist crops. 1 lecture, 2 laboratories. Prerequisite: OH 131.

OH 230 Ornamental Gardening (3)

For non-horticulture majors. Information and recommendations for the home gardener. Methods of propagation, pruning, planting, soils, fertilizers, lawn planting and maintenance, pest and weed control, home landscaping, and identification and care of house plants. 2 lectures, 1 laboratory.

OH 231, 232, 233 Plant Materials (4) (4) (4)

Identification, habits of growth, cultural requirements, and use of ornamental woody and herbaceous plants used in the landscape of California. 3 lectures, 1 laboratory.

OH 237, 238, 239 Landscape Plants I, II, III (3) (3) (3)

Woody and herbaceous plants used in California landscaping. Identification, landscape uses, cultural requirements and growth habits of those plants best shown during the fall, winter, and spring. For non-horticulture majors. 2 lectures, 1 laboratory.

OH 243 Turf Management (4)

Turf propagation, irrigation, fertilizer and pest control methods and procedures. Turf grass varieties and uses. Turf equipment. 3 lectures, 1 laboratory.

OH 251 Ikebana (3)

Techniques of the ancient art of Ikebana as it influences western floral design. 2 lectures, 1 laboratory. Prerequisite: OH 125.

OH 252 Continental Mass Design (3)

Techniques of European and early American mass floral arranging as it influences western design of today. 2 lectures, 1 laboratory. Prerequisite: OH 251.

OH 253 Stylized Western Design (3)

Techniques of western stylized line design as it is known currently. 2 lectures, 1 laboratory. Prerequisite: OH 252.
OH 321  Residential Landscaping (4)
Principles of landscape design for residential properties. Designing of several small home properties. 2 lectures, 2 laboratories. Prerequisite: OH 223, 233.

OH 322  Advanced Landscape Design (4)
Principles of landscape design of public properties and the application of these principles in solving of landscape design problems. 2 lectures, 2 laboratories. Prerequisite: OH 223, 233.

OH 323  Greenhouse Management (4)
Problems and practices in the management of greenhouses. Scheduling greenhouse crops, planning crop rotation, management decisions in production costs and personnel matters. Field trip required. 3 lectures, 1 laboratory. Prerequisite: OH 133, 325 or 334.

OH 324  Tropical Plant Culture (4)
Identification, culture, propagation, and ornamental use of tropical plants. 3 lectures, 1 laboratory. Prerequisite: Junior standing and permission of instructor.

OH 325  Pot Plant Production (4)
The production of major commercial potted plants under glass and lath. Preparation for sale and merchandising of greenhouse crops. 3 lectures, 1 laboratory. Prerequisite: OH 133, SS 221.

OH 327  Diseases and Pests of Ornamental Plants (4)
A detailed study of diseases and pests of ornamental plants, their effect on plants, their prevention and control. 3 lectures, 1 laboratory. Prerequisite: Ent 220 or CrSc 311, Bot 324.

OH 328  Advanced Floral Design (4)
Advanced styling of floral designs used in sympathy work; casket sprays, wreaths, hospital arrangements, and solid work. 2 lectures, 2 laboratories. Prerequisite: OH 125, 132, 253.

OH 329  Advanced Floral Design (4)
Advanced styling of floral designs to wear and carry, as practiced specifically in wedding work. Field trip required. 2 lectures, 2 laboratories. Prerequisite: OH 328.

OH 330  Flower Arrangement (2)
Principles and uses of flower arrangements as used in home and party decorating. 1 lecture, 1 laboratory. Prerequisite: Art 321 or HE 242 or consent of instructor.

OH 331, 332  Landscape Contracting (4) (4)
Practices in supervising men and applying approved techniques in landscape construction. Cost finding and estimating for landscape trades. Contract writing, accounting systems, and legal aspects of landscape contracting. 3 lectures, 1 laboratory. Prerequisite: OH 126, junior standing in the major curriculum and permission of instructor.

OH 333  Advanced Turf Management (4)
Maintenance and operation of large areas such as golf greens, athletic fields, and park areas. Systems of management and maintenance, business aspects, and turf industry. 3 lectures, 1 laboratory. Prerequisite: OH 243 or equivalent.

OH 334  Cut Flower Production (4)
The production of cut flowers in the field, under cloth, and under glass. Preparation of cut flowers for market. 3 lectures, 1 laboratory. Prerequisite: OH 133, SS 221.

OH 337  Park Planning and Management (4)
Design, management and maintenance of private and public parks and recreational areas. 3 lectures, 1 laboratory. Prerequisite: OH 126, consent of instructor.

OH 338  Advanced Plant Propagation (4)
Advanced nursery and plant propagation practices. Grafting, dormant budding, lining out, balling out, bare rooting, and making hardwood cuttings. Construction and operation of forcing structures. 3 lectures, 1 laboratory. Prerequisite: OH 133.
Ornamental Horticulture

OH 381  Advanced Plant Materials (3)
Recognition, identification, ecological significance, propagation, uses and landscape potential, environmental impact, and cultural needs of California Flora as they pertain to the horticultural field, and natural resource management. 2 lectures, 1 laboratory. Prerequisite: Junior standing and permission of instructor.

OH 400  Special Problems for Advanced Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of department head.

OH 402  Garden Center Management (4)
Legal aspects and economics of operating a commercial nursery and garden center and flower shop. State and county regulations, quarantines, grades and standards of nursery stock and floral design materials. Purchasing, merchandising and record keeping. Trade associations and cooperative buying. 3 lectures, 1 laboratory. Field trip required. Prerequisite: Econ 201 or 211, Actg 131, junior or senior standing, or permission of instructor.

OH 421  Arboriculture (4)
The care and management of large ornamental trees. The use of ropes and other safety equipment in tree climbing. Cavity work, bracing, cabling, and pruning. 3 lectures, 1 laboratory. Prerequisite: OH 233, 327.

OH 423  Advanced Floriculture (4)
Analysis of problems and practices affecting the contemporary commercial floriculturist. Application of current research in the floral industry. 3 lectures, 1 laboratory. Prerequisite: OH 133, 323, 334 and senior standing.

OH 424  Container Plant Production (4)
Commercial container plant nursery operations, including growing media, fertilization, weed control, container sizing, pruning and staking, systems analysis, production and inventory control, and marketing. 3 lectures, 1 laboratory. Prerequisite: OH 133, SS 221, senior standing, or permission of instructor.

OH 425  Tissue Culture Propagation (2)
Principles of tissue culture applied to the propagation of ornamental plants. Systems applicable to commercial crops, laboratory organization, media, and current research. 1 lecture, 1 activity. Prerequisite: Junior standing and consent of instructor.

OH 451, 452, 453  Implementation of Landscape Design (2) (2) (2)
Planting design related to soils and fertilizers, disease and pest prevention, maintenance and growth factors. Landscape design and specification writing, estimating, installation. 2 laboratories. Prerequisite: Junior standing in Landscape Architecture or Ornamental Horticulture.

OH 461, 462  Senior Project (2) (2)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

OH 463  Undergraduate Seminar (2)
An open forum of senior students in which the latest developments, practices, and procedures are discussed. Each student is responsible for the development and presentation of a topic in his or her chosen field. 2 lectures. Prerequisite: A completed OH 462, senior project.

OH 470  Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.
OH 471  Selected Advanced Laboratory (1-3)
  Directed group laboratory study of selected topics for advanced students. Open to undergraduates and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. One to three laboratories. Prerequisite: Consent of instructor.

OH 581  Graduate Seminar in Ornamental Horticulture (3)
  Group study of current problems of the ornamental horticulture industry; current experimental and research findings as applied to production and to the teaching of horticulture.

PHILOSOPHY

Phil 101  Introduction to Philosophy (3)
  A sampling of the problems, arguments, methods, and schools of philosophy. 3 lectures.

Phil 221  Traditional Logic (3)
  Brief survey of logic, language, and its functions. The nature, recognition, and avoidance of the common informal fallacies. Classical logic including immediate inference, syllogisms, and sorites. 3 lectures.

Phil 222  Modern Logic (3)
  Techniques of formal reasoning. Deductive techniques of propositional and predicate logic. 3 lectures.

Phil 305  Western Religions (3)
  Judaism, Christianity, Islam. Beliefs, ethics, religious practices and history of Western and near Eastern world religions. 3 lectures.

Phil 306  Eastern Religions (3)
  Religions and life-view philosophies of the Far East and India, including Buddhism, Hinduism, Taoism, Confucianism. Beliefs, ethics, religious practices of contemporary Far Eastern and Indian religions and significant historical developments leading to modern forms of these religions and philosophies of life. 3 lectures.

Phil 307  Philosophy of Religion (3)
  Inquiry into the nature of religious experience and claims, naturalism and supernaturalism, arguments for the existence of God, the problem of evil, miracles, revelation, faith, human nature and destiny, verification and refutation of religious claims. 3 lectures.

Phil 311  History of Greek Philosophy (3)
  Beginnings of Western Science and philosophy. Pre-Socrates, Socrates, Plato, and Aristotle. Greek philosophies in the Roman world. 3 lectures. Prerequisite: Phil 101.

Phil 312  History of Medieval Philosophy (3)
  Main developments of Western philosophy from Augustine to Occam, especially the philosophies of Anselm, Abelard, Roger Bacon, Bonaventure, and Aquinas. 3 lectures. Prerequisite: Phil 101.

Phil 313  History of Modern Philosophy (3)
  Development of Western philosophy from the Renaissance period through Hume with emphasis upon the philosophies of the Continental Rationalists and the British Empiricists. 3 lectures. Prerequisite: Phil 101.

Phil 315  Contemporary Philosophy (3)
  Contemporary answers to perennial philosophical questions regarding man, the universe, and their relationships. Representative examples from the major contributors to the new movements in philosophy: Existentialism, Phenomenology, Logical Positivism, Analytic Philosophy, and Pragmatism. 3 lectures.
Philosophy

Phil 321  Philosophy of Science (3)

The methods of physics, biology, psychology and other selected sciences, with reference to their presuppositions and general findings. Relations between the sciences and implications of scientific methods for other fields of inquiry. 3 lectures. Prerequisite: Junior standing or a course in philosophy.

Phil 322  Symbolic Logic (3)

Introduction to the techniques of formal reasoning. Propositional and predicate logic, predicate logic with identity and definite descriptions. Metalogical foundations of modern symbolic logic. 3 lectures. Prerequisite: Phil 221 or 222.

Phil 331  Ethics (3)

Implications of ethics and ethical systems; scientific inquiry into the principles of the morality of human actions. 3 lectures. Prerequisite: Phil 101 or instructor’s permission.

Phil 333  Philosophy and the State (3)

Philosophic foundation of political ideologies. Freedom, state, law, obligation, sanction, and their relation to metaphysics, theory of knowledge, and ethics. 3 lectures.
### PHYSICAL EDUCATION

#### Number Fields for Physical Education Courses

<table>
<thead>
<tr>
<th>Category</th>
<th>Coed (PE)</th>
<th>Men (PEM)</th>
<th>Women (PEW)</th>
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<tbody>
<tr>
<td>General Activities</td>
<td>100–165</td>
<td>100–165</td>
<td>100–165</td>
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<tr>
<td>Intramural activities</td>
<td>174</td>
<td>175</td>
<td>176</td>
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<tr>
<td>Competitive athletics</td>
<td>181–199</td>
<td>181–199</td>
<td>181–199</td>
</tr>
<tr>
<td>Professional activities (PE majors or related option students only)</td>
<td>206–239</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Academic courses</td>
<td>240 up</td>
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</tbody>
</table>

**General Activities**

Enrollment is open to all students except where the activity is deemed a contact sport. In such case, duplicate classes will be offered when interest and need are determined. Courses satisfy the general education breadth requirement, carry 1 unit of credit, meet 2 hours per week, and are designed to develop skill, knowledge of rules, background and analysis of techniques, and desirable attitudes toward physical fitness and participation in sports.

The beginning course in an activity or its equivalent is prerequisite to the intermediate, and the intermediate to the advanced. Prerequisite may be waived by consent of the instructor.

Students may apply a maximum of 12 units of credit earned in general and intramural activity courses toward the bachelor’s degree.
Physical Education

PE 130 Orienteering
PE 131 Physical Conditioning
PE 132 Racquetball, Beg.
PE 133 Racquetball, Int.
PE 136 Skin-Scuba Diving
PE 137 Self-Defense
PE 139 Soccer, Beg. PEM 138 Rugby
PE 140 Soccer, Int. PEM 139 Soccer, Beg.
PE 141 Social Dance PEM 140 Soccer, Int.
PE 142 Softball
PE 143 Senior Life Saving
PE 144 Swimming, Beg.
PE 145 Swimming, Int.
PE 146 Swimming, Adv.
PE 147 Team Handball.... PEM 147 Team Handball
PE 148 Tennis, Beg.
PE 149 Tennis, Int.
PE 150 Tumbling- Trampoline
PE 151 Volleyball, Beg.
PE 152 Volleyball, Int.
PE 153 Water Polo
PE 154 Weight Training
PE 155 Basic Rhythms
PE 156 Aqua-Calisthenics
PE 158 Synch. Swimming
PE 159 Wrestling PEM 159 Wrestling
PE 160 Track and Field
PE 174 Coed Intramurals PEM 175 Men's Intramurals
PEM 176 Women's Intramurals

Competitive Athletics

Enrollment limited to those qualified to compete in intercollegiate athletic programs. Consent of coach required. Total credit limited to 8 units. Courses are each 1 unit and meet for a minimum of 10 hours per week.

<table>
<thead>
<tr>
<th>Coed</th>
<th>Men</th>
<th>Women</th>
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<tbody>
<tr>
<td>PE 181</td>
<td>Fencing.............</td>
<td>PEM 182 Baseball</td>
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<tr>
<td></td>
<td>PEM 183 Basketball</td>
<td>PEM 184 Cross Country</td>
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<td></td>
<td>PEM 185 Football</td>
<td>PEM 186 Golf</td>
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<td></td>
<td>PEM 188 Rugby</td>
<td>PEM 189 Soccer</td>
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<td>PEM 191 Swimming</td>
<td>PEM 192 Tennis</td>
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<td>PEM 192 Tennis</td>
<td>PEM 193 Track and Field</td>
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<td>PEM 194 Volleyball</td>
<td>PEM 195 Water Polo</td>
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<tr>
<td></td>
<td>PEM 196 Wrestling</td>
<td></td>
</tr>
</tbody>
</table>
Physical Education

Professional Activities

Enrollment limited to those pursuing a major in physical education or related option taught in this department (athletic coaching or teaching). Total credit limited to 12 units. Course selection is determined by the student's advisor on the basis of sports proficiency tests. All courses are one unit and meet for two hours per week. All professional activities are coed. It is expected that the student will possess either an intermediate or advanced skill level to qualify for enrollment. Courses are designed to analyze activities and develop high proficiency. Prerequisites in the 100–165 series activities will be required if student cannot demonstrate skill level desired.

PE 206 Tumbling-Trampoline
PE 207 Apparatus
PE 208 Golf
PE 209 Bowling
PE 210 Tennis
PE 211 Softball-Baseball
PE 212 Handball
PE 213 Basketball
PE 214 Volleyball
PE 215 Field Sports (Soccer, Speedball, Speed-away)
PE 216 Wrestling
PE 217 Football
PE 218 Aquatics
PE 219 Physical Conditioning
PE 220 Weight Training
PE 221 Combatives
PE 222 Archery
PE 223 Cross Country and Track Events
PE 224 Field Events
PE 225 Team Handball
PE 226 Field Hockey
PE 227 Fencing
PE 228 Dance Fundamentals
PE 229 Badminton
PE 230 Water Polo

Academic Courses

Professional courses designed primarily for the student majoring in physical education. Course 250 may be used in partial satisfaction of the General Education Breadth requirement in physical education.

PE 240 Special Problems for Undergraduates (1-2)

Individual investigation, research, studies, or other selected problems. Total credit limited to 4 units with a maximum of 2 units per quarter. Prerequisite: Permission of department head.

PE 244 Introduction to Dance (3)

History, rhythmic analysis, accompaniment for creative dance. 1 lecture, 2 two-hour laboratories.

PE 250 Health Education (2)

An introductory health course geared to bridge the gap between scientific health discoveries and one's application of these discoveries in the daily living pattern. 1 lecture, 1 recitation.

PE 252 Beginning Athletic Training (2)

Modern principles and practices in the prevention, treatment, rehabilitation and follow-up care of athletic injuries. Functions and limitations of the athletic trainer as an athletic paramedic. Theory and practice of adhesive strapping as related to supporting major body joints for athletic participation. 2 two-hour activities. Prerequisite: Zoo 131.

PE 254 School Health Program (2)

Introduction to school health services, instruction, and environment within the public and private school system. 2 lectures.

PE 260 Intramural Sports (3)

Principles and policies underlying programs of intramural sports in secondary schools and community centers. 2 lectures, 1 two-hour laboratory.

PE 270 Introduction to Physical Education (2)

Designed to acquaint the student with concept of Physical Education as a profession and to orient the student to the Cal Poly program. 2 lectures.

PE 274 History and Philosophy of Physical Education (3)

History of physical education including philosophical, institutional, and personal influences. Application of education principles to physical education. 3 lectures.
Physical Education

PE 278 Officiating Football (1)
Rules interpretation and techniques of officiating football. 1 two-hour laboratory.

PE 280 Safety and First Aid (2)
A standard American Red Cross first aid course. Instruction and practice in the immediate and temporary care of injuries and sudden illness. 1 lecture, 1 two-hour laboratory.

PE 284 Water Safety (1)
Review of life saving skills, swim strokes, and teaching methods. Upon successful completion of this class the student receives the water safety instructor's card from the American Red Cross. 2 one and one-half hour laboratories. Prerequisite: Current life saving card.

PE 290 Officiating Basketball (1)
Rules interpretation and officiating of women's basketball. 1 two-hour laboratory.

PE 292 Officiating Gymnastics (1)
Development of judging technique in gymnastics. 1 two-hour laboratory.

PE 294 Officiating Track & Field (1)
Rules interpretation and officiating track and field events. 1 two-hour laboratory.

PE 296 Organization and Planning Technique (3)
Practical skills and techniques of teaching physical education in schools. Unit and lesson planning and organizing, class management and procedure, teaching aids, evaluation skills. 2 lectures, 1 two-hour laboratory.

PE 297 Officiating Volleyball (1)
Rules interpretation and officiating of volleyball. 1 two-hour laboratory.

PE 298 Officiating Baseball and Softball (1)
Rule interpretations in officiating baseball and softball. 2 one-hour activities. Prerequisite: PE 211 or permission of instructor.

PE 300 Safety Education (3)
Principles and practices of safety as applied to home, fire, industrial, school, community, and traffic situations. Accident prevention. 3 lectures.

PE 302 Kinesiology (3)
Science of human movement integrating both structural and functional aspects. Anatomy, physiology, and elementary mechanics in relation to movement in sports, work, and the activities of daily living. 2 lectures, 1 two-hour laboratory. Prerequisite: Zoo 237.

PE 303 Physiology of Exercise (3)
Application of the knowledge of human physiology to exercise situations. 2 lectures, 1 two-hour laboratory. Prerequisite: Zoo 238, 239.

PE 305 Drug Education (2)
Instruction on the nature and effect of the use of tobacco, alcohol, narcotics and restrictive dangerous drugs. 2 lectures.

PE 311 Coaching Water Sports (2)
Theories of coaching principles and organization of interscholastic water sports. 1 lecture, 1 two-hour laboratory. Prerequisite: PE 218 or permission of instructor.

PE 319 Tests and Measurements in Physical Education (3)
Physical tests and measurements of skill, strength, speed, and endurance as a basis for grading and as a measure of progress in activities. 2 lectures, 1 two-hour laboratory. Prerequisite: Stat 211.
PE 321 Coaching Football (2)
Fundamentals and systems of offensive and defensive football. Preparation for interscholastic coaching. Rules of the game. 1 lecture, 1 two-hour laboratory. Prerequisite: PE 217 or permission of instructor.

PE 322 Coaching Basketball (2)
Theories of coaching, principles of organization of interscholastic basketball. 1 lecture, 1 two-hour laboratory. Prerequisite: PE 213 or permission of instructor.

PE 323 Baseball Coaching Theory and Practice (2)
Fundamentals of baseball with emphasis on strategy, selection of players, officiating, interpretation of rules, scoring, and administration of interschool games. 1 lecture, 1 two-hour laboratory.

PE 327 Coaching Wrestling (2)
Coaching techniques of wrestling. Theories of coaching principles and organization of interscholastic wrestling. 1 lecture, 1 two-hour laboratory. Prerequisite: PE 216 or permission of instructor.

PE 332 Elementary School Physical Education (3)
Prepares the student to guide elementary school age children through a well-balanced program in physical education. Aims, objectives, procedures, methods, evaluation and program planning. 1 lecture, 2 two-hour laboratories.

PE 333 Coaching Cross Country Track and Field (2)
Theories of coaching, principles and organization of interscholastic cross country and track and field. 1 lecture, 1 two-hour laboratory. Prerequisite: PE 223 and 224, or permission of instructor.

PE 340 Coaching Individual Sports (2)
Techniques, theory and problems of coaching individual sports such as archery, golf, and racquet sports at the secondary and collegiate levels. 1 lecture, 1 two-hour laboratory. Prerequisite: PE 208, 210, 222, 229 and 296.

PE 341 Coaching Team Sports (2)
Techniques, theory, and problems of coaching team sports such as field hockey, team handball, and soccer at the secondary and collegiate levels. 1 lecture, 1 two-hour laboratory. Prerequisite: PE 215, 222, 226 and 296.

PE 344 Coaching Power Volleyball (2)
Techniques and theories of individual fundamentals, game strategies, and problems of coaching secondary and collegiate level athletes. 1 lecture, 1 two-hour laboratory.

PE 355 Coaching Gymnastics (2)
Theories of coaching, principles and organization of interscholastic gymnastics. 1 lecture, 1 two-hour laboratory. Prerequisite: PE 206 and 207, or permission of instructor.

PE 371 Teaching Aquatics (3)
Problems and techniques in teaching swimming and water sports. 1 lecture, 2 two-hour laboratories. Prerequisite: PE 218, 230, 296.

PE 373 Gymnastics (3)
Techniques and problems in teaching gymnastics. 1 lecture, 2 two-hour laboratories. Prerequisite: PE 206, 207, 296.

PE 375 Teaching Team and Individual Sports (3)
Techniques and problems in teaching archery, tennis, volleyball and softball. 1 lecture, 2 two-hour laboratories. Prerequisite: PE 210, 211, 214, 222 and 296.
Physical Education

PE 377 Teaching Team and Individual Sports (3)
Techniques and problems in teaching golf, badminton, basketball and football. 1 lecture, 2 two-hour laboratories. Prerequisite: PE 208, 213, 217, 229 and 296.

PE 379 Teaching Track and Field and Cross Country (3)
Techniques and problems in teaching track and field and cross country. 1 lecture, 2 two-hour laboratories. Prerequisite: PE 223, 224, and 296.

PE 381 Recreational Dance Theory (3)
Selection of music; theory, methods and problems in teaching social, folk, and square dance. 1 lecture, 2 two-hour laboratories. Prerequisite: PE 228, 296.

PE 383 Modern Dance Theory (3)
Development of teaching skills for dance instruction and production. 1 lecture, 2 two-hour laboratories. Prerequisite: PE 228, 296.

PE 385 Choreography (3)
Problems connected with dance composition and choreography. Practical experience in preparing annual dance production. Total credit limited to 6 units. 1 lecture, 2 two-hour laboratories. Prerequisite: One year dance experience or consent of instructor.

PE 400 Special Problems for Advanced Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Senior standing or permission of the instructor.

PE 401 Organization and Administration of Health and Physical Education (3)
Underlying philosophy, principles, policies, and procedures of administration as applied to health and physical education. Legal aspects and the interrelationships with the general school curriculum at the local, state, and national levels. 3 lectures.

PE 405 Administration of Health Education (2)
Current procedures and policies in curriculum development and basic administration of health education programs. 2 lectures.

PE 406 Adaptive Physical Education (3)
Growth and development patterns; their relation to special and regular physical education programs. Analysis of postural divergence and procedures for prevention and correction. 2 lectures, 1 two-hour laboratory. Prerequisite: PE 302, 303.

PE 410 Psychology of Coaching (3)
Psychological consideration of the coach-athlete relationship. Mental preparation of teams and individuals for competition. 3 lectures. Prerequisite: Senior standing.

PE 424 Organizing and Teaching Physical Education (3)
Organization, selection, presentation, application, and interpretation of subject matter in physical education. 3 lectures. Prerequisite: Permission of instructor.

PE 432 Athletic Training and Massage (2)
Modern principles and practices in conditioning and care of athletes. Theory and practice in the scientific manipulation of the muscles as related to therapeutic exercise. 2 two-hour laboratories. Prerequisite: PE 252.

PE 436 Coaching Women's Sports (3)
Effect of success and failure in competitive situations. Understanding the role of competition in our society as viewed from psychological, sociological and physiological perspectives. 3 lectures. Prerequisite: PE 296 and senior standing.

PE 437 Directed Field Work (1–3)
Practical work experience in related phases of physical education under qualified supervision. Total credit limited to 9 units. Minimum of 2 laboratory hours per week per unit. Prerequisite: Senior standing and permission of advisor.
PE 440  Activity Supervision (1)

Required of physical education majors enrolled in the teaching option. Emphasis will be given to class organization of required physical education classes. Total credit limited to 3 units. 2 one-hour periods. Prerequisite: Senior standing and 300-level methods courses.

PE 461, 462  Senior Project (2) (2)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time. Prerequisite: PE 302, 303, 319 or advisor approval.

PE 500  Individual Study (1–3)

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: PE 517 and consent of department head, graduate adviser, and supervising faculty member.

PE 501  Adaptive Physical Education Seminar (3)

Advanced techniques in the detection of defective body mechanics and establishment of class procedures for prevention and elimination of these defects. Individual case studies. 3 meetings.

PE 502  Advanced Seminar in Problems of Physical Education (3)

Practical problems in physical education and their solution in terms of desired objectives in this field. 3 lectures.

PE 506  Physical Education for the Mentally Retarded (2)

Development of concepts and activities for trainable and educable mentally retarded. Contributions of physical education to the growth and development of the mentally retarded as an integral tool in their education and training. 2 lectures. Prerequisite: Graduate standing.

PE 511  Administration of Physical Education (3)

Principles and techniques of administration of physical education on the elementary and secondary school levels. 3 lectures.

PE 512  Critical Health Issues (3)

Contemporary health issues and related information. Adaptability of scientific health discoveries to current patterns of living. 3 lectures.

PE 513  Evaluation of Current Studies (3)

Analysis and evaluation of published studies in physical education, health education and recreation. 3 lectures. Prerequisite: PE 517.

PE 516  Physical Education Facilities, Equipment and Finance (3)

Design and construction of physical education facilities. Budgeting and financing physical education, intramural, and athletic facilities and programs. 3 lectures. Prerequisite: Graduate standing.

PE 517  Research Methods in Physical Education (3)

Experimental, descriptive, historical, philosophical, and action research in physical education. Selection of adequate problems for investigation; various sampling techniques and analyses; use of library facilities; manuscript requirements for the thesis. 3 lectures. Prerequisite: PE 319 or consent of the instructor.

PE 522  Mechanical Analysis of Sports (3)

Application of principles of body mechanics to physical education and sports activities as a basis for analyzing and improving motor performance. 3 lectures. Prerequisite: PE 302, 303, consent of instructor.
PE 523  Administration of Co-Curricular Activities (3)
The place of co-curricular activities in education. Particular emphasis on purposes, administrative control, management and operational policies of men’s and women’s programs. 3 lectures.

PE 525  Motor Learning (3)
Analysis of research principles and concepts of motor performance and learning directed toward psychology of teaching and coaching. 3 lectures.

PE 526  Sports in American Life (3)
Analysis of physical education in U.S. culture, socio-cultural variables, changing patterns, current trends, problems and issues. 3 lectures.

PE 530  Advanced Physiology of Exercise (3)
effects of exercise on human beings in relation to performance and physiological adjustment to activity. 2 lectures, 1 two-hour laboratory. Prerequisite: PE 303.

PE 535  Administration of Athletics (3)
Responsibilities and administrative concerns of athletic directors. Philosophy and ethics, budget and finance, equipment and supplies, legal liability, public relations, planning and maintenance of facilities, health aspects of athletics, and responsibilities to students. 3 lectures.

PE 599  Thesis (2) (2) (2)
Independent research under the guidance and supervision of the staff. Prerequisite: PE 517, consent of graduate adviser and supervising faculty member.

PHYSICAL SCIENCE

PSc 101  The Physical Environment: Matter and Energy (4)
Introduction to the basic principles of physical science and application of these principles in modern society. Objects at rest and in motion, energy and power, fluids, heat, light, and sound. 3 lectures, 1 recitation.

PSc 102  The Physical Environment: Atoms and Molecules (4)
Introduction to the basic principles of the atomic, molecular, and sub-atomic behavior of matter, and applications of these principles in modern society. Electricity and magnetism, electrical nature of matter, organic and inorganic chemistry, modern physics, the nucleus. 3 lectures, 1 recitation. Prerequisite: PSc 101.

PSc 103  The Physical Environment: Earth and the Universe (4)
Introduction to the basic principles of the earth sciences and astronomy, and applications of these principles in modern society. Structure and formation of the earth, earthquakes, weather, oceanography, solar system, stars, and cosmology. 3 lectures, 1 recitation. Prerequisite: PSc 101.

PSc 171  Science and Society (3)
Interdisciplinary approach to contemporary science-society issues. Three 3-week periods, each conducted by a professor from a different scientific discipline. 3 lectures.

PSc 201  Introduction to Physical Oceanography (3)
Origin, extent of oceans; nature of sea bottom, sediments. Causes, effects of ocean circulation, tides and waves. Physical properties of sea water. Transmission of heat, sound and light. Shorelines and shoreline processes. One or two field trips. Not open to students with credit in PSc 301. 3 lectures.

PSc 301  Physical Oceanography (3)
Oceanic regions, waves, mechanics and dynamics of currents, Earth’s heat budget, ocean margins, influence of biological and chemical processes, man’s interaction with the ocean, measurements, problems of special interest. Not open to students with credit in PSc 201. 3 lectures. Prerequisite: Physics 122 or 132 and a course in calculus.
PSc 303 Earth and Space Science (3)

Concept oriented treatment of astronomy and space science, geology, oceanography, atmospheric physics, and meteorology designed for prospective elementary teachers. 2 lectures, 1 activity. Prerequisite: PSc 101 and 102 and junior standing.

PSc 424 Organizing and Teaching of Physical Sciences (3)

Techniques, aims and objectives in the teaching of physical sciences and general sciences at the secondary level. Selection and organization of teaching material. Evaluation of results. 3 lectures. Prerequisite: Evidence of satisfactory preparation in physics and chemistry.

PSc 436 Demonstration Experiments in Physical Science (1)

Investigation and illustration of the principles of physical science through demonstration experiments, designed and assembled by students according to their background and interest, largely from inexpensive, easily obtainable materials. Total credit limited to 2 units. 1 activity. Prerequisite: 6 quarter units of physical science.

PSc 461 Senior Project (2)

Selection and completion of a project under faculty supervision. Project results are presented in a formal report. Minimum of 60 hours total time.

PHYSICS

Phys 100 Introduction to Physics (1)

Introduction to the professional work of the physicist. Content and methods of physics. Orientation to the resources and objectives of the Physics Department. Offered only on a credit-no credit basis. Open to physics and physical science majors only. 1 lecture.

Phys 104 Introductory Physics (4)

Fundamental principles of mechanics, heat, light and electricity. Not to be taken by students who have taken a college course in Physics. 4 lectures. Prerequisite: Math 103 or 114 or 120.

Phys 110 Energy for the Future (3)

Detailed presentation of current and future sources of energy. Nuclear fission, nuclear fusion, geothermal energy, and solar energy. Physical principles, problems, current research, and future prospects. 3 lectures.

Phys 113 Physics of Sound Reproduction (1)

Nonmathematical introduction to the physical principles of sound reproduction. Qualitative study of sound, hearing and psychoacoustics, room acoustics, signals and noise, power, audio systems, transducers. 1 two-hour activity.

Phys 121, 122, 123 College Physics (4) (4) (4)

Fundamental principles of mechanics; hydraulics, heat, light and sound; magnetism, electrostatics, current electricity, atomic and nuclear physics. Not open to students who have previously taken corresponding college courses in physics. 3 lectures, 1 laboratory. Prerequisite: Math 115 or 120.

Phys 124 Introduction to Modern Physics (3)

Elementary treatment of relativity, atomic structure, atomic spectra; nuclear radiation and detection; nuclear reactions, radioactivity and nuclear energy. Not open to students with credit in Phys 211. Will not satisfy the Phys 211 requirement. 3 lectures. Prerequisite: Phys 121.

Phys 131 General Physics (4)

Fundamental principles of mechanics: vectors, particle kinematics, statics and dynamics, equilibrium of a rigid body, work and energy, linear momentum. Primarily for physical science, engineering, and architecture students. 3 lectures, 1 laboratory. Prerequisite: Math 131 or concurrent enrollment in Math 142.

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Physics

Phys 132 General Physics (4)
Rotational kinematics and dynamics, oscillations, waves in elastic media, sound waves, temperature, heat and the first law of thermodynamics, kinetic theory of matter, second law of thermodynamics. 3 lectures, 1 laboratory. Prerequisite: Phys 131.

Phys 133 General Physics (4)
Charge and matter, electric field, electric potential, dielectrics, capacitance, current and resistance, electromotive force and circuits, magnetic fields, magnetic field of a moving charge, induced emf, geometric and wave properties of light. 3 lectures, 1 laboratory. Prerequisite: Phys 131, Math 132 or 143.

Phys 134 General Physics (3)
Magnetic properties of matter, Maxwell's equations, electromagnetic waves, radiation, physical optics. 3 lectures. Prerequisite: Phys 133 or EL 207.

Phys 137 General Physics: Mechanical Vibrations and Electric Circuits (4)
Damped, forced, and coupled oscillations in mechanical structures and electric circuits. Applications to earthquake movements, alternating current circuits, and electronic instrumentation. For School of Architecture and Environmental Design majors. 3 lectures, 1 laboratory. Prerequisite: Phys 132, Math 142.

Phys 200 Special Problems for Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of department head.

Phys 206, 207 Instrumentation in Experimental Physics (2) (2)
Electrical and electronic circuit elements, operational amplifiers, and digital techniques including logic, counting, and analog-digital converters with applications to instrumentation in modern physics. 2 lectures. Prerequisite: Phys 133, Math 143, and concurrent enrollment in Phys 256, 257.

Phys 210 Introduction to Modern Physics (4)
Fundamental principles of modern physics, atomic and nuclear phenomena. Introduction to special relativity, wave-particle duality. 4 lectures. Prerequisite: Phys 133 or EL 207 or equivalent.

Phys 211 Modern Physics (4)
Fundamental principles of modern physics, emphasizing atomic and quantum phenomena. Introduction to special relativity; wave-particle duality; Bohr theory; Schrödinger equation; elementary atomic structure. 4 lectures. Prerequisite: Phys 133 or EL 207 or equivalent, Math 133 or 241.

Phys 213 Introduction to Nuclear Physics (3)
Nuclear radiations and interactions. Detection methods, instruments and radioactive hazards. Nuclear reactions and induced radioactivity. Nuclear energy. 3 lectures. Prerequisite: Phys 211.

Phys 243 Introductory Nuclear Physics Laboratory (1)
Techniques of nuclear radiation detection and measurement including Geiger, proportional and scintillation counting. Properties of alpha, beta and gamma radiation. 1 laboratory. Prerequisite or concurrent: Phys 210 or 213, Phys 256 or equivalent.

Phys 256, 257 Electrical Measurements Laboratory (1) (1)
Experimental studies of circuit analysis and electronics; introduction to digital techniques; instrumentation. 1 laboratory. Prerequisite: Phys 133, Math 143.

Phys 301 Heat (3)
Thermodynamics and statistical mechanics. Entropy, temperature, chemical potential, free energy. Selected applications including paramagnetism, ideal gas, Fermi-Dirac distribution. 3 lectures. Prerequisite: Phys 211, Math 241.
Phys 302 Analytic Mechanics (3)

Phys 303 Analytic Mechanics (3)
Dynamics of a rigid body, central force motion, accelerated reference frames. Three-dimensional motion of a rigid body, introduction to Lagrange’s and Hamilton’s equations. 3 lectures. Prerequisite: Phys 302, concurrent Math 304.

Phys 310 Physics of Energy (3)
Physics and mathematics applied to broad energy topics. Conservation, transportation, solar energy, nuclear fission, breeder reactors, plasma fusion, laser fusion and separation, hydrogen economy, fuel cells, wind wave, tidal, and geothermal energy, transmission, storage, fossils, magnetohydrodynamic generators, and national planning. 3 lectures. Prerequisite: Phys 133.

Phys 312 Waves and Vibrations (3)

Phys 313 Introduction to Atmospheric Physics (3)
Properties of the atmosphere. Atmospheric motions. Solar and terrestial radiation; atmospheric scattering, optics, elements of radiative heat transfer and cloud physics. Description of the upper atmosphere. 3 lectures. Prerequisite: Physics 132 or 122 and Math 143 or 133 or equivalent.

Phys 317 The Special Theory of Relativity (3)
Fundamental experiments and basic postulates of special relativity. Simultaneity, length and time measurements. Lorentz transformations. Four-Vectors. Space-time diagrams. Relativistic mechanics and electromagnetism. 3 lectures. Prerequisite: Phys 211.

Phys 323 Physical Optics (4)
Selected topics in geometrical optics. Optic fields: Fourier’s and Kirchhoff’s integral theorems, applications of interference and diffraction. Optical properties of solids: dispersion, optical activity, non-linear optics. Theory and applications of lasers. 3 lectures, 1 laboratory. Prerequisite: Phys 134, 211, Math 241.

Phys 341, 342 Quantum Physics Laboratory (1) (1)
Experimental studies of particles and radiation, their quantum properties and interactions with atoms and nuclei. 1 laboratory. Prerequisite: Phys 256, 243.

Phys 363 Undergraduate Seminar (2)
Study and oral presentation of current developments in physics. Discussion of projects and research by students and faculty. 2 meetings.

Phys 400 Special Problems for Advanced Undergraduates (1–2)
Individual investigations, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of the department head.

Phys 403 Nuclear Physics (3)

Phys 405 Quantum Mechanics (3)
The wave nature of matter. The wave function and its interpretation. The Schroedinger equation. Solutions for one dimensional problems and the one electron atom. 3 lectures. Prerequisite: Phys 211; Math 242. Recommend: Math 304.

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Phys 406  Solid State Physics (3)
Crystalline structure of solids. Vibrational and electronic energies in the crystal lattice. Electrical, thermal, and magnetic properties of metals, insulators, and semi-conductors. 3 lectures. Prerequisite: Phys 405.

Phys 407  Quantum Mechanics (3)

Phys 408, 409  Electromagnetic Fields and Waves (4) (3)
Electric and magnetic field theory using vector analysis. Electric fields, dielectric materials, magnetic fields, induced emf's, magnetic materials, Maxwell's equations, wave equations, plane electromagnetic waves. Dipole radiation, radiation from an accelerated charge. 4 lectures, 3 lectures. Prerequisite: Phys 134, Math 304.

Phys 410  Physics of the Solid Earth (3)
Gravity and the figure of the earth. Body wave seismology, structure and composition of the earth, heat flow and heat sources, earth tides, rotational dynamics, the geomagnetic field and its source, paleomagnetism. 3 lectures. Prerequisite: Phys 133 and Math 242 or equivalent.

Phys 412  Solid State Physics for Engineers (3)
Basic quantum mechanics. Application to atomic structure and bonding. Crystal structures and their determination. Elementary treatments of Fermi statistics, free electron theory and band theory of solids, bulk properties of metals and semi-conductors. Application to optical properties of solids and to selected current topics of interest (lasers, superconductivity, etc.). 3 lectures. Prerequisite: Phys 211.

Phys 413  Advanced Topics in Solid State Physics (3)
Lattice dynamics, tunable lasers, non-linear optics, band theory, transport phenomena. Properties of superfluids and conductors, current experimental techniques. Review of the present state of the art from journal articles. 3 lectures. Prerequisite: Phys 406, 412, or consent of instructor.

Phys 421  Nuclear Reactor Physics (4)

Phys 452  Solid State Physics Laboratory for Engineers (1)
Selected experiments on the solid state of matter using electrical, optical, and x-ray methods. 1 laboratory. Prerequisite or concurrent: Phys 412

Phys 456  Solid State Physics Laboratory (1)
Experimental study of the solid state of matter using X-ray, electrical and optical methods. 1 laboratory. Prerequisite or concurrent: Phys 406. Prerequisite: Phys 341 or consent of instructor.

Phys 461, 462  Senior Project (2) (2)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

Phys 470  Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

Phys 471  Selected Advanced Laboratory (1–3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. One to three laboratories. Prerequisite: Consent of instructor.

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POLITICAL SCIENCE

Pol Sc 100  U.S. History and Government (3)
Basic structure and operation of the federal government. The constitution as a modern regulatory instrument; bases of American ideals. Function of state and local government. This course may not be substituted for Hist 204, 205, Pol Sc 201 or 401. 3 lectures. Not open to degree students for degree credit.

Pol Sc 101, 102  National and California Government (3) (3)
Governmental institutions of the United States. California state and local political institutions and problems. Completion of Pol Sc 101 and 102 will satisfy the California state requirements in the United States Constitution, state and local government. 3 lectures.

Pol Sc 105  Introduction to International Relations (3)
Introduction to dynamics, character and substance of power relations among nations; conflict and accommodation, including the nature of the state and the international community. 3 lectures.

Pol Sc 110  Introduction to Political Science (3)
Introduction to the scope, language, concepts and approaches of the discipline of political science. Career opportunities. 3 lectures.

Pol Sc 200  Special Problems for Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of department head.

Pol Sc 201  American Government (3)
The origin, nature, and distribution of political power. Declaration of Independence. The Constitution of the United States. Function and current problems of national, state and local government. Finding and evaluating authoritative source materials on political affairs. Not open to students with credit in or enrolled in Pol Sc 101. 3 lectures.

Pol Sc 202  Comparative Government (3)
Comparative study of the government of the United Kingdom and other selected Western European countries. 3 lectures. Prerequisite: Pol Sc 101 or 201.

Pol Sc 203  Basic Political Analysis (3)
Basic methods and techniques of systematic political analysis including examples of statistical and computer applications in the field of political science. 3 lectures. Prerequisite: Pol Sc 110, Stat 211.

Pol Sc 204  Basic Concepts of Political Thought (3)
Introduction to major concepts (such as authority, equality, force, individual, justice, law, political obligation, power, rights, state) which affect our thinking about social relations. The social and political theories of thinkers from Socrates to Machiavelli. 3 lectures.

Pol Sc 206  Law Enforcement Processes (3)
Social and political influences affecting the law and its enforcement. Examination of selected steps in the law enforcement process. The roles of police, courts, judges, prison officials, and parole officers. 3 lectures.

Pol Sc 214  Introduction to Public Administration (3)
Development of the executive functions in government. Making and carrying out public policy by government in the United States. Survey of administrative concepts and cases. 3 lectures.

Pol Sc 250  Model United Nations (2)
Preparation for participation in the campus Model United Nations. Procedure, MUN rules of debate, preparation of country positions, area papers, and policy statements suitable for use in mock United Nations sessions. May be repeated to six units. 2 lectures. Prerequisite: One
Political Science

course in Pol Sc or permission of instructor.

Pol Sc 270 Politics Through Films (2)
The political process as depicted through films. The way films (and secondarily, the mass media) affect perception and understanding of political processes. Class schedule will list topic. Total credit limited to 4 units. 1 lecture-recitation, 1 laboratory. Credit-No Credit grading.

Pol Sc 302 American Political Process (3)
Political parties, pressure groups, public opinion and the role of each in contributing to the dynamics of the American political process. 3 lectures. Prerequisite: Pol Sc 101 or 201.

Pol Sc 303 Minority Group Politics (3)
Analysis of political factors affecting minority groups in America. Involvement, organization and role of minority groups in the political process. Emphasis on the political behavior of black and chicano minorities. 3 lectures. Prerequisite: Eth S 114, Pol Sc 302 or consent of instructor.

Pol Sc 306 Modern Political Thought (3)
Theories of political control and the relationship between man and the state. 3 lectures. Prerequisite: Pol Sc 204 or junior standing.

Pol Sc 307 American Political Thought (3)
The central political ideas of America’s leading thinkers from Thomas Paine to the present. 3 lectures. Prerequisite: Pol Sc 204.

Pol Sc 311 Inter-American Relations (3)
Inter-American affairs. Political, economic, and social problems; forces motivating cultural behavior, industrial development, trade techniques, agriculture methods. Opportunities for employment in agriculture, engineering, and business. Finding and evaluating authoritative source materials on Latin American affairs. 3 lectures. Prerequisite: Pol Sc 201, Hist 204.

Pol Sc 312 International Politics (3)
International political processes and problems; foreign policies and politics in relations between states; conflicts and adjustments. Analyses of selected problems. 3 lectures. Prerequisite: Pol Sc 105.

Pol Sc 313 National Strategies (3)
Theoretical approaches to the study of war and peace and the evolution of contemporary defenses and strategies, especially those pertaining to the United States. The impact of national strategy on both national and international politics. 3 lectures. Prerequisite: Pol Sc 105 or advanced standing in ROTC.

Pol Sc 318 Administrative Theory and Behavior (3)
Conceptual examination of the theory and behavior of large and small bureaucracies. Role of the individual in the organization. Social, psychological and behavioral theories of organization. 3 lectures. Prerequisite: Pol Sc 214.

Pol Sc 319 Public Personnel and Finance Administration (3)
Processes of recruiting and managing personnel in the public service. Philosophy of public personnel administration, civil service system, labor issues. Theory and practice of public finance administration. Examination of the budget as an instrument of public policy. 3 lectures. Prerequisite: Pol Sc 214.

Pol Sc 320 Comparative Administration (3)
Comparisons of administrative systems and their relationship to political systems and processes in established and newly developing nations. Analysis of administrative strategies to achieve social change. 3 lectures. Prerequisite: Pol Sc 214.
Pol Sc 321 American Constitutional Law (3)
Basic principles of American constitutional law. Role of the Supreme Court as arbiter of separation of powers and federalism. 3 lectures. Prerequisite: Pol Sc 101 and 102, or 201.

Pol Sc 322 Protection of Civil Liberties (3)
Role of Supreme Court as interpreter of Constitutional rights and liberties, freedom of expression, civil and criminal procedural guarantees, search and seizure, due process, and equal protection of the laws. 3 lectures. Prerequisite: Pol Sc 101 and 102, or Pol Sc 201.

Pol Sc 325 Public Policy Analysis (3)
Methods of analyzing the actions or inactions of government. Techniques for evaluating the outputs and impacts of governmental policies. Comparisons of various domestic issue areas such as transportation, education, housing, welfare, and law enforcement. 3 lectures. Prerequisite: Pol Sc 101 or 201.

Pol Sc 335 Legislative Process (3)
Organization and procedures of Congress, state and local legislative bodies, theory and practices of representative government. Problems of representation in selected political systems. 3 lectures. Prerequisite: Pol Sc 101 or 201.

Pol Sc 340 Government Internship (1–4)
Supervised work experience in a government or related public agency as approved by the School Dean. The intern will function as an employee subject to all the duties and responsibilities of employees engaged in comparable work. 30 hours of work experience per unit of credit. Total credit limited to 8 units, with a maximum of 4 units per quarter. Credit-no-credit. Recommended preparation: Junior standing with a 2.5 GPA.

Pol Sc 350 Advanced Model United Nations (2)
Participation in the campus Model United Nations. Procedure, MUN rules of debate, preparation of country positions, area papers, and policy statement for use in mock United Nations sessions. May be repeated to 6 units. 2 lectures. Prerequisite: Pol Sc 250 or permission of instructor.

Pol Sc 400 Special Problems for Advanced Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

Pol Sc 401 State and Local Government (3)
Structure, function and problems of state, county, and local governments. 3 lectures. Prerequisite: Pol Sc 102 or 201.

Pol Sc 402 Politics and Governments of Developing Areas (3)
Institutions and processes of governments in a selected world area experiencing economic and political development. Each time the course is offered it will bear a subtitle descriptive of the particular area studied. 3 lectures. May be repeated to a total of 9 units. Prerequisite: Pol Sc 201 and Hist 205 or equivalent.

Pol Sc 403 Municipal Government (3)
Organization, politics, and problems of contemporary American municipalities. Trends in city life and government. 3 lectures. Prerequisite: Pol Sc 102 or 201.

Pol Sc 404 Science, Technology and Public Policy (3)
Analysis of the problems stemming from the relationship of technology and politics. Ecology, energy crisis, civilian-military complex, electronic eavesdropping, governmental support of technology, policy implications of technological change. The individual's role and responsibilities in a democracy. 3 lectures. Prerequisite: Pol Sc 201 or equivalent.

Pol Sc 405 Politics of Municipal Finance and Planning (3)
Political and economic considerations affecting the decision-making process of planning departments, commissions, and other local government decision-making boards. The budgetary process, interest groups, urban renewal, economic development at the subnational level.
Political Science

3 lectures. Prerequisite: Pol Sc 401 or 403 or equivalent.

Pol Sc 411 Contemporary U.S. Foreign Policy (3)
The formulation and conduct of U.S. foreign policy. Analysis of the theory and elements of U.S. strategy; diplomacy, propaganda, economic operations, psychological warfare, and military strategies. 3 lectures. Prerequisite: Pol Sc 105.

Pol Sc 412 International Organization (3)
Structure, functions, powers of the United Nations, selected regional organization, and specialized agencies. Current problems facing international organizations. 3 lectures. Prerequisite: Pol Sc 105.

Pol Sc 417 Contemporary Problems and Institutions of Asia (3)
Analysis of political, economic, and social institutions and conditions in selected Asian nations. 3 lectures. Prerequisite: Junior standing or consent of instructor.

Pol Sc 418 Contemporary Problems and Institutions of the U.S.S.R. (3)
Study and analysis of political, economic, and social institutions and conditions of the U.S.S.R. 3 lectures. Prerequisite: Junior standing or consent of instructor.

Pol Sc 424 Organizing and Teaching Political Science (3)
Organization, selection, presentation, application, and interpretation of political science subject matter for teaching of high school government and civics. 3 lectures. Prerequisite: Admission to teacher education program or valid teaching credential.

Pol Sc 442 The American Presidency (3)
The nature and problems of contemporary presidential leadership emphasizing the impact of the bureaucracy, congress, public opinion, the courts, interest groups, and the party system upon the presidency and national policy making. 3 lectures. Prerequisite: Pol Sc 101 or 201.

Pol Sc 461, 462 Senior Project (2) (2)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

Pol Sc 463 Undergraduate Seminar (2)
Preparation and presentation of current developments in the field of political science. 2 meetings. Prerequisite: Pol Sc 461, 462 or consent of instructor.

Pol Sc 465 Contemporary Problems and Institutions of the Middle East and Africa (3)
Study and analysis of political, economic, and social institutions and conditions of the countries of the Middle East and North Africa. 3 lectures. Prerequisite: Junior standing or consent of instructor.

Pol Sc 468 Contemporary Problems and Institutions of Africa South of the Sahara (3)
Study and analysis of indigenous institutions, Western influences, and nationalism in Africa south of the Sahara. Selective area studies illustrative of colonialism and the politics of independence. 3 lectures. Prerequisite: Junior standing or consent of instructor.

Pol Sc 470 Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

Pol Sc 510 Administration in Developing Nations (3)
Processes of administration with reference to the differing cultural, political, and economic environments of the developing areas of the world. 3 lectures. Prerequisite: Graduate standing.

Pol Sc 583 Organizations in the Political Process (3)
Methods and problems of organizations operating in the political process such as consumerism, conflict of interest, accountability, social responsibility. National and multi-national organizations, both public and private. 3 lectures. Prerequisite: Graduate standing.
Pol Sc 590 Seminar in Political Science (3)

Special problems in selected areas of Political Science. Each seminar will have a subtitle describing its nature and content. 3 lectures. Maximum of 6 units may be earned. Prerequisite: Graduate standing and consent of instructor.

POULTRY INDUSTRY

PI 121 Poultry Industry Development (4)
Scope and importance of the poultry industry as a part of California agriculture. Poultry organizations, publications, employment opportunities. Basic skills in industry organization. 3 lectures, 1 laboratory.

PI 122 Replacement Programs and Broiler Production (4)
Organization and planning of the replacement program on the commercial poultry enterprise. Modern techniques and practices including costs, facilities, and management of the replacement program. 3 lectures, 1 laboratory.

PI 123 Poultry Feeding and Nutrition (4)
Nutritional requirements, feeding principles and modern practices. Formulation of rations for specific purposes and commercial economy practices. Feed industry distributive procedures. 3 lectures, 1 laboratory. Prerequisite: DH 101.

PI 200 Special Problems for Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of department head.

PI 221 Poultry Selection and Egg Production (2)
Biological environmental factors that affect quality, size, and number of eggs produced. Techniques and practices of working with the commercial producing flock. 1 lecture, 1 laboratory.

PI 222 Poultry Products, Processing and Marketing (3)
Assembling, processing, distributing and merchandising of poultry meat and eggs. Standardization and regulations applicable to the marketing of poultry products. Development and promotion of consumer products. 2 lectures, 1 laboratory.

PI 223 Poultry Incubation (2)
Embryology fundamentals and metabolism of the developing embryo. Artificial incubation practices as applied in the commercial hatchery. Nutritional, genetic and environmental factors that affect the hatch. 1 lecture, 1 laboratory.

PI 230 General Poultry Production (3)
Survey of the various phases of the modern poultry industry including nutrition, breeding, flock health, production and management. Business aspects of poultry production and marketing of products. Not open to poultry majors. 2 lectures, 1 laboratory.

PI 231 Poultry Anatomy and Physiology (3)
Structural aspects and normal functions of the principal systems of domestic poultry. 2 lectures, 1 laboratory. Prerequisite: Zoo 131 or Bio 100.

PI 233 Poultry Plant Design and Equipment (2)
Design and planning a modern commercial poultry operation. The engineering of buildings and equipment to specific commercial functions. Coordination of buildings, equipment and operations designed for maximum plant efficiency. 1 lecture, 1 laboratory.

PI 305 Game Bird Propagation and Management (3)
Game bird anatomy, physiology and nutrition. Health, natural and artificial reproduction, and rearing techniques as practiced in public resource programs and private enterprises. 3 lectures. Prerequisite: One quarter college mathematics, one quarter animal biology and Chem 401
Poultry

PI 306 Game Bird Propagation and Management Laboratory (1)
Field trips and basic skills in propagation and management in support of PI 305. 1 laboratory.
Prerequisite or concurrent: PI 305.

PI 320 Poultry Consumer Education (2)

PI 321 Applied Poultry Breeding (3)
Genetic applications in the development of commercial poultry stocks for specific productive designs. Application of commercial breeding techniques for flock improvement. Analysis of breeding records. 3 lectures.

PI 322 Hatchery Business Organization (4)
Organization and management of a commercial hatchery operation. Recruiting and supervising personnel, organizing flow of products and planning the distribution systems. Managing the finance, advertising, public relations, and sales phases of the hatchery organization. 3 lectures, 1 laboratory.

PI 323 Poultry Diseases and Hygiene (3)
Management, sanitation and vaccinating programs for the maintenance of the flock health. Control and prevention of diseases and parasites. 3 lectures. Prerequisite: Bact 221.

PI 400 Special Problems for Advanced Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of department head.

PI 421 Turkey Industry (3)
Coordination and operation of a commercial turkey enterprise. Application of nutritional, breeding, disease control and marketing practices. Planning and supervising the specialized phases of the turkey enterprise. Development of new products and specialized marketing techniques. 2 lectures, 1 laboratory. Prerequisite: Consent of instructor.

PI 422 Advanced Poultry Enterprise Supervision (3)
Coordination and supervision of the modern commercial poultry enterprise. Analysis of operational procedures, efficiency practices, cost and quality control techniques. Interrelationship of business practices to the enterprise success. 3 lectures. Prerequisite: Consent of instructor.

PI 461, 462 Senior Project (2) (2)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

PI 463 Undergraduate Seminar (2)
Preparing and presenting in an organized manner reports on new trends, special problems, research developments related to the poultry industry. Group discussion of industry special problems. 2 meetings.

PI 470 Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: consent of instructor.
PI 471 Selected Advanced Laboratory (1-3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. One to three laboratories. Prerequisite: Consent of instructor.

PI 530 Poultry Business Dynamics (3)
Organizational structure of modern poultry industry. Economic integration of production, processing, and marketing. Role of poultry and poultry products in the economic and nutritional health of state and nation. 3 lectures. Prerequisite: Graduate standing and consent of instructor.

PI 581 Graduate Seminar in Poultry (3)
Current trends and characteristics of the poultry industry enterprise. Group discussions of skills, techniques and practices to improve teaching of vocational agriculture as it applies to poultry. 3 meetings.

PSYCHOLOGY
Psy 104 Effective Study Techniques (2)
Designed to acquaint students with basic aims and objectives of going to college, and to provide adequate instruction and practice in specific study skills; effective study methods, note-taking, time-planning, memory, concentration. 1 lecture, 1 quiz section.

Psy 201 General Psychology (3)
Introduction to psychological research and applications; psychobiology, perception, learning, motivation, consciousness, cognition, personality and assessment, social behavior, psychopathology, and psychotherapy. 3 lectures. A student may enroll for credit in either Psy 201 or Psy 202, but not both.

Psy 202 General Psychology (3)
Introduction to psychological research and applications; psychobiology, perception, learning, motivation, consciousness, cognition, personality and assessment, social behavior, psychopathology, and psychotherapy. 2 lectures, 1 recitation. A student may enroll for credit in either Psy 202 or Psy 201, but not both.

Psy 251 Laboratory in Group Activities (1-3)
Skills and techniques of solving problems in large and small groups; conducting and reporting meetings; analyses of leadership dynamics in campus organizations. Total credit limited to 6 units. 1-3 activities.

Psy 301 Psychology of Personal Development (3)
Approaches to self exploration and self modification; conceptions of human potential; evaluation and development of personal effectiveness. 3 lectures. Prerequisite: Psy 201 or 202.

Psy 302 Behavior in Organizations (3)
Factors involved in organizing; types and characteristics of functioning organizations; the individual in the organization; methods of obtaining organization members. Psychological issues relevant to the maintenance of the organization. Motivation, attitudes, leadership, group phenomena, communication, decision-making and organizational change. 3 lectures. Prerequisite: Psy 201 or 202.

Psy 303 Human Sexuality (2)
Understanding aspects of personal sexuality. Sexual development, attitudes, role awareness, intimacy, biological aspects of sexuality, homosexuality, sexual dysfunction, family planning and birth. Credit-No Credit. 2 lectures.

Psy 304 Comparative and Physiological Psychology (3)
Variables relevant to the interaction of physiological and behavioral processes. Learning, motivation, emotion, perception, individual differences, social and abnormal behaviors as a function of the nervous and endocrine systems, sensory structures, genetic factors, effects of
Psy 307 Abnormal Psychology (3)
Abnormal behavior of individuals. Dynamics, etiology, symptoms, treatment and prevention of the more severe personality and behavior disorders. Includes the psychoneuroses, psychoses, alcohol and drug addiction, psychosomatic illnesses, and character disorders. 3 lectures. Prerequisite: Psy 201 or 202.

Psy 311 Human Factors and Environmental Psychology (3)
Man-environment transactions including human decision-making and problem-solving capabilities and limitations; information capacity of the senses; effects of the physical environment upon individuals and groups. 3 lectures. Prerequisite: Psy 201 or 202.

Psy 320 Behavioral Effects of Drugs and Alcohol (3)
Effects of drugs and alcohol on motivation, emotion, perception, and learning. Organization of research findings into tentative theoretical and treatment models relevant to personal, social, and organizational adjustment. 3 lectures. Prerequisite: Junior standing.

Psy 401 Social Psychology (3)
Human behavior as a product of social influence and interaction; conformity, attitudes and attitude change, interpersonal attraction and attributional processes, cooperation, competition, aggression, leadership. 3 lectures. Prerequisite: Psy 201 or 202 or permission of instructor.

Psy 432 Psychological Testing (3)
Principles and procedures of the selection, the administration, scoring, and the interpretation of achievement tests, aptitude tests including scholastic aptitude, interest inventories, and personality inventories. 3 lectures. Prerequisite: 9 units of psychology.

Psy 433 Individual Intelligence Testing I (4)
Principles and procedures of individual intelligence testing. Supervised experience in the administration, scoring and interpretation of the Stanford Binet Intelligence Scale. 2 lectures, 2 activity periods. Prerequisite: Psy 432.

Psy 434 Individual Intelligence Testing II (4)
Administration, scoring, and interpretation of the Wechsler Scales and measures of intelligence, perception, and achievement. Supervised experience in collecting test data and making meaningful interpretations and recommendations to teachers, parents, and agencies needing assistance in helping children and adults. 2 lectures, 4 hours supervised field experience minimum. Prerequisite: Psy 433.

Psy 435 Testing Exceptional Children (4)
Testing of exceptional children to determine learning difficulties, intelligence, mental and emotional characteristics. Preparation of case studies. Screening children for programs for exceptional children. Techniques for assessing psychological traits of culturally different children. 2 lectures, 4 hours supervised field experience minimum. Prerequisite: Psy 434.

Psy 446 Assessment of Learning Disabilities (3)
Assessment of physical, intellectual, social and emotional characteristics of children. Use of psychological tests for diagnosis of learning disabilities and for developing prescriptive teaching. 3 lectures. Prerequisite: Psy 202, 432.

Psy 454 Personality (3)
Personality theories and research; human motivation; description and development of personality characteristics; adaptation and self-actualization. 3 lectures. Prerequisite: 6 units of psychology.

Psy 455 Learning and Motivation (3)
Principles, major theories, methods and research findings relevant to major experimental areas of learning and motivation. Derivation of principles from research data, current research contributions, and implications for applied problems. 3 lectures. Prerequisite: 6 units of psychology.
Psy 456  Behavioral Disorders in Children (3)

Applications of psychological learning principles to childhood behavioral disorders: aggression, delinquency, stress reactions, emotional-motivational disorders, perceptual-attentional deficiencies, neuroses, psychoses, psychosomatic disorders, biological dysfunctions, and retarded social and cognitive development. 3 lectures. Prerequisite: 3 units of psychology.

RECREATION

Rec 101  Introduction to Recreation (3)

Designed to acquaint the student with the field of recreation as a profession. 3 lectures.

Rec 105  Principles of Recreation Leadership (3)

Nature, status, and development of professional recreational leadership; concomitant roles and skills. Competencies for guidance, supervision, administration and evaluation. 3 lectures.

Rec 126  Community Recreation (3)

Aspects of community recreation; roles of schools, public and private agencies. Practical experience in supervised leadership roles in the community. 2 lectures, 1 two-hour laboratory. Prerequisite: Rec 105.

Rec 210  Program Planning for Recreation (3)

Principles of program construction, planning and methods of adapting a varied program for public and private groups. Evaluation of existing programs. 3 lectures.

Rec 324  Administration of Recreation (3)

Administrative relationships in public recreation. Scope, levels, concepts, structure, personnel practices and policies. 3 lectures. Prerequisite: Rec 126, 210 or consent of instructor.

Rec 325  Administration of Recreation (3)

Administrative practices in public recreation. Public recreation programs, finance, budget, fees and charging policies, and practices, areas and facilities. 3 lectures. Prerequisite: Rec 324 or consent of instructor.

Rec 337  Administration of Camping and Outdoor Education (3)

Programs for organized camps. Techniques associated with living out-of-doors. Practical experience in the field. 2 lectures, 1 two-hour laboratory. Prerequisite: Rec 325.

Rec 338  Administration of Camping and Outdoor Education (3)

Administration and organization of camping; history and trends in camping; qualifications, duties of camp personnel, professional opportunities in the field. Campsite sanitation; food management; selection, training, duties and responsibilities of counselors. 2 lectures, 1 laboratory. Prerequisite: Rec 337.

Rec 352  Administration of Recreation Programs for Special Groups (3)

Specific recreation needs based on particular characteristics of groups, such as: orthopedic handicapped, auditory and visually handicapped, mentally retarded, mentally ill, and emotionally disturbed. Practical experience working with one of these groups. 3 lectures. Prerequisite: Rec 325.

Rec 423  Supervisory Roles in Recreation Administration (3)

Analysis of the supervisory roles in public and private recreation agencies. Methods, techniques and evaluation systems. 3 lectures.

Rec 430  Directed Field Experience (1–3)

Practical work experience in related phases of Recreation Administration under qualified supervision. Total credit limited to 6 units. Prerequisite: Rec 352, senior standing, departmental approval.
Sociology

Rec 461, 462 Senior Project (2) (2)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum of 120 hours total time. Prerequisite: Senior standing.

SOCIAL SCIENCES

Soc Sc 200 Special Problems for Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of department head.

Soc Sc 400 Special Problems for Advanced Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of the department head.

Soc Sc 424 Organizing and Teaching Social Sciences (3)

Organization, selection, presentation, application, and interpretation of social sciences subject matter for teaching of high school civics and social problems. 3 lectures. Prerequisite: Admission to the teacher education program or possession of valid teaching credential.

Soc Sc 440 Supervised Field Work (3)

Supervised observation, research and work in community organizations, public agencies, with attention to the barrio and ghetto. Prerequisite: Senior standing and permission of instructor. Repeatable to 9 units.

Soc Sc 460 Senior Project (2)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 60 hours total time. Prerequisite: Soc Sc 463, senior standing or consent of instructor.

Soc Sc 463 Undergraduate Seminar (2)

Intensive study of selected social problems with application of techniques for analysis. 2 meetings. Prerequisite: Senior standing or consent of instructor.

Soc Sc 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

Soc Sc 590 Seminar in Social Sciences (3)

Special problems in selected areas of the Social Sciences. Each seminar will have a subtitle describing its nature and content. 3 lectures. Maximum of 9 units may be earned. Prerequisite: Graduate standing and consent of instructor.

SOCILOGY

Soc 105 Introduction to Sociology (3)

Orientation to the nature of the study of society; survey of approaches to social analysis. Emphasis upon primary concepts describing environment, social structure, and social change for increased understanding of human relations. An overview of the systems of social relationships. 3 lectures.

Soc 106 Social Problems (3)

An appraisal of various factors from which social problems of the contemporary American society emerge and alternative procedures for dealing with such problems. 3 lectures.
Sociology

Soc 201, 202, 203 Principles of Sociology (3) (3) (3)
Sources of materials and methods of sociological study; concepts and principles; structure
and process of group life; social institutions. Applications of techniques in field study. 3
lectures.

Soc 206 The Sociology of Family Life (3)
Description and analysis of the social relationships within the family group. Examination
of alternative solutions to problems which arise in family living. 3 lectures.

Soc 301 Social Welfare in the U.S. (3)
Introduction to the field of social welfare; the development of American social work; scope
and diversity of specific programs designed to meet welfare problems in contemporary society.
3 lectures. Prerequisite: 9 hours of sociology or consent of instructor.

Soc 302 Social Work (3)
Development of public welfare services; current problems and policy issues; analysis of
current programs of social insurance, public assistance programs; interagency relationships. 3
lectures. Prerequisite: Soc 301.

Soc 313 Urban Sociology (3)
Structure of social relationships in the community; physical structure of communities;
patterns of community cooperation and conflict; changing patterns of urban community life;
social class and political influence on the community level. 3 lectures. Prerequisite: One
sociology course or consent of instructor.

Soc 315 Race Relations (3)
Structure of relationships among ethnic and racial groups. Source of discrimination and
prejudice in personality and social structure. Patterns of segregation. Evaluation of current
techniques for restructing intergroup relations. 3 lectures. Prerequisite: Eth S 114; 6 hours
of sociology or consent of instructor.

Soc 316 American Minorities (3)
Problems in assimilation of the Afro-American, Mexican-American, and American Indian.
Analysis of internal group structures and external factors impeding assimilation of these
minorities. Dynamics of intergroup relationships. Assessment of current programs aimed at
assimilation. 3 lectures. Prerequisite: Six units of sociology or consent of instructor.

Soc 323 Social Stratification (3)
Social class and the distribution of status and power in society, with emphasis on contempo-
rary United States; social mobility; relationships of stratification to mental illness, race, family
systems, crime and delinquency, etc. 3 lectures. Prerequisite: 6 hours of sociology or consent
of instructor.

Soc 330 Social Change (3)
Description and analysis of social change in contemporary American society as it relates to
major revolutionary changes in this century; variables alleged to affect social change; impact
of social change upon traditional societies; prospects for future social change. 3 lectures.
Prerequisite: 6 units of Sociology.

Soc 333 Social Research Methods (3)
Research design, development of scales, uses of computers, questionnaire construction and
interview techniques, sampling methods and analysis of data. 3 lectures. Prerequisite: one
sociology course and Stat 211; or consent of instructor.

Soc 344 Sociology of Poverty (3)
Variable indicators of poverty in modern society. Chief features of the subculture of the
poor. Analysis of different explanations for the persistence of poverty. Survey of proposals for
reducing poverty. 3 lectures. Prerequisite: College course in sociology or consent of instructor.
Soil Science

Soc 402 Crime and Delinquency (3)
Theories of delinquent and criminal behavior; analysis of institutional and other approaches to rehabilitation of criminals and delinquents. 3 lectures. Prerequisite: Two courses in sociology or consent of instructor.

Soc 412 Treatment of Criminals and Delinquents (3)
Approaches to the control and rehabilitation of adult and juvenile offenders; philosophy of treatment strategies; history and analysis of probation, imprisonment, parole and preventive programs. 3 lectures. Prerequisite: Soc 402.

Soc 413 Methods of Social Work (3)
Theories, concepts, values stressed in social work. Social casework. Principles and practices used by social workers serving individuals and families in correctional, public assistance, medical, psychiatric youth services, and other settings. Discussion of case material and available literature. 3 lectures. Prerequisite: Soc 302.

Soc 414 Social Work Practicum (3)
The social-intervention practice model and its application. Social intervention goals and strategy. Social workers and social agencies. Professional social work skills in assessment, observation, interviewing, engagement, communication, and intervention activities. Reading and discussion of illustrative cases. 3 lectures. Prerequisite: Soc 413 or equivalent, or consent of instructor.

Soc 421 Social Theory (3)
Analysis of the nature and types of classical and contemporary sociological and anthropological theory. 3 lectures. Prerequisite: Soc 203.

Soc 431 Population Problems (3)
Description and analysis of population variables and their sociological consequences. 3 lectures. Prerequisite: One sociology course and Stat 211; or consent of instructor.

SOIL SCIENCE

SS 100 Orientation in Soil Science (1)
Understanding the depth and breadth of the study of soils as a science. Student and professional organizations. 1 lecture.

SS 121 Soils (4)
Physical, chemical, and biological properties of soils as related to agriculture. 3 lectures, 1 laboratory.

SS 122 Soil Management (4)
Effect of tillage, manuring, drainage, and irrigation practices on soil productivity. 3 lectures, 1 laboratory. Prerequisite: SS 121.

SS 123 Soil Materials (3)
Origin, composition, and identification of rocks, minerals, and other materials important in the development of soils. Land forms as related to the nature and properties of soils. 2 lectures, 1 laboratory. Prerequisite: SS 121.

SS 200 Special Problems for Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of department head.

SS 202 Soil Conservation (3)
Climate, topography, soils and land use in relation to soil and water losses. Evaluation of soil and water conservation programs and practices. 3 lectures. Prerequisite: SS 121 or consent of instructor.
Soil Science

SS 221 Fertilizers (4)
Composition, value, and use of fertilizer materials and soil correctives. Methods employed in the manufacture, distribution, and application of fertilizers. 3 lectures, 1 laboratory. Prerequisite: SS 121.

SS 230 General Soils (3)
Properties of soils, management and conservation practices required for the utilization of soil as a natural resource to produce food and fiber. For students outside the field of soil science. Not open to students with credit in SS 121. 3 lectures.

SS 321 Soil Classification (4)
Systems used in soil and land classification. Methods employed in soil surveying. Mapping of assigned areas and the preparation of survey reports. 3 lectures, 1 laboratory. Prerequisite: SS 122.

SS 322 Soil Fertility (3)
Plant nutrient requirements of crops. Effect of soil and climatic conditions on the availability of nutrients in the soil. Diagnostic techniques in soils and crops. 2 lectures, 1 laboratory. Prerequisite: SS 122, 221, Chem 122.

SS 332 Conservation Techniques (3)
Basic development of subject matter, materials, and activities for classroom instruction in soils, water, range, woodland, and recreation resources. 2 lectures, 1 laboratory.

SS 333 Tropical Soils (4)
Nature and properties of tropical soils, their origin, morphology, classification, fertility, utilization, and conservation. 3 lectures, 1 laboratory.

SS 400 Special Problems for Advanced Undergraduates (1–2)
Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Permission of department head.

SS 422 Soil Microbiology (3)
Biochemical activities of soil organisms. Effect of soil organisms on the formation, characteristics, and productivity of soils. Methods of studying soil organisms. 2 lectures, 1 laboratory. Prerequisite: SS 122, 221, Bact 221 or consent of instructor.

SS 423 Soil Chemistry (4)
Fundamental concepts and practices in soil chemistry. Methods of analysis and interpretation of significant investigations for the management of soils. 3 lectures, 1 laboratory. Prerequisite: SS 322 or consent of instructor.

SS 432 Soil Physics (4)
Advanced study of the physical properties of soils. Application of physical-chemical soil relationships to farming and engineering practices. 2 lectures, 2 laboratories. Prerequisite: SS 122, Phys 104, Chem 122, or consent of instructor.

SS 433 Land Use Planning (3)
Evaluation of land use capabilities. Development of plans and practices for the management of crop, range, and forest land. 2 lectures, 1 laboratory. Prerequisite: SS 202 or consent of instructor.

SS 461, 462 Senior Project (2) (2)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.
SS 463 Undergraduate Seminar (2)
Review of current research, experiments, and problems related to the students' major field of interest. Preparation and presentation of reports on problems or research activities. 2 lectures.

SS 470 Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

SS 471 Selected Advanced Laboratory (1–3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. One to three laboratories. Prerequisite: Consent of instructor.

SS 508 Conservation Legislation (3)
Legislation enabling and implementing conservation programs. Legal responsibilities of individuals and groups in the development of natural resources. Proposed or needed legislation for more effective conservation. 3 lectures. Prerequisite: Senior or graduate standing.

SS 521 Soil Morphology (3)
Advanced study of the morphological characteristics of soils. New techniques used in modern systems of soil classification and mapping. 2 lectures, 1 laboratory. Prerequisite: Graduate standing, SS 202, 321, 433.

SS 581 Graduate Seminar in Soils (3)
A review of current research, experiments and problems related to soil science. Development of special demonstration and field plot trials for educational groups. 3 lectures.

SS 582 Graduate Seminar in Land Management (3)
Development of plans and practices for the management of crop, range, and woodland, 2 lectures, 1 laboratory. Prerequisite: Graduate standing, SS 433, Cr Sc 411 or equivalent.

SS 599 Thesis or Internship (3) (3) (3)
Problems and topics in advanced soil conservation according to interests and needs of the students enrolled. Prerequisite: Graduate standing in soil conservation.

SPANISH

Span 101, 102, 103 Elementary Spanish (4) (4) (4)
For beginners. Class practice in pronunciation, sentence structure, reading, writing, and basic conversation. Laboratory drill required. To be taken in numerical sequence. 4 lectures.

Span 104 Intensive Elementary Spanish (12)
Class practice in pronunciation, syntax, reading, writing, and conversation. Offered in summer only. Laboratory drill required. 12 lectures.

Span 110, 111, 112 Spanish for Spanish Speakers (3) (3) (3)
Standard Spanish, including conversation, grammar, and composition. Reading and writing of the language, with emphasis on the Mexican heritage in the United States, particularly California. To be taken in numerical sequence. 3 lectures. Prerequisite: Conversational knowledge of Spanish, Span 103, or equivalent.

Span 201, 202, 203 Intermediate Spanish (3) (3) (3)
Further practice in speaking, reading, and writing Spanish. Introduction to Spanish and Latin American cultures. To be taken in numerical sequence. 3 lectures. Prerequisite: Span 103 or equivalent.
Speech

Span 251, 252, 253 Barrio Spanish (3) (3) (3)
Accelerated oral approach to everyday communication with Spanish speaking people, particularly school age children. To be taken in numerical sequence. 3 lectures. Prerequisite: Some experience in Spanish, approval of the instructor.

Span 301 Advanced Spanish Grammar and Composition (3)
Oral and written development of structural grammar, syntax, and complex components of Spanish. Vocabulary expansion and idiomatic construction. Written composition. Translations to examine linguistic and semantic differences. 3 lectures. Prerequisite: Span 203.

Span 305 Significant Writers in Spanish (4)
Study in depth of selected Spanish writers, as individual writers or in groups. 4 lectures. Prerequisite: Span 203 or equivalent.

SPEECH

Sp 111 Professional Fields of Speech (1)
Occupational opportunities, professional organizations, and important journals in the various fields of speech. Development and trends in forensics, discussion, theater arts, and speech correction. 1 lecture.

Sp 200 Principles of Speech (3)
Introduction to the fundamentals and principles which underlie effective speech communication. Practical experience in various types of speaking situations: informative speaking, persuasive speaking, and panel discussion. 3 lectures.

Sp 214 Communication Theory (4)
Concepts and theories of the human communication process. Psycho-sociological aspects of attitude change. Interpersonal relations in an informational-behavioral context. 4 lectures. Prerequisite: Psy 202, consent of instructor.

Sp 215 Argumentation (4)
Analysis of evidence and reasoning. Preparation and delivery of speeches based on logical proof. Practice in refutation. 4 lectures.

Sp 217 Essentials of Discussion (4)
Basic principle and techniques of discussion. Survey of the importance of discussion in contemporary society, including a study of and practice in informal group discussion, panel discussion, symposium, and forum. 4 lectures.

Sp 250 Forensic Activity (1)
Lower division participation in intercollegiate forensic activities. Any student who wishes to receive academic credit for participation in such activities during the quarter should enroll. Specific assignments will be determined by instructor. May be repeated to 6 units. 1 activity.

Sp 301 Debate (4)
Techniques of argumentation and their application to debate; logic and reasoning; fallacies of reasoning; experience in various forms of formal argument, including intercollegiate debate; judging and debate program administration. 4 lectures. Prerequisite: Sp 200.

Sp 302 Introduction to Communicative Disorders (4)
Survey of speech, language, and hearing disorders emphasizing causes, symptoms, and treatment; role of the speech therapist in the community and in public schools; role of the classroom teacher in speech improvement. 4 lectures.

Sp 304 Persuasion (4)
Persuasive theory including methods of attention, suggestion, motivation, and adaptation employed to influence opinion and action. Analysis of persuasive discourse and the application of persuasive methods in speaking. 4 lectures. Prerequisite: Sp 214 or 215 or 217, or consent of instructor.
Speech

Sp 305 Oral Interpretation (4)
Basic theory of interpretation; selection, preparation, and presentation of material for oral reading. 4 lectures. Prerequisite: Sp 200

Sp 306 Voice and Phonetics (4)
Physiological and anatomical bases of normal voice production. Phonetics as a basis of correct sound formation and standards of pronunciation. Concentration on special skills of enunciation, articulation, and voice improvement. 4 lectures.

Sp 308 Industrial and Professional Speech (3)
Speech in industrial, professional, and informal business including interviews, sales talks, and conference speaking. Preparation of oral reports in business and professional situations. 3 lectures. Prerequisite: Sp 200, or consent of instructor.

Sp 311 Cross Cultural Communication (3)
Examination and clarification of communication problems within and between ethnic groups. 3 lectures. Prerequisite: Consent of instructor.

Sp 312 Speech and Hearing Services in the Schools (4)
Principles and methods of identification, selection, and management of speech problems. Administrative functions; relationship to the school, parents, and community. 4 lectures. Prerequisite: Sp 200, 302, 306.

Sp 313 The Development of Speech and Language (4)
Development of speech and language from birth to adolescence. Physical and psychological processes contributing to the emergence, practice, and mastery of speech and language. 4 lectures. Prerequisite: Sp 302, 306.

Sp 317 Rhetoric: Classical Period to Renaissance (4)
Early development of rhetorical theory in Greco-Roman civilization; analysis of the canons of rhetoric; rhetorical thought of Plato, Aristotle, the ad Herennium, Cicero, Quintilian and the medieval contribution of Augustine. 4 lectures. Prerequisite: Consent of instructor.

Sp 318 Rhetoric: Renaissance to the Present (4)
Development of rhetorical theory in the Renaissance thought to modern concepts of rhetoric; contributions of John of Salisbury, Ramus, Cox, Wilson, Bacon, Sheridan, Walker, Campbell, Whately, Blair, Adams, Goodrich, Jebb; contemporary speech textbook writers. 4 lectures. Prerequisite: Consent of instructor.

Sp 350 Advanced Forensic Activity (2)
Upper division participation in intercollegiate forensics. Administration and operation of tournaments held annually on campus and in the community. May be repeated to 6 units. 2 activities. Prerequisite: Sp 250.

Sp 400 Special Problems for Advanced Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of instructor.

Sp 401 Current Methods in Speech Pathology (4)
Current procedures and rationales in the management of speech disorders. Familiarization with instrumentation, testing, and methodology. 3 lectures, 1 two-hour laboratory. Prerequisite: Sp 302.

Sp 402 Introduction to Audiology (4)
Anatomy and physiology of the hearing mechanism. The hearing process. Familiarization with differing types of hearing disorders. Instrumentation and testing. Methods of rehabilitation. 4 lectures. Prerequisite: Sp 302.
Sp 403 Organizational Communication (3)
Relationships of human behavioral dynamics within the organizational process. Functions of information networks in organizations. The role of leadership in the business-industrial context. 3 lectures. Prerequisite: Junior standing.

Sp 405 Advanced Oral Interpretation (3)
Choral reading, reader's theater, and special projects. 3 lectures. Prerequisite: Sp 305, or consent of instructor.

Sp 406 Communication Practices (4)
Development of the prospective teacher's communication skills in lesson presentation, interpersonal communication, oral reading, listening. Discussion, oral reading, and dramatics applied to various types of subject matter. Basic knowledge of voice science. Identification and management of communication problems. 4 lectures. Prerequisite: Sp 200.

Sp 408 American Public Address (4)
Historical survey to 1865; evaluation of great speakers and speeches as they pertain to the development of American institutions. 4 lectures. Prerequisite: Sp 304, or consent of instructor.

Sp 409 American Public Address (4)
Historical survey from 1865 to present; evaluation of great speakers and speeches as they pertain to the development of American institutions. 4 lectures. Prerequisite: Sp 304, or consent of instructor.

Sp 411 Communication Research (4)
Communication research strategy methodology. Basic methods of designing research in empirical and non-empirical communication studies. 4 lectures. Prerequisite: Sp 214, CSc 110.

Sp 424 Organizing and Teaching Speech Communication (3)
Curricula, methods, and procedures that may be used effectively in teaching speech classes and directing speech activities in secondary schools. Selection and organization of teaching material. 3 lectures. Prerequisite: Admission to teacher education program or valid teaching credential.

Sp 461 Senior Project (2)
Selection and completion of a project under faculty supervision. Projects typify problems which a graduate may face in his field of employment. Project results are presented in a formal written report. Minimum 60 hours total time.

Sp 463 Undergraduate Seminar (2)
Discussion of individual projects, oral reports on material in current professional writings. 2 lectures. Prerequisite: Senior standing.

Sp 470 Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

Sp 512 Psycholinguistic Disabilities (3)
Causes, identification, evaluation, and treatment of various types of language disorders. Oral language, reading, and writing disabilities. Organic, environmental, and emotional factors. 3 lectures. Prerequisite: Sp 302, 313.

Sp 590 Seminar in Speech (1-3)
Readings and papers on special problems in selected areas of speech. Total credit limited to 6 units. 1–3 lectures. Prerequisite: Graduate status.
Statistics

STATISTICS

Stat 200  Special Problems for Undergraduates (1–2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: permission of department head.

Stat 211  Elementary Probability and Statistics (3)

Classification of statistical data; calculation and uses of various averages; measures of variability; permutations, combinations, and elementary probability; binomial and normal distributions; random sampling, confidence limits. 3 lectures. Prerequisite: Intermediate Algebra or equivalent.

Stat 212  Statistical Methods (3)

Tests of hypotheses, confidence intervals; nonparametric methods; linear regression and correlation; chi-square and F-distributions; index numbers; time series; analysis of variance. 3 lectures. Prerequisite: Stat 211.

Stat 313  Analysis of Variance (3)

Applications of statistics for students not majoring in statistics or mathematics. Analysis of variance including the one-way classification, randomized blocks, Latin squares, and factorial designs. Introduction to multiple regression and to analysis of covariance. Use of computer software in the solution of statistical problems. 3 lectures. Prerequisite: Stat 212.

Stat 321, 322, 323  Statistical Analysis (3) (3) (3)

Probability and probability distributions for statistical procedures. Statistical techniques based on sampling from normally distributed populations. Regression and correlation, analysis of variance, analysis of covariance, distribution free procedures. Use of computing facilities in the solution of statistical problems. 3 lectures. Prerequisite: Stat 212.

Stat 330  Statistical Uses of Computers (3)

Techniques available to the statistician for efficient use of a digital computer to perform statistical computations and to handle large amounts of data. Use of special languages. Analysis of computer software used in the solution of statistical problems. 3 lectures. Prerequisite: Stat 322, CSc 101.

Stat 400  Special Problems for Advanced Undergraduates (1–2)

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with not more than 2 units in any one quarter. Prerequisite: permission of department head.

Stat 415  Nonparametric Methods in Statistics (3)

Hypothesis testing when the form of the parent population is unknown; tests based on Binomial Distribution; measures of dependence; contingency tables; tests based on ranks; Kolmogorov-Smirnov-type tests. 3 lectures. Prerequisite: Stat 212 or 322.

Stat 421  Sampling Techniques (3)

Planning, execution, and analysis of sampling from finite populations. Sampling designs and estimation procedures. Nonsampling errors. Questionnaire analysis. Case studies. 3 lectures. Prerequisite: Stat 211 or 321.

Stat 423  Design of Experiments (3)

General linear model—a unified approach to various applied methods. Regression, t-test, analysis of variance and covariance; programming statistical problems. Advanced topics in statistical designs; split plot design, confounding, fractional factorial, response surfaces. 3 lectures. Prerequisite: Stat 323.

Stat 425  Probability Theory and Applications I (3)

Basic probability theory, conditional and marginal probability, stochastic independence, probability models for random phenomena, probability distributions, mathematical expectation and transformation. 3 lectures. Prerequisite: Stat 321, Math 241.
Stat 426 Probability Theory and Applications II (3)
Multivariate normal distribution, sampling distributions, theory of estimation and hypothesis testing. 3 lectures. Prerequisite: Stat 425.

State 427 Mathematical Statistics (3)
Investigation of statistical theory, including the topics of Bayesian inference, regression and linear hypotheses, and sequential analyses. 3 lectures. Prerequisite: Stat 426.

Stat 461, 462 Senior Project (2) (2)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

Stat 463 Undergraduate Seminar (2)
Reports and discussions by students through seminar methods, based on topics of interest to persons preparing for a career in statistics. 2 activity periods.

Stat 470 Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: consent of instructor.

Stat 512 Statistical Methods (3)
Statistical methods in research for graduate students not majoring in mathematical sciences. Probability distributions, confidence intervals, hypothesis testing, contingency tables, linear regression and correlation. Application of statistics in the student's major field. 3 lectures. Prerequisite: Intermediate algebra or equivalent.

Stat 527 Theory and Applications of Statistics (3)
Discrete and continuous random variables, expected values and moments, moment generating functions, multivariate distributions, sampling, sampling distributions, interval estimation, tests of hypotheses. 3 lectures. Prerequisite: Stat 321.

Stat 528 Theory and Applications of Statistics (3)
Multivariate normal distribution, sampling distributions, interval estimation, tests of hypotheses, regression and linear hypotheses, experimental design models, and non-parametric methods. 3 lectures. Prerequisite: Stat 527.

Stat 540 Foundations in Statistics (3)
Intensive foundation course for the MBA program. Selected elements of descriptive, analytical, and inferential statistics to provide tools for research and decision making in business and economics. 3 lectures. Prerequisite: Graduate standing and Stat 212.

VEGETABLE SCIENCE

Vg Sc 230 General Vegetable Crops (4)
Principles involved in production, harvesting, packaging, and marketing of major California vegetable crops. Survey of the vegetable industry for other than crop science majors. Credit not allowed for both Vg Sc 230 and Vg Sc 232. 3 lectures, 1 laboratory.

Vg Sc 232 Vegetable Crops Production (4)
Production, adaptation, utilization of vegetable crops such as cole crops, beans, celery, peppers, squash, melons, cucumbers, lettuce, carrots, spinach, sweet potatoes. Credit not allowed for both Vg Sc 230 and Vg Sc 232. 3 lectures, 1 laboratory. Prerequisite: Cr Sc 131.

Vg Sc 250 Home Vegetable Production (2)
Practical aspects of growing vegetable crops in the home garden. Seedbed preparation, mulching, composting, transplanting, seeding, irrigation, fertilization and cultural practices utilized in production of vegetable crops. 1 lecture, 1 laboratory.
Veterinary Science

Vg Sc 324  Harvesting, Packaging and Marketing Vegetable Crops (4)
Harvesting methods and procedures; current handling and packaging techniques; containers; storage; and grades, grading and laboratory tests for fresh market vegetables. A field trip to a major California vegetable production, processing or marketing area is required. 3 lectures, 1 laboratory. Prerequisite: Vg Sc 232.

Vg Sc 326  Advanced Vegetable Production (4)
Advanced studies of recent developments and problems of vegetable production. Cultural practices associated with mechanization. A field trip to a major California vegetable production area is required. 3 lectures, 1 laboratory. Prerequisite: Vg Sc 232.

Vg Sc 424  Vegetable Crop Management (4)
Organization, management, and operation of commercial size vegetable production acreages; advanced work in production, harvesting, marketing operations, and the varied aspects of the entire commercial vegetable production industry. A field trip to a major California vegetable production area is required. 3 lectures, 1 laboratory. Prerequisite: Vg Sc 232 or consent of instructor.

Vg Sc 521  Advanced Vegetable Science (4)
Problems and techniques of vegetable science. Special study projects. 3 lectures, 1 laboratory. Prerequisite: Graduate standing and permission of instructor.

VETERINARY SCIENCE

VS 100  Principles of Veterinary Science (5)
Structural aspects and functions of the principal systems of farm animals, control and prevention of common diseases causing economic losses in livestock. 4 lectures, 1 laboratory. To be taken by technical students only, in substitution for VS 123, 302 and 203. Not open to degree students for degree credit. Prerequisite: Bio 100 or 101.

VS 123  Anatomy and Physiology (3)
Structural aspects and the normal functions of the principal systems of the various farm animals. 2 lectures, 1 laboratory. Prerequisite: Zoo 131, 132.

VS 203  Animal Parasitology (3)
Identification, life cycles, prevention and control of the common external and internal parasites causing economic loss in livestock. 3 lectures. Prerequisite: Zoo 131, 132.

VS 206  Laboratory Animal Care (3)
Applied principles involving care and management of laboratory farm animals, veterinary principles involving the care of animals with injury and disease. 3 lectures. Prerequisite: VS 123.

VS 302  Animal Hygiene (3)
Basic disease concepts, transmission of infectious diseases, fundamentals of immunology. Infectious disease preventive principles. The livestock producer's role and responsibilities in governmental farm animal disease control programs. 3 lectures. Prerequisite: Bact 221.

VS 310  Zoonosis (2)
A study of some of the common diseases of domestic animals and birds which can be transmitted to man. 2 lectures. Prerequisite: Zoo 131, Bact 221.

VS 432  Animal Pathology (4)
Gross and microscopic study of disease and parasitic lesions involving meat animal tissues. Traumatic, infectious, and parasitic lesions bearing public health significance. 3 lectures, 1 laboratory. Prerequisite: VS 302 or consent of instructor.

VS 435  Meat Inspection (4)
Organization of federal and state meat inspection services; definition of regulations established by codes and laws. Laboratory work in principles and procedures of meat inspection. 3 lectures, 1 laboratory. Prerequisite: FI 210, VS 302.
VS 438 Systemic Animal Physiology (4)

Homeostatic relationships of organ systems. Cardiovascular, respiratory, urogenital and neuro-endocrinological functions. 3 lectures, 1 laboratory. Prerequisite: Zoo 132, Chem 328. Recommended: Chem 126, Chem 329, Bio 431, and/or VS 123 and Zoo 133.

VS 522 Seminar in Disease Problems (2)

Livestock disease problems related to national and international animal health. Familiarization with governmental prevention, control, and eradication programs. State and federal regulations relating to importation and exportation of livestock. 2 lectures. Prerequisite: VS 302.

WELDING

Weld 141 Manufacturing Processes (1)

Theory, practice, and application of metal joining processes including oxyacetylene, resistance, gas, tungsten, arc, silver brazing and adhesive bonding. Demonstration of electron beam welding. Mechanical tests of welded—and brazed and adhesive-bonded joints. Related reports. 1 laboratory.

Weld 142 Manufacturing Processes (1)

Theory and practice in metal cutting and arc welding systems. Filler metals manufacture, classification, and applications. Joint design, codes, mechanical testing with related reports. Weldability studies, distortion control. Application and economic considerations of various processes. 1 laboratory.

Weld 151 Micro Bonding (1)

Theory, practice and applications of joining processes associated with electronic circuitry including soldering, thermocompression, ultrasonic and beam lead bonding, plasma needle arc, and electron beam welding. 1 laboratory. Prerequisite: Weld 141.

Weld 155 Industrial Welding Technology (1)

Application of various electric welding processes to joining of steel sheet and plate. Includes short circuiting arc, flux cored electrode, gas metal arc, and shielded metal arc processes. Gas welding of steel pipe and hard surfacing. 1 laboratory. Prerequisite: Weld 142.

Weld 156 Welder Qualification Technology (1)

Out of position fillet and groove welds in carbon steel plate. Welder qualification tests according to code requirements. 1 laboratory. Prerequisite: Weld 142.

Weld 157 Welding Survey (1)

Brazing and soldering processes applied to copper, aluminum, stainless steel and carbon steel tubing. Resistance welding of a variety of light gauge materials. Gas tungsten arc welding of aluminum and stainless steel. 1 laboratory. Prerequisite: Weld 141.

Weld 235 Nondestructive Examination (4)

Theory and application of nondestructive test systems for quality control. Includes radiography, ultrasonic, magnetic particle, penetrants, eddy current and holography. For ET, Welding and Manufacturing Processes majors. 2 lectures, 2 laboratories. Prerequisite: Weld 259, Math 120, Phys 123.

Weld 240 Additional Welding Laboratory (1-2)

Individual welding investigation of current methods and applications. Studies of laboratory procedures and selected problems. Total credit limited to 4 units, not more than 2 units per quarter. 1 or 2 laboratories. Prerequisite: Weld 142 or consent of instructor.

Weld 259 Advanced Welding (1)

Theory and application of various gas shielded arc welding processes to the welding of aluminum, carbon steel, and stainless steel. 1 laboratory. Prerequisite: Weld 141, 142.
**Zoology**

**Weld 324, 325, 326 Welding Technology (4) (4) (4)**


**Weld 336 Welding Power Sources (3)**

- Design, selection, and application of welding power sources. Physics of the welding arc as related to power sources. 2 lectures, 1 laboratory. Prerequisite: Phys 123, Math 120 ET 126.

**Weld 434, 435, 436 Advanced Welding Technology (3) (3) (3)**


**ZOOGOGY**

**Zoo 131 General Zoology (4)**

- Cells, tissues, and organ systems of vertebrates; emphasis on man and domestic animals. 2 lectures, 2 laboratories.

**Zoo 132 General Zoology (4)**

- Embryology, genetics, taxonomy, economic zoology, ecology and evolution. 2 lectures, 2 laboratories. Prerequisite: Zoo 131.

**Zoo 133 General Zoology (4)**

- The variety, structure and distribution of invertebrate animals. 2 lectures, 2 laboratories. Prerequisite: Zoo 132.

**Zoo 237, 238, 239 Human Anatomy and Physiology (3) (3) (3)**

- Morphology of man. Functions of the various organ systems of man with appropriate laboratory experiments. Zoo 237 not open for credit to students who have completed Zoo 326, Comparative Anatomy. 2 lectures, 1 laboratory. Prerequisite: Zoo 131, elementary chemistry.

**Zoo 303 Vertebrate Embryology (3)**

- The developmental processes from the egg to the formation of the body and the establishment of the principal organs and systems. 3 lectures. Prerequisite: Zoo 132.

**Zoo 321 Mammalogy (4)**

- Identification, biology and economic importance of mammals, with special reference to California species. 2 lectures, 2 laboratories. Prerequisite: Zoo 132 or Bio 129.

**Zoo 322 Biology of Fishes (4)**

- Identification, physiology, anatomy, and behavior of marine and freshwater fishes with special reference to local and economically important species. 2 lectures, 2 laboratories. Prerequisite: Zoo 132.

**Zoo 323 Ornithology (4)**

- Classification, anatomy and physiology, ecology and behavior, and economic importance of birds. Four Saturday field trips required. 2 lectures, 2 laboratories. Prerequisite: Zoo 132 or Bio 129.

**Zoo 326 Comparative Anatomy of the Vertebrates (5)**

- Comparative structure of vertebrate organ systems. 3 lectures, 2 laboratories. Prerequisite: Zoo 132. Recommended: Zoo 303 and Zoo 353.
Zoo 329  Vertebrate Field Zoology (4)
Identification and natural history of terrestrial vertebrates, with emphasis on field studies and local species. 2 lectures, 2 laboratories. Prerequisite: Zoo 132 or Bio 129.

Zoo 336  Invertebrate Zoology (4)
Study of invertebrate groups of animals with emphasis on taxonomy, morphology, distribution and economic importance. 2 lectures, 2 laboratories, and field work. Prerequisite: Zoo 133 or Bio 129.

Zoo 340  Human Muscle Anatomy (2)
Study of the muscles of a human cadaver. 1 lecture, 1 laboratory. Prerequisite: Zoo 237 (may be taken concurrently).

Zoo 341  Herpetology (4)
Living and extinct reptiles and amphibians; an adaptive approach to their diversity, biology, and classification. 2 lectures, 2 laboratories. Prerequisite: Zoo 132.

Zoo 353  Vertebrate Embryology Laboratory (2)
Study of the developmental anatomy of selected stages of the frog, chick and pig. Demonstrations and exercises in the preparation of embryonic materials for study purposes. 2 laboratories. Prerequisite: Zoo 303 (may be taken concurrently).

Zoo 412  Introduction to Clinical Pathology (3)
Malignant, deficiency, degenerative and other non-infectious diseases from the standpoint of etiology, manifestations and laboratory findings. 3 lectures. Prerequisite: Chem 328, Zoo 239 or Bio 431.

Zoo 422  Histology (4)
Functional microscopic anatomy of principal tissues and organs of vertebrates. 2 lectures, 2 laboratories. Prerequisite: Zoo 132.

Zoo 425  Parasitology (4)
External and internal parasites of man and animals; life history; parasite-host relationships; control and recognition of species of clinical importance. 2 lectures, 2 laboratories. Prerequisite: Zoo 132. Recommended: Zoo 133.

Zoo 426  Serology and Immunology (4)
Nature of innate and acquired immune reactions: theory and techniques of serological methods in diagnosing disease. Designed for preparing laboratory technologists. 2 lectures, 2 laboratories. Prerequisite: Consent of instructor.

Zoo 428  Hematology (4)
Microscopic and chemical examination of blood. Designed for preparing laboratory technologists. 2 lectures, 2 laboratories. Prerequisite: Consent of instructor. Recommended: Zoo 426.

Zoo 432  Physiology II: Comparative Systems (4)
Physiological mechanisms involved in osmotic and ionic regulations, digestion, circulation, respiratory energetics and thermal acclimation. Laboratory experiments in physiological processes and their ecological importance. 2 lectures, 2 laboratories. Prerequisite: Bio 431.

Zoo 437  Animal Behavior (4)
Behavioral adaptations of animals to their environment and way of life. Analysis of behavior patterns, use of patterns in clarifying evolutionary and ecological relationships. 3 lectures, 1 laboratory. Prerequisite: Zoo 132 (Bio 315 and Bio 325 recommended).

Zoo 524  Functional Vertebrate Morphology (3)
Discussion and critical evaluation of selections from the modern anatomical literature. Locomotor and feeding mechanisms. Dissections of skeleto-muscle mechanisms. 1 lecture, 2 laboratories. Prerequisite: Zoo 325 or consent of instructor. Recommended: Zoo 329.
Directories
EXECUTIVE

President ............................................................................. Robert E. Kennedy
Secretary to the President ............................................................ Grace Arvidson
Executive Assistant to the President ............................................. Larry R. Voss
Executive Vice President .......................................................... Dale W. Andrews
Associate Executive Vice President ............................................ Howard West
Vice President, Academic Affairs .............................................. Hazel J. Jones
Executive Dean ........................................................................ E. Douglas Gerard
Coordinator, Alumni Services ................................................... Steven G. Riddell
Coordinator, Research Development ......................................... Robert A. Lucas
Director, Public Affairs .......................................................... Lachlan P. MacDonald
Director, Personnel Relations ................................................... Donald L. Shelton

INSTRUCTION

Dean, School of Agriculture and Natural Resources ................ Howard C. Brown
Associate Dean ........................................................................ John W. West
Dean, School of Architecture and Environmental Design ........ George Hasslein
Associate Dean ........................................................................ J. Handel Evans
Dean, School of Business ......................................................... Roy E. Anderson, Acting Dean
Dean, School of Communicative Arts and Humanities ............. John M. Ericson
Associate Dean ........................................................................ Joseph B. Romney
Dean, School of Engineering and Technology ......................... Robert G. Valpey
Associate Dean ........................................................................ Laurence F. Talbott
Dean, School of Human Development and Education ............. Carl C. Cummins
Associate Dean ........................................................................ Richard M. Sanchez
Dean, School of Science and Mathematics .................. William C. Langworthy
Associate Dean ........................................................................ Philip S. Bailey
Associate Dean, Division of Social Sciences ............................ Warren W. DeLey
Associate Dean, Continuing Education .................................... Don M. Morris
Associate Dean, Curriculum and Instruction ............................ David W. Cook
Associate Dean, Educational Services ..................................... Donald M. Coats
Associate Dean, Graduate Studies .......................................... Malcolm W. Wilson
Associate Dean, Academic Planning ........................................ David M. Grant
Coordinator of Special Programs ............................................. Fred E. Wolf
Director, Audio Visual Services and Production ...................... John A. Heinz
Director, Computer Center ..................................................... Raymond E. Boche
Director, Institutional Research .............................................. Lowell H. Dunigan
Director, University Library .................................................... Norman D. Alexander
STUDENT AFFAIRS

Dean of Students.......................................................Everett M. Chandler
Assistant to the Dean of Students........................................Barney R. Timone
Associate Dean, Women ..................................................Lorraine H. Howard
Director, Activities ....................................................John D. Lawson
Director, Admissions, Records, and Evaluations ...............F. Jerald Holley
Admissions Officer ....................................................David H. Snyder
Registrar ........................................................................Gerald N. Punches
Director, Counseling and Testing .....................................George Mulder
Director, Financial Aid ..................................................Lawrence Wolf
Director, Housing ........................................................Robert M. Bostrom
Director, Judicial Affairs ...............................................David A. Ciano
Director, Placement ...................................................Richard M. Equinoa, Acting
Director, EOP ..................................................................William C. Wallace

BUSINESS AFFAIRS

Director, Business Affairs.................................................James R. Landreth
Administrative Assistant ................................................Rey Pena
Financial Manager ........................................................Harold R. Miller
Chief of Plant Operations ...............................................Robert R. Adams, Jr.
Director, Public Safety ...................................................
Housing Manager ............................................................Raymond Baker
Procurement and Support Services Officer .......................Donald M. Vert

FOUNDATION

Executive Director ........................................................Alfred Amaral
Administrative Assistant ................................................Robert E. Griffin
Controller ........................................................................James A. Neal

ASSOCIATED STUDENTS, INC.

Director, Business Affairs.............................................Roy Gersten

DEPARTMENT HEADS

SCHOOL OF AGRICULTURE AND NATURAL RESOURCES

Agricultural Education ...................................................Larry P. Rathbun
Agricultural Engineering ...............................................Jack D. Wilson
Agricultural Management ...............................................Edgar A. Hyer
Animal Science ................................................................Richard F. Johnson
Crop Science .....................................................................Corwin M. Johnson
Dairy and Poultry Science ...............................................Harmon Toone
Food Industries ...........................................................Thomas M. Lukes
Natural Resources Management .....................................Marvin J. Whalls
Ornamental Horticulture ................................................Marvin C. Carbonneau
Soil Science .................................................................C. Dean Piper
Veterinary Science ........................................................Wallace F. Glidden

SCHOOL OF ARCHITECTURE AND ENVIRONMENTAL DESIGN

Directors .................................................................William H. Brown, Paul R. Neel, William R. Phillips,
Kenneth E. Schwartz

SCHOOL OF BUSINESS

Accounting .................................................................Charles T. Andrews, Acting
Business Administration ..............................................Eugene L. O'Connor, Acting
Economics ........................................................................Fuad H. Tellew
Management ...............................................................Ernest C. Miller, Acting
SCHOOL OF COMMUNICATIVE ARTS AND HUMANITIES

Art ................................................................. Thomas V. Johnston
English .......................................................... Robert McDonnell
Foreign Languages ........................................ Verlan Stahl
Graphic Communications .............................. John B. Wordeman
History .......................................................... Robert E. Burton
Journalism ..................................................... Loren L. Nicholson, Acting
Music ............................................................. Bessie R. Swanson
Philosophy ...................................................... Russell A. Lascola, Acting
Speech Communication .................................... Harry Sharp, Acting

SCHOOL OF ENGINEERING AND TECHNOLOGY

Aeronautical Engineering ................................... John D. Nicholaides
Civil Engineering ............................................ Andrew D. Jones
Electronic and Electrical Engineering ................... Warren R. Anderson
Engineering Technology .................................... Willis Arnold Finchum
Environmental Engineering ................................ Walter E. Holtz
Industrial Engineering ..................................... Donald E. Morgan
Industrial Technology ...................................... Mac McRobbie
Mechanical Engineering ................................... John J. Kane
Metallurgical Engineering ................................. Richard C. Wiley

SCHOOL OF HUMAN DEVELOPMENT AND EDUCATION

Child Development ......................................... David L. Englund
Education ..................................................... Walter P. Schroeder
Ethnic Studies ............................................... David J. Sanchez
Home Economics .......................................... Harry J. Busselem, Jr.
Liberal Studies ............................................... John B. Connelly
Physical Education ......................................... Jimmy H. Railey
Psychology .................................................... L. Robert Sorenson

SCHOOL OF SCIENCE AND MATHEMATICS

Biological Sciences ........................................ John K. Hampton, Jr.
Chemistry ..................................................... Harold J. Watson, Acting
Computer Science and Statistics ........................ Daniel F. Stubbs
Mathematics .................................................. Charles J. Hanks
Military Science ............................................ Lt. Col. Robert W. McKee
Physics ........................................................... Robert H. Frost

DIVISION OF SOCIAL SCIENCES

Political Science .............................................. William M. Alexander
Social Sciences ............................................... Mahmud S. Hariri

LIBRARY

Director, University Library ................................ Norman D. Alexander
Head, Technical Services ................................... Charles R. Beymer
Head, Public Services ....................................... Angelina Martinez

FACULTY EMERITI
(Dates indicate period of service)

John K. Allen (1952-1970) ................................ Veterinary Science
Olive M. Andersen (1957-1972) ............................ Mathematics
John H. Applegarth (1952-1972) ......................... Biological Sciences
Lyman L. Bennion (1938-1967) ............................. Animal Husbandry
Joy Berghell (1956-1975) ...................................... Library
Ellard W. Betz (1947-1976) ................................... Engineering Technology
Ralph O. Bille (1948-1965) ........................................ Agricultural Engineering
Chester O. Bishop (1957-1973) ..................................... Metallurgical Engineering
Emmett A. Bloom (1946-1974) ....................................... Animal Science
Robert O. Boothe (1954-1972) ....................................... Foreign Languages
Woodford E. Bowls (1937-1973) ...................................... Physics
Gene E. Brendlin (1950-1971) ........................................ Farm Management
J. Philip Bromley (1947-1973) ....................................... Agricultural Management
H. H. Burlingham (1948-1972) ....................................... Agricultural Education
Arthur G. Butzbach (1950-1970) ..................................... Education
Logan S. Carter (1947-1970) .......................................... Soil Science
Marjorie Cass (1957-1974) ........................................... Education
Ralph C. Collins (1955-1974) ........................................ Education
Speiman B. Collins (1940-1968) ..................................... Animal Husbandry
A. Norman Cruikshanks (1947-1971) ......................... Social Sciences
James T. Culbertson (1953-1977) .................................. Philosophy
Evelyn K. deVoros (1955-1974) ..................................... Speech
Ralph W. Dilts (1944-1973) .......................................... History
Wesley T. Dunn (1959-1974) ......................................... Graphic Communications
Charles A. Elston (1947-1973) ....................................... Mathematics
Vincent J. Gates (1950-1971) ........................................ Printing Technology and Management
A. M. Fellows (1946-1966) ............................................. Printing Engineering and Management
Volmar A. Folsom (1946-1975) ..................................... Mathematics
George S. Fursmisky (1955-1973) .................................. Engineering Technology
Vincent J. Gates (1958-1977) ....................................... Journalism
J. Cordner Gibson (1949-1976) .................................... Dean of Agriculture and Natural Resources
Lester W. Gustafson (1947-1971) .................................. Aeronautical Engineering
Richard E. Hall (1946-1977) ....................................... Engineering Technology
Anatol Helman (1957-1974) ......................................... Architecture
Charles Herald (1958-1975) ........................................ Electronic and Electrical Engineering
Wilbur C. Hogan (1959-1973) ..................................... Philosophy
Gilbert Homfield (1960-1976) ..................................... Mathematics
A. L. Houk (1946-1972) ............................................. Chemistry
LeRoy B. Hughes (1950-1971) ..................................... Physical Education
James J. Jensen (1948-1973) ....................................... Physical Education
Edward J. Jorgensen (1947-1976) .................................. Physical Education
C. E. Knott (1921-1959) .............................................. Mechanical Engineering and Dean of Engineering
Alexander N. Landyshev (1956-1972) ......................... Electronic and Electrical Engineering
James A. Langford (1955-1976) .................................. Education
Richard Leach (1930-1971) ......................................... Poultry Industry
Raymond V. Leighty (1957-1975) .................................. Soil Science
Vance D. Lewis (1946-1972) ....................................... Physics and Associate Dean, Science and Mathematics
John H. Manning (1956-1975) ..................................... Mathematics
Ena L. Marston (1946-1970) ....................................... English
M. C. Martinsen (1915-1957) ...................................... Aeronautical Engineering
Theodore Matthew (1956-1974) .................................. Chemistry
C. O. McCorkle (1932-1960) ....................................... Agricultural Economics and Dean of the College
James M. McGrath (1946-1975) .................................. Engineering Technology
Glenn A. Noble (1947-1973) ....................................... Biological Sciences
Thomas F. Nolan (1949-1974) ..................................... Political Science
Howard R. O'Daniels (1938-1971) ................................. Business Administration
Philip H. Overmeyer (1958-1972) ................................ Business Administration
William M. Pederson (1961-1977) ................................ English
Clifford J. Price (1956-1974) ..................................... Aeronautical Engineering
Oscar E. Reece (1956-1973) ....................................... Crop Science

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Distinguished Teacher Award Recipients

In 1963 the University instituted a program of recognizing outstanding teaching efforts through the Distinguished Teacher Awards. Selections for this honor are based upon recommendations of the Academic Senate committee which follows the procedure of soliciting nominations from students and colleagues. Evaluations and subsequent recommendations of the nominees are based upon an in-depth review by the committee, including classroom visitations. Recipients of the Distinguished Teacher Awards and their departments since the inception of the program are listed below.

1963–64  
Robert E. Holmquist, Physics  
John L. Merriam, Agricultural Engineering

1964–65  
Joy O. Richardson, Mechanical Engineering  
Milo E. Whitson, Mathematics

1965–66  
A. Norman Cruikshanks, Social Sciences  
Richard F. Johnson, Animal Husbandry  
George R. Mach, Mathematics

1966–67  
Robert W. Adamson, Mechanical Engineering  
Kenneth G. Fuller, Mathematics  
William D. Curtis, Psychology

1967–68  
Rodney G. Keif, Environmental Engineering  
David M. Grant, English  
Wesley S. Ward, Architecture

1968–69  
Robert M. Johnson, Mechanical Engineering  
Bruce Kennelly, Chemistry  
Alice E. Roberts, Education

1969–70  
Donald W. Hensel, History  
David H. Montgomery, Biological Sciences  
Philip H. Overmeyer, Business Administration  
Willard M. Pederson, English  
Omer K. Whipple, Chemistry

1970–71  
Robert L. Cleath, Speech  
Kenneth E. Schwartz, Architecture  
Hewitt G. Wight, Chemistry
1971-72  Stuart E. Larsen, Aeronautical Engineering
        Barton C. Olsen, History
        Ronald L. Ritschard, Biological Sciences
        Joseph N. Weatherby, Social Sciences
1972-73  Lyle G. McNeal, Animal Science
        Charles W. Quinlan, Architecture
        James E. Simmons, English
1973-74  William J. Phaklides, Engineering Technology
        Louis D. Pippin, Education
        Duane O. Seaberg, Agricultural Management
1974-75  Peter Jankay, Biological Sciences
        Josephine S. Stearns, Child Development
        George J. Suchand, Social Sciences
1975-76  James Hayes, Journalism
        William V. Johnson, Music
        Erna Knapp, Art

STAFF EMERITI
(Dates indicate period of service)

Vic Allen (1951-1976) .................................................. Business Affairs
Fern Ballard (1954-1974) ............................................ Foundation
Edith Barnes (1960-1976) ........................................ Agriculture and Natural Resources
Jack Bertram (1952-1972) ........................................ Foundation
Cyrus E. Casady (1950-1974) ................... Business Affairs
George W. Cockriel (1957-1977) ............................... Business Affairs
Loretta Costen (1953-1976) ........................................ Business Affairs
Richard T. Crosby (1949-1971) ........................................ Business Affairs
Donald J. Curtis (1960-1976) ........................................... Student Affairs
Roy E. Darr (1953-1971) ........................................ Business Affairs
Lloyd G. Dietrich (1953-1973) ........................................ Business Affairs
Paul S. Dillon (1947-1971) ........................................ Foundation
Patricia A. Farrow (1957-1972) ........................................ Student Affairs
Juanita A. Fredericks (1954-1974) ........................................ Foundation
Lena Gianolini (1949-1972) ........................................ Business Affairs
Gertrude Gladin (1957-1972) ........................................... Student Affairs
Mary Lee Green (1948-1976) ........................................ Foundation
Joseph C. Hampl (1943-1971) ........................................ Foundation
Francine Hapgood (1951-1976) ....................................... Business Affairs
Raymond T. Hesse (1948-1972) ...................................... Business Affairs
Clara Huffman (1939-1974) ........................................ Foundation
Mary Johnson (1950-1976) ........................................ Business Affairs
Edwin Koch (1961-1976) ........................................ Foundation
John Lee (1960-1975) ........................................ Foundation
Lionel Middlecamp (1942-1976) ................... Agriculture and Natural Resources
Harold A. Nash (1947-1974) ........................................ Business Affairs
Donald S. Nelson (1943-1971) ........................................ Director, Business Affairs
Alfred J. Pelucca (1956-1971) ........................................ Business Affairs
Charles O. Penwell (1946-1971) ........................................ Foundation
Rubin Rutschke (1959-1977) ........................................ Business Affairs
Lucy Schmidt (1956-1972) ........................................ Business Affairs
Ralph Schurtz (1949-1973) ........................................ Business Affairs
Thornton G. Snider (1954-1973) ........................................ Foundation
Jean Steck (1960-1975) ........................................ Business Affairs
Merlin Ward (1946-1974) ........................................ Business Affairs
Boyd Wettlaufer (1960-1976) ........................................ Audio Visual
Alfred Wilcox (1960-1975) ........................................ Business Affairs
Frank H. Wyman (1956-1972) ........................................ Business Affairs
ABITIA, FRED (1969) ............................................................. Industrial Technology
Professor.
Experience: Technician, Engineering Department, San Jose State College; Teacher, Abraham Lincoln High School, San Jose; Instructor, San Jose State College; Assistant Professor, Chico State College; Assistant Professor, Washington State University; draftsman, U.S. Navy.

ADAMS, JOHN P., JR. (1970) ............................................................. Economics
Experience: Military assistance plans officer, JUSMAG—Thailand; advisor to Directorate of Operations, Royal Thai Army; instructor, California State Polytechnic College, Kellogg-Voorhis; staff associate/director, Claremont Manpower Institute, Claremont Graduate School; Lt. Colonel, U.S. Army.

Experience: Assistant director, campus center, Susquehanna University; activities program advisor, Kansas State University; food service, Southern Illinois University.

ADAMSON, ROBERT W. (1953) ............................................................. Mechanical Engineering
B.S., Ch.E., Tulane University, 1941; M.S., Ch.E., Oregon State College, 1948. Professor.
Experience: Petroleum refinery engineer, Standard Oil Company of New Jersey; instructor, mechanical engineering, Oregon State College; research assistant, industrial sales engineer, Union Oil Company of California. Registered professional engineer, California.

AIKEN, JAMES L. (1970) ............................................................. Counselor
B.A., University of Florida, 1964; M.Ed., 1965; Ph.D., Missouri University, 1970.
Experience: Counselor, St. Johns River Jr. College, Florida; psychologist, Counseling and Testing Service, assistant professor, Speech Communication, University of Texas; assistant professor of psychiatry, New Jersey College of Medicine and Dentistry; coordinator of counseling, University of California, Santa Cruz.

AIRTH, GERALD LEE (1976) ............................................................. Industrial Engineering
B.S., Utah State University, 1967; M.S. Stanford University, 1971; additional graduate study Stanford University. Associate Professor.
Experience: Quality control analyst, Chrysler Corporation; associate engineer, research engineer, group leader, program plans coordinator, Lockheed Missles & Space Company, Sunnyvale.

ALBERTI, ROBERT E. (1969) ............................................................. Counselor
B.S., California State Polytechnic College, San Luis Obispo, 1959; M.A., California State College, Los Angeles, 1962; Ph.D., Michigan State University, 1969. Professor.
Experience: Associate Dean of Students and assistant to the vice president, California State Polytechnic College, Pomona; senior graduate assistant, Michigan State University; program director, Memorial Union, Arizona State University; coordinator of student activities, California State College, Los Angeles; research technician, University of California, Los Angeles.

ALEXANDER, NORMAN D. (1976) .................................................... Director, University Library
Experience: Head of library reference, Montana State University; assistant to the library director, University of Minnesota; head of public services, Portland State University; library director, Southern Oregon State College; chairman of Interinstitutional Library Council for OSSHE.
ALEXANDER, WILLIAM M. (1958) ........................... Head, Political Science Department
B.S., Oregon State University, 1949; M.S., 1951; M.A., Pennsylvania State University, 1953; Ph.D., University of Oregon, 1962; additional graduate study, University of Stockholm, George Washington University, University of Georgia. Professor.
Experience: Management assistant, U.S. Geological Survey; teaching fellow, University of Oregon; instructor, Oregon State University; Fulbright professor of political science, India.

AL-HADAD, SABAH (1965) .............................................................. ................... Mathematics
Experience: Director, Ministry of Agricultural Development, Baghdad, Iraq.

ALLEN, RAY R. (1955) .............. Engineering Technology and Environmental Engineering
B.A., Santa Barbara State College, 1942; M.A., California State Polytechnic College, 1965; additional graduate study, University of Southern California. Professor.

ALMANZIO, JOSEPH C. (1971) ............................. Architecture and Environmental Design
Experience: Lecturer, University of Strathclyde, Glasgow, Scotland; visiting foreign lecturer, Regional College of Art, Hull, England; teaching assistant, Washington University; designer, Greenleaf and Telesca, Architects and Engineers; designer-draftsman, Watson, Deutschman and Kruse, Architects and Engineers; draftsman, campus architect, University of Florida.

AMARAL, ALFRED W. (1967) ...................... Executive Director, Foundation
Experience: Assistant manager, G. L. Soares Labor Contractor; assistant sales manager, Martin Produce, Inc.; agricultural representative, Wells Fargo Bank; Instructor, Agricultural Management, Cal Poly, SLO.

AMATO, ANTHONY J. (1955) .......... Acting Head, Ornamental Horticulture Department
B.S., California State Polytechnic College, 1949; graduate study, California Polytechnic State University. Professor.
Experience: Instructor, Mt. San Antonio Junior College, Pomona; Oakland Junior College; landscape architect and contractor, Walnut Creek, California; officer, U.S. Air Force.

AMEDEE, GASTON (1976) .................................................... Soil Science
B.S., University of Haiti, 1963; M.S., The University of Connecticut, 1971; Ph.D., Cornell University, 1974. Assistant Professor.
Experience: Postdoctoral research associate, Cornell University; graduate research and teaching assistant, The University of Connecticut and Cornell University; chemical technician, Felton International, New York.

ANDERSON, ELIZABETH B. (1958) .............................................................. English
B.S., Ohio University, 1938; M.A., California State Polytechnic College, 1959; additional graduate study, University of California, Santa Barbara. Associate Professor.

ANDERSON, RICHARD A. (1947) .............................................................. Physical Education
B.S., University of Southern California, 1942; M.S., 1947; additional graduate study, University of California at Los Angeles. Professor.
Experience: Playground director, Los Angeles Playground and Recreation Department; officer, U.S. Navy; swimming pool director, South Pasadena; assistant instructor in physical education and assistant swimming coach, University of Southern California.
ANDERSON, ROY E. (1949) .......................................... Acting Dean, School of Business
Experience: Officer, U.S. Army; instructor, Monterey Peninsula College, Monterey, California; National Park ranger; dean, arts and sciences division, department head, Business Administration Department, California Polytechnic State University, San Luis Obispo.

ANDERSON, RUSSELL K. (1955) ............................................................... Animal Science
B.S., University of Minnesota, 1948; M.S., Iowa State College, 1950; Ph.D., 1956. Professor.
Experience: U.S. Air Force; instructor, Animal Husbandry Department, Iowa State University.

ANDERSON, WARREN R. (1946) Head, Electronic and Electrical Engineering Department
B.S., University of Minnesota, 1939; B.S., Louisiana State University, 1944; graduate study, Central Signal Corps School, Camp Crowder, Missouri. Professor.

ANDOLI, FREDERICK P. (1968) ........................................................... Biological Sciences
B.A., Upsala College, 1963; M.S., Utah State University, 1968; D.A., Idaho State University, 1974. Associate Professor.
Experience: Teaching assistant, Upsala College, Utah State University; research supervisor, Army Chemical Corps.

ANDRE, BARBARA R ................................................ Associate Director of Housing
B.A., Humboldt State University, 1969; M.A., California Polytechnic State University, 1971. Professor.
Experience: Student affairs intern, California Polytechnic State University; rehabilitation counselor, New Horizons Workshop, Northridge, California.

ANDREINI, ROBERT L. (1954) ..................................................... Speech Communication
B.A., Stanford University, 1941; M.A., 1949; additional graduate study, University of California, Berkeley, Teachers College, Columbia University. Professor.
Experience: U.S. Air Force; Royal University of Pisa, Italy; teacher, California high schools.

ANDREOLI, ALFRED E. (1963) ............................................... Aeronautical Engineering
B.S., University of Colorado, 1954; M.S., California Institute of Technology, 1956; additional graduate study, University of Colorado. Professor.
Experience: Test engineer, aerodynamicist, Northrop Aircraft; assistant professor, Los Angeles State College; teaching associate, University of Colorado.

ANDRESEN, JAMES G. (1956) ..................................................... Mechanical Engineering
B.S., California State Polytechnic College, 1956. Assistant Professor.
Experience: U.S. Army.

ANDREWS, CHARLES T. (1972) ......................................... Acting Head, Accounting Department
Experience: Associate dean, Creighton University; assistant professor, University of Missouri, Columbia; faculty lecturer, Indiana University; instructor, Elmhurst College; accountant, Marathon Oil Co.; C.P.A., Indiana.

ANDREWS, DALE W. (1930) ......................................................... Executive Vice President
B.S., University of California, Davis, 1941; M.A., California State Polytechnic College, 1952; Ph.D., University of Minnesota, 1957.
Experience: Director of agriculture and supervising teacher, Merced Union High School; director of agriculture and supervising teacher, Arroyo Grande Union High School; officer, U.S. Marine Corps; agricultural teacher trainer, instructional materials coordinator, and special educational services coordinator, Dean of the College, Vice President, Academic Vice President, California State Polytechnic College; Danforth associate.

ANDREWS, LESLIE B. (1976) ......................................................... Placement Supervisor
B.A., California State University, Fullerton, 1972.
Experience: Executive trainee/manager, Bullock's Co., California; senatorial legal and political assistant, Nevada; administrative secretary, Food Products Division, Knudsen Corporation.
APFELBERG, HERSCHEL L. (1971) ............................................... Graphic Communications
Experience: Printing superintendent, Equitable Bag Company; process engineer and rotogravure administrator, American Can Company; compositor and linotype operator, Gannett Company, Inc.

ARMENTROUT, WILLIAM W. (1953) ........................................... Coordinator, Credential Advisement and Teacher Candidate Selection
Experience: Guidance counselor, Menlo School and College; associate registrar, Stanford University; test officer, assistant to Dean of Arts and Sciences, coordinator secondary education, California Polytechnic State University, San Luis Obispo; U.S. Air Force.

ARMSTRONG, GENE A. (1970) ........................................................ Animal Science
B.S., California Polytechnic State University, San Luis Obispo, California, 1972. Associate Professor.
Experience: Self-employed horseshoer and horse trainer.

ARNOLDT, GRACE A. (1976) .................................................. Graduate Nurse
A.A.; R.N., Pasadena City College, 1964; B.S., California State University, Los Angeles, 1970; M.S., 1972.
Experience: Supervisor, Elwood Convalescent Hospital, Pasadena; staff nurse, Santa Teresa Hospital, Duarte; City of Hope Medical Center, Duarte; instructor, Chaffey College; instructor, Cuesta College.

ASBURY, ROBERT F., JR. (1964) ........................................................ Architecture and Environmental Design
Experience: Assistant professor, University of Kansas; designer-draftsman, various architectural firms; U.S. Air Force. Registered Architect, Kansas.

ATLEE, CHARLES B., JR. (1969) ................................................... Crop Science
B.S., Pennsylvania State University, 1950; M.S., University of California, Davis, 1962. Associate Professor.
Experience: Farm adviser, University of California Agricultural Extension Service, Santa Cruz and Monterey Counties; horticulture adviser, U.S. Agency for International Development, Guatemala, Central America.


B.S., Cairo University, Cairo, Egypt, 1958; M.S., University of California, Berkeley, 1964; Ph.D., University of California, Santa Barbara, 1974. Associate Professor.
Experience: Engineer, Shell Oil Company; software system analyst, Autonetics; senior programmer, Astrodatal Inc.; senior software system analyst, TRW Systems Group; evening instructor, Los Angeles Trade Technical College.

ATWOOD, LINDA (1974) .............................................................. Chemistry
Experience: Teacher, Hudson Junior High School; teaching assistant, Wesleyan University.
AVEY, RENNY J. (1973)  ................................ ...................... Agricultural Management  
B.S., California Polytechnic State University, 1969; M.S., Oregon State University, 1972; Ph.D., University of Hawaii, 1974. Associate Professor.  
Experience: Cattle ranching, agricultural statistician, California Crop and Livestock Reporting Service, Sacramento; graduate research assistant, Departments of Agricultural Economics at Oregon State University and University of Hawaii.

BABB, JAMES H. (1959)  ........................................  Graphic Communications  
Experience: fifteen years experience in printing, 6 1/2 of which was as owner of Visalia Printing Service; special training and lab experience with U.S. Navy Aerial Torpedo Testing Station, Whidby Island, Washington. Assistant Professor.

BABCOCK, RICHARD D. (1973)  .................................... .... ................. Management  
B.S., Indiana University, 1958; M.S., Arizona State University, 1963; Ph.D., University of California, Los Angeles, 1970. Associate Professor.  
Experience: Assistant professor, California Polytechnic State University, California State College at Fullerton, University of Illinois, DePaul University.

BABOS, PARASCHOS (1972)  ........................................ ........... Biological Sciences  
Experience: Assistant professor, Edinburgh University, Scotland; head of virus laboratory, Benaki Institute, Athens, Greece; research associate, research assistant professor, assistant professor, Washington University, St. Louis, Missouri.

BABOW, IRVING P. (1971)  .............................................. Social Sciences  
A.B., University of California, Berkeley, 1936; Ph.D., 1954. Professor.  
Experience: Research director, San Francisco Civil Rights Inventory; research director, San Francisco Community Health and Rehabilitation Study; study director, Alameda County Mental Health Study; study director, California Cancer Patient Study; research sociologist, U.S. Public Health Service; instructor, Golden Gate College; lecturer and acting assistant professor, School of Social Welfare, University of California, Berkeley; research social scientist, California Department of Mental Hygiene.

BACHMAN, ALFRED M. (1970)  .................................................... Mathematics  
Experience: Associate professor, California State College, Fullerton; visiting professor, Temple University; assistant professor, Lane Community College; assistant professor, Portland State University; elementary and high school teaching.

BAGNALL, JAMES R. (1969)  .................................. Architecture and Environmental Design  
B.A., Occidental College, 1957; M. Arch., University of California, Berkeley, 1974. Associate Professor.  
Experience: Designer, Robertson Montgomery, San Francisco and James Robertson, Sausalito; exhibit design consultant, The Oakland Museum; private practice, Berkeley; design consultant, Amazing Life Games Co., Sausalito.

BAILEY, PHILIP S. (1969)  Associate Dean, School of Science and Mathematics  
B.S., University of Texas, 1964; Ph.D., Purdue University, 1969. Associate Professor.  
Experience: Research assistant, University of Texas; instructor and research assistant, Purdue University.

BAILEY, ROGER S. (1962)  ...................................................... Art  
Experience: Supervising teacher, State University of Iowa; art instructor, Coronado High School and La Mesa Junior High School; art supervisor, Escondido Union School District; instructor in art education, University of California Extension; Palomar Junior College and Pacific Lutheran University, Washington.

BAKER, EDWARD H. (1968)  ................................. Mechanical Engineering  
B.S., Northwestern University, 1958; M.S., University of California, 1963; Ph.D., Northwestern University, 1965. Professor.  
Experience: Senior technical specialist, North American Rockwell Corporation.
BALL, R. WAYNE (1969) ................................................................. Medical Officer
M.D., University of Missouri School of Medicine, 1961.
Experience: Internship, Mercy Hospital, Des Moines, Iowa; residency, Santa Barbara General Hospital, Santa Barbara, California; private practice, Santa Maria, California.

BALTHASER, LAWRENCE H. (1969) ............................................ Physics
Experience: Map draftsman, Sun Oil Company; field assistant, New Jersey Agricultural Experiment Station; teaching assistant, Indiana University; assistant professor, Southampton College.

BANKS, BERNARD W. (1969) ...................................................... Mathematics
Experience: Pilot officer, Royal Air Force; engineering aid, Aeroflex Corp.; tutor, National Science Foundation; mathematician, Naval Undersea Warfare Center; teaching assistant and lecturer, San Diego State College.

BARNES, TIMOTHY M. (1969) ...................................................... History
B.A., University of New Mexico, 1965; M.A., 1966; Ph.D., 1970. Associate Professor.
Experience: Instructor, University of Albuquerque; graduate assistant, University of New Mexico.

BARR, STANLEY L. (1959) ............................................................. English
B.A., St. Bernardine of Siena College, 1953; M.A., University of Michigan, 1955; additional graduate study, University of Wisconsin, Harvard University, University of Oregon. Associate Professor.
Experience: Teacher, Michigan Public Schools; assistant professor, Lakeland College; instructor, Wisconsin State College.

BARROWS, ROBERT S. (1970) ...................................................... Counselor
Experience: Counselor, Urban Center, State University of New York; visiting professor, State University College, Oneonta, New York; teaching assistant, State University of New York at Albany; counselor, secondary schools, Wappingers Falls, New York; teacher of agriculture, Poland, New York; U. S. Navy.

BATTPERSON, RONALD E. (1971) ............................................ Architecture and Environmental Design
Experience: Teaching assistant, University of Washington; designer for Reed Morgan, AIA, Seattle, Larry Blackman, AIA, Indiana, Sanborn, Steketee, Otis & Evans, AIA, Toledo, Ohio, Ole Helweg, MAA, Denmark, Carl Strauss, AIA, Cincinnati, Ohio; planner and coordinator, Inter-American Center, Miami, Florida; registered architect, Ohio.

BAUMGARTEN, GEORGE M. (1969) ......................................... Architecture and Environmental Design
B. Arch., University of Michigan, 1947; M. Arch., University of California, Berkeley, 1976. Associate Professor.
Experience: Lecturer, Old Dominion University; private practice; project architect, John Graham & Co.; project coordinator, Victor Gruen Association; zoning analyst, Harrison, Ballard and Allen; designer, Skidmore, Owings and Merrill; registered architect, New York, Michigan.

BAUR, LAWRENCE E., JR. (1965) ............................................. Accounting
Experience: Staff accountant, Wagar, Lunt and Oehring, Michigan; accountant, U.S. General Accounting Office, Los Angeles; staff accountant, Touche, Ross, Bailey and Smart, Los Angeles; staff accountant and partner, Charles Belcher and Company, San Luis Obispo; U.S. Army; C.P.A.

BAYNE, JAY S. (1973) ................................................................. Computer Science and Statistics
B.A., University of California, Santa Barbara, 1969; M.S., 1971; Ph.D., 1977. Associate Professor.
Experience: Design engineer, Magnetica, Inc., Santa Monica, California; senior engineer aid, senior engineer, research assistant, researcher, University of California, Santa Barbara.
BEARDSLEY, GEORGE L., JR. (1975) ............................................................ Economics
B.A., University of California, Berkeley, 1971; M.A., University of Pennsylvania, 1973;
Ph.D., 1974. Assistant Professor.
Experience: Teaching assistant, University of Pennsylvania; project administrator's aide,
Westinghouse Electric Corporation, Baltimore; cost analyst, Kaiser Aluminum and Chemical
Corporation, Maryland and California.

BEATIE, GEORGE C. (1959) .............................................................................. Music
A.B., University of California, Santa Barbara, 1949; M.A., California Polytechnic State
University, 1956; additional graduate study, University of California, Santa Barbara; North-
western University. Professor.
Experience: Music teacher, elementary and secondary schools, band director; class program
scheduler, associate dean, Special Programs, California Polytechnic State University.

BEAUVIAIS, H. PAUL (1970) ........................................... Senior Clinical Laboratory Technologist
Hospital Corps School, Medical Dept., U.S. Navy, 1942; Glendale College, 1949–51.
Experience: Chief laboratory technologist, Northridge Hospital, Northridge, California;
Facey Medical Group, Granada Hills, California.

BEDWELL, JACK E. (1974) .......................................................... Natural Resources Management
B.S., California State College, Long Beach, 1969; M.S., California State University, Long
Beach, 1973. Assistant Professor.
Experience: Police officer, Santa Barbara, Burbank; deputy sheriff, Santa Barbara County;
fish and game warden, State of California; deputy, United States Game Warden; instructor,
College of the Desert, Palm Desert; instructor in law enforcement, Palm Springs and Coachella
Valley High Schools; technical consultant to network TV and radio; U.S. Army.

BEECHER, LLOYD N. (1969) ................................................ History
B.A., California State College, Fullerton, 1965; M.A., 1966; Ph.D., University of Georgia,
1970. Associate Professor.
Experience: graduate assistant, California State College, Fullerton; teaching assistant, Uni-
versity of Georgia.

BEGG, IAN C. (1970) ........................................................... Engineering Technology
B.S.M.E., Witwatersrand University, Johannesburg, South Africa, 1941; B.S.E.E., 1946; M.S.,
University of California, Berkeley, 1970. Associate Professor.
Experience: Senior project engineer, The Rucker Co., Oakland; plant and tool engineer,
Gilro Machine & Stamping Co., Oakland; tool designer, Kearney & Trecker Corp., Milwaukee,
Wisconsin; production engineer, First Electric Corp., Knights, Transvaal South Africa; test
engineer, Electricity Supply Commission, Rosherville, Johannesburg; college apprentice, Met-
ropolitan-Vickers Electrical Co., Trafford Park, Manchester, England; chief petty officer,
South African and Royal Navies; Corporal, South African Engineering Corps. Registered
professional engineer, California and South Africa.

BEHMANN, SARA A. (1971) ........................................................ Management
A.B., University of Pennsylvania, 1943; M.G.A., 1944; Ph.D., University of California, Berke-
ley, 1966. Professor.
Experience: Labor market analyst, California Department of Employment; research techni-
cian, California Senate Interim Committee on State and Local Taxation; historical assistant,
Chicago Quartermaster Depot; research assistant, Department of Internal Affairs, Common-
wealth of Pennsylvania; director of research, Center for Labor Research and Education at the
Institute of Industrial Relations, University of California, Berkeley; lecturer, assistant profes-
sor, San Jose State College; associate dean, School of Business and Social Sciences, Cal Poly,
SLO; deputy director, and Chief, Labor Statistics and Research, State Department of Industrial
Relations.

BENNETT, DARRELL F. (1971) .......................................................... Pharmacist
B.S., University of Arizona, 1965.
Experience: Registered pharmacist in retail pharmacies; Registered pharmacist, San Luis
Obispo County Hospital.
BERMANN, JAMES (1964) ......................................... Agricultural Engineering
B.S., California State Polytechnic College, 1959, 1961; M.S., Michigan State University, 1971. Professor.
Experience: Chief engineer, Grether Agricultural Co.; Farming; U.S. Army.

BERTOZZI, DAN, JR. (1974) ......................................... Business Administration

BETHEL, ARTHUR C. W. (1968) ......................................................... Philosophy
B.A., University of California, Santa Barbara, 1964; M.A., 1968; Ph.D., 1974. Associate Professor.
Experience: Associate instructor, University of California, Santa Barbara.

BEUG, JAMES L. (1973) ......................................................... Computer Science and Statistics
B.A., Northwestern University, 1962; M.S., Ohio State University, 1971; Ph.D., 1974. Associate Professor.
Experience: Research assistant, University of Chicago; research, teaching assistant, University of Illinois; senior systems analyst, Abbott Laboratories, North Chicago, Ill.; teaching assistant, research associate, Ohio State University.

BEYMER, CHARLES R. (1966) ......................................................... Library
B.S., University of Wisconsin, 1950; M.L.S., 1955; additional graduate study, University of Wisconsin, University of California, Berkeley. Librarian.
Experience: Cataloger, Marquette University, Cornell University, Finger Lakes Library System, Ithaca, New York; science reference librarian, University of Norte Dame.

BIRKETT, RICHARD J. (1955) ......................................................... Animal Science
B.S., California State Polytechnic College, 1953; M.S., Kansas State University, 1963. Professor.
Experience: Feed and milling supervision, Union Stock Farms, Blythe, California; research assistant, Kansas State University.

BLODGET, ROBERT L. (1974) ......................................................... Child Development
B.A., Willamette University, 1965; Ed.D., University of Massachusetts, 1973. Assistant Professor.
Experience: Junior high school teacher and counselor; chairman, junior high school social studies; choral director; research associate, Center for the Study of Human Potential, University of Massachusetts.

BOCHE, RAYMOND E. (1969) ......................................................... Director, Computer Center
B.S., California State Polytechnic College, SLO, 1958; M.S., San Jose State College, 1966; Ph.D., Texas Tech University, 1971. Professor.

BONDS, ROBERT V. (1972) ......................................................... Coordinator, Disabled Students
B.A., San Jose State University, 1965; M.S., University of California, Los Angeles, 1972.
Experience: Teacher-counselor, Rancho Linda School, San Jose; teacher-adviser-coach, North High School, Riverside; consultant for ethnic involvement in education, Santa Clara County, Riverside County, San Bernardino County, Los Angeles County; assistant aquatic director, University of California, Los Angeles; assistant dean of students, University of California, Los Angeles.

BONGIO, ENRICO P. (1948) ......................................................... Engineering Technology
Experience: Welder, Chicago Bridge and Iron Co. and Eureka Boiler Works and Steel Products, Eureka, California; U.S. Army Signal Corps; instructor, Sonoma Valley Union High School, Sonoma, California; metals inspector and welding instructor, Hunters Point Naval Shipyard; nondestructive testing technician, Ferro-Spec Laboratory, Los Angeles; instructor, welding operator qualification tests, Bethlehem Steel Co., Pinole, California.
Faculty and Staff

BOONE, JOSEPH C. (1968) ......................................................... Physics
Experience: Teaching and research assistant, University of Wisconsin.

BOOTH, JAMES S. (1972) ......................................................... Biological Sciences
B.S., Los Angeles State College, 1959; M.S., University of Southern California, 1962; Ph.D., 1968. Associate Professor.
Experience: Research assistant, instructor, University of Southern California; instructor, California State College, Los Angeles; assistant professor, University of New Mexico.

BOSTROM, ROBERT M. (1956) ............................................ Director, Housing
B.S., California State Polytechnic College, 1956; M.A., 1970.
Experience: Graduate manager, California State Polytechnic College.

BOWEN, JAMES J. (1972) ......................................................... Education
Experience: Elementary school teacher, Imlay City, Michigan and Lompoc, California; assistant professor, California State University, Los Angeles.

BOWKER, LESLIE S. (1974) ..................................................... Biological Sciences
B.S., University of Massachusetts, 1963; M.S., Rutgers University, 1965; Ph.D., Washington State University, 1974. Assistant Professor.
Experience: Teaching assistant, Rutgers University; instructor, Christopher Newport Junior College; research technician, University of Delaware Marine Station; teaching assistant, Washington State University.

BOYCE, WILLIAM M. (1966) ...................................................... Management
B.S., University of Connecticut, 1938; graduate work at George Washington University, California State Polytechnic College; graduate Command and General Staff College, 1943; Special Weapons Officer Course, 1955. Assistant Professor.
Experience: Infantry platoon leader, battalion commander and deputy battle group commander; instructor and committee chairman, U.S. Army Infantry School, Ft. Benning, Georgia; inspector general; member of Department of the Army general staff and the joint staff of the Joint Chiefs of Staff, Washington, D.C.; head, Military Science Department, Director of Developmental Affairs, California State Polytechnic College; past national senior vice president, Campus Division, Society for Advancement of Management.

BOYD, JOHN W. (1975) ......................................................... Ornamental Horticulture

BRADY, MARY L. (1968) ......................................................... Library

BRAUNINGER, ANDREA, M.D. (1974) ........................................... Physician
A.B., California State University, San Jose, 1966; M.D., University of Southern California, 1971; Medical Internship, University of Florida, 1972.
Experience: Student health physician, University of Florida.

BREAZEALE, CONNIE R. (1966) ..................................................... Home Economics
B.A., California State Polytechnic College, 1960; M.S., 1966. Associate Professor.
Experience: Chairman, Home Economics Department, Santa Maria High School; home economics coordinator, Peace Corps; Suji Culinary School, Osaka School for Professional Chefs, Osaka, Japan; Marcella Hazan, School of Classical Italian Cuisine, Bologna, Italy.

BRENNAN, ANDREW (1968) ..................................................... Coach, Physical Education
B.S., University of Southern California, 1958; M.S., 1960.
Experience: Graduate assistant, University of Southern California; teacher/coach, Mira Loma High School, Glendale High School, Downey High School, Rio Hondo Junior College.
BRENNER, PATRICIA A. (1970) ................................................................. English
  B.S., Bob Jones University, 1957; M.A., Middlebury College, 1963; Ph.D., Kent State University, 1970. Associate Professor.
  Experience: Teacher, Binghampton, N.Y., Winchester, Massachusetts, Beachwood, Ohio, Kent State University, Ohio.

BRODIE, DAVID A. (1970) .................................................. Architecture and Environmental Design
  Experience: Assistant planner, City of Oakland; professor, and teaching assistant, University of California, Berkeley; architect for various firms in England and Rhodesia.

BROOMALL, HOLLY (1975) .................................................................. Graduate Nurse
  R.N., Los Angeles Valley College; University of California, Santa Barbara, 1971; additional study, San Diego State University, University of California, Santa Barbara.
  Experience: Hemodialysis Center, Santa Barbara; University of California, Los Angeles Hemodialysis Unit; Pediatrics, San Luis Medical Clinic, San Luis Obispo.

BROWN, HOWARD C. (1946) ....................... Dean, School of Agriculture and Natural Resources
  B.S., California State Polytechnic College, 1943; M.S., Ohio State University, 1954; Ph.D., 1963.
  Experience: U.S. Army Air Force; head, Ornamental Horticulture Department, California Polytechnic State University.

  Experience: Reference Librarian, University of Montana.

BROWN, ROBERT J. (1969) .......................................................... Biological Sciences
  B.S., California State College, Los Angeles, 1964; M.S., Arizona State University, 1967; Ph.D., University of Toronto, Ontario, Canada, 1972. Associate Professor.
  Experience: Teaching assistant, California State College, Los Angeles; research assistant, Arizona State University; teaching assistant, University of Toronto.

BROWN, WILLIAM H. (1957) Director, School of Architecture and Environmental Design
  B. Arch., University of Florida, 1954; M. Arch., 1968; additional graduate study, University of Sydney. Professor.

BRUCKART, WILLIAM L. (1969) ........................................ Industrial Technology
  B.S., University of Kentucky, 1942; M.S., Ohio State University, 1953; additional graduate study, Bowdoin College and Massachusetts Institute of Technology. Associate Professor.
  Experience: Officer, U.S. Navy; engineer, Southern Liquid Gas Co., Dothan, Alabama; assistant chief; non-ferrous physical metallurgy group, Battelle Memorial Institute, Columbus, Ohio; sales manager, Cyclops Corporation, Bridgeville, Pennsylvania; consultant, Pittsburgh, Pennsylvania; manager, metallics and refractories, Aerojet-General Corporation; consultant, Torrance, California; chief engineer, Fansteel, Inc., Advanced Structures Division.

BRUNK, ATHOL J. D. (1957) ......................................................... Physics
  B.S., Northwestern State Teachers College, 1937; M.A., West Texas State Teachers College, 1941. Associate Professor.
  Experience: Instructor in mathematics and science, high school, Beaver, Oklahoma; elementary principal, Alamogordo, New Mexico; officer, U.S. Navy; mathematics instructor, Atascadero, California.

BUCCOLA, VICTOR A. (1962) ........................................ Director of Athletics
  Experience: Officer, U.S. Army; physical education instructor and athletic coach, The College of Idaho; science and math instructor and athletic coach, Mark Keppel High School.
Faculty and Staff


BUCY, L. LaVERNE (1955) ........................................ Animal Science B.S., University of Kentucky, 1943; M.S. 1950; Ph.D., University of Illinois, 1954. Professor. Experience: Graduate assistant in animal science, University of Illinois; teacher of vocational agriculture, Kentucky high schools; farming; educational adviser, Cal Poly-A.I.D., Swaziland Project; U.S. Navy.


BURNS, CHARLOTTE B. (1974) ........................................ Ornamental Horticulture B.A., University of California, Los Angeles, 1951; graduate studies, University of Hawaii; University of California, Berkeley; University of California, Irvine. Assistant Professor. Experience: Manager, Hollister's Nursery and Florist, Newport Beach, California; associate ombudsman, University of California, Irvine; theater manager, University of Hawaii.


BURROUGHS, SARAH E. (1967) ...................................... Home Economics B.S. and Certificate in Medical Technology, University of Michigan, 1956; Ph.D., University of California, 1967. Professor. Experience: Senior technician, University Hospital, Ann Arbor; biochemist, Akron General Hospital, Ohio; supervising chemist, Parma Community Hospital, Ohio; biochemist, Stanford Research Institute; research/teaching assistant, University of California, Berkeley.

BURT, WALLACE H. (1968) ........................................... Accounting B.S., University of California, 1949; M.B.A., University of Denver, 1962; M.P.A., University of Southern California, 1975. Associate Professor. Experience: Teacher, Shasta Union High School; assistant county superintendent of schools, Shasta County; certified public accountant, staff, Muney and Company; C.P.A.'s instructor, Coalinga College; consultant, State of California; C.P.A.


BUSCHMAN, WILLIAM O. (1956) ......................... Computer Science & Statistics A.B., Reed College, 1941; M.Ed., University of Oregon, 1947; Ed.D., Oregon State University, 1953. Professor. Experience: Marine engineering and naval architecture, Kaiser Co., and others; teaching, Portland Public Schools, Gresham Union High School; instructor, Multnomah College, Oregon State University; assistant professor, Oregon State System of Higher Education, General Extension Division; assistant professor, Portland State College; research, University of Oregon Medical School, Stanford Research Institute, and Institute for Motivational Research.

BUSSELEN, HARRY J., JR. (1975) ......................... Head, Home Economics Department B.S., California State College of Sacramento, 1959; M.S., 1962; Ph.D., Florida State University, 1970; additional graduate study, University of Oregon. Professor. Experience: Administrative aide, United States Air Force; instructor, Lodi Union High School; instructor, San Joaquin Delta College; assistant professor, Southern Oregon College; professor, Central Michigan University.
BUTLER, ROBERT O. (1964) ............................................. Computer Science and Statistics
A.B., Fresno State College, 1951; M.A., California State Polytechnic College, 1967; additional
graduate study, University of California, Los Angeles State College. Assistant Professor.
Experience: Teacher, Reedley, Dinuba, Orosi, Paso Robles; vice principal and principal, Paso Robles Union.

CAIRNS, EDWARD A. (1969) .............................................................................. English
B.A., Stanford University, 1956; M.A., San Francisco State College, 1963; Ph.D., University of
Denver, 1971. Associate Professor.
Experience: Instructor, University of Denver; assistant professor, Yankton College; instructor
and supervisor of instructors, Cryptographic School, USAF.

CALL, TRACEY G. (1962) ............................................................................. Biological Sciences
B.S., Idaho State College, 1940; M.S., University of Maryland, 1944; A.B., Brigham Young
University, 1947; Ph.D., University of Minnesota, 1956. Professor.
Experience: Teaching assistant, Idaho State College, University of Washington, University of
Maryland; drug store manager, Afton, Wyoming; assistant professor, Duquesne University,
University of Wyoming; associate professor, Montana State University; research pharmacolo-
gist, Sunkist Growers, Inc.; project director-consultant, W.L.R.I., Holland-Rantos Youngs
Rubber Corporation.

CAMPBELL, MILDRED P. (1972) ................................................... Graduate Nurse
Experience: General duty and ICU-CCU, San Luis General Hospital; general duty, Paso
Robles War Memorial Hospital.

CANO, RAUL J. (1974) ............................................................................. Biological Sciences
M.S., 1972; Ph.D., University of Montana, 1974. Assistant Professor.
Experience: Teaching assistant, research assistant, Eastern Washington State College; teach-
ing assistant, University of Montana; research fellow, University of Montana.

CARNEGIE, E. J. (1963–64) (1965) ............................................................ Agricultural Engineering
B.S., California State Polytechnic College, 1962; M.Engr., University of California, Davis,
1963. Professor.
Experience: Research assistant, University of California, Davis; junior agricultural engineer,
University of California; officer, U.S. Naval Reserve. Registered professional engineer, Califor-
nia.

CARPENTER, THOMAS W. (1968) ................................................................. Aeronautical Engineering
B.S., Virginia Polytechnic Institute, 1961; M.S., 1964; Ph.D., Purdue University, 1969. Pro-
fessor.
Experience: Research assistant, instructor, Purdue University; engineer, Hamilton Standard.

CARR, LAURENCE H. (1963) ................................................................. Mechanical Engineering
B.S., University of Chicago, 1932; M.S., 1934. Professor.
Experience: Director of research and engineering, Edward Valves, Inc.; lecturer and assistant
professor, Purdue University; mechanical engineer, Pacific Gas & Electric Co. Registered
professional engineer, California.

CARY, ARTHUR S. (1974) ................................................................. Physics
B.A., Fisk University, 1949; M.A., 1951; Ph.D., University of California, Riverside, 1969.
Assistant Professor.
Experience: Instructor, Dillard University; associate professor, Tennessee State University;
research assistant, University of California, Riverside; associate professor. Harvey Mudd Col-
lege.

CASTILLO, SYLVIA E. (1976) ................................................................. Counselor
B.A., University of California Santa Barbara, 1973; M.S.W., University of California, Berke-
ley, 1976.
Experience: Clinical caseworker, El Centro Salud Mental; caseworker for developmental
disabled, California State Department of Health; secondary consultant, Oakland Unified
School District.
CENSULLO, ALBERT C. (1974) ................................................................. Chemistry
B.S., Villanova University, Villanova, Pennsylvania; Ph.D., Penn State University, 1975.
Assistant Professor.

CHANDLER, EVERETT M. (1951) ......................................................... Dean of Students
A.B., University of California, 1939; Ph.D., Michigan State University, 1970.
Experience: Administrative officer, U.S. Air Force; personnel technician, State Personnel
Board; management analyst, State Department of Finance; extension teacher, Sacramento State
College; U.S. Air Force.

CHAPMAN, ARTHUR J. (1972) ......................................................... Architecture and Environmental Design
B.S., B. Arch., California State Polytechnic College, 1970; M.S., Pennsylvania State Univer-
sity, 1971; additional graduate study, University of California, Los Angeles. Assistant Profes-
sor.
Experience: Systems analyst, LOG/AN, Los Angeles; production scheduler Praeger, Kavan-
agh, Waterbury, New York; National Science Foundation teaching assistant, Department of
Computer Science, Pennsylvania State University; architectural draftsman, Spencer, Lee &
Busse, Palo Alto, California.

CHASE, DANIEL C. (1954) ................................................................. Agricultural Management
B.S., University of Arizona, 1946; M.Agr. Ed., 1951; Ed.D., Pennsylvania State University,
1954. Professor.
Experience: Teacher of vocational agriculture, veterans' instructor, Tolleson Union High
School, Tolleson, Arizona; supervising teacher, University of Arizona; veterans' co-ordinating
teacher, State Department of Vocational Education, Phoenix, Arizona; farm editor and column-
ist, Arizona Republic; assistant professor and head, division of farm management, Arizona
State College, Tempe, Arizona.

CHEEK, DONALD K. (1973) ................................................................. Counselor
B.S., Seton Hall University, 1953; M.S.W., Fordham School of Social Service, 1955; Ph.D.,
Temple University, 1971.
Experience: Probation officer, Los Angeles County Probation Department; Senior psychiat-
ric social worker, Atascadero State Hospital; consultant, York School System, York, PA;
director, Upward Bound Program, Swarthmore College; vice president, Student Affairs, dean
of students, lecturer in social psychology, Lincoln University; vice-president, Director of Black
Studies Center, lecturer in social psychology, Claremont Colleges/Human Resources Institute.

CHESTNUT, F. STUART (1963) ................................................................. Physical Education
B.S., Indiana University, 1951; M.S., 1963; additional graduate study Indiana University,
University of Oregon. Professor.
Experience: Technical supervisor, Commercial Solvents Corp.; coach-teacher, senior high
school, Terre Haute, Indiana, Washington, Indiana, Brazil, Indiana; teaching assistant, Univer-
sity of Oregon.

CHIW, MARIE (1976) ................................................................. Graduate Nurse
Experience: Medical staff nurse, Veterans Administration Hospital, Syracuse, N.Y.; Ob-
Gyn, St. Mary's Hospital, Tucson; evening supervisor, Tucson General Hospital; industrial
nurse, Lockheed Missiles and Space Company, Sunnyvale; relief industrial nurse, Ampex
Corporation, Redwood City, Syntex, Palo Alto.

CHIPPING, DAVID H. (1971) ................................................................. Physics
Associate Professor.
Experience: Chief field assistant Geological Survey of Canada; teaching assistant, lecturer,
Stanford University; assistant professor, University of California, Davis.

CHIZEK, GAYLORD J. (1958) ................................................................. Agricultural Management
B.S., Kansas State College, 1957; M.S., 1958; additional graduate study, Oregon State Univer-
sity. Professor.
Experience: Assistant instructor, Kansas State College, Manhattan, Kansas; farmer; U.S.
Army.
CHO, MARJORIE ........................................................................ Home Economics
B.S., California Polytechnic State University, 1971; M.S., Kansas State University, 1972;
Ph.D., 1974. Assistant Professor.
Experience: Graduate teaching assistant, graduate research assistant, interviewer, North
Central Regional Nutrition Project, Kansas State University; food service supervisor and
diabetic camp coordinator, University of Kansas Medical Center; instructor, Kansas City
University; nutrition consultant, Riley County Well-Baby Clinic, Manhattan, Kansas; resident
in clinical nutrition, Ohio State University, College of Medicine, Medical Dietetics.

CHOU, THOMAS T. L. (1961) .................................................................. Electronic and Electrical Engineering
B.S.E.E., Chinese National Chekiang University, 1947; M.S.E.E., University of Washington,
1956; additional graduate study, University of California at Los Angeles. Professor.
Experience: Research fellow, NASA Ames Research Center, Moffett Field; senior research
engineer, member technical staff, Autonetics, Division of North American Rockwell Corpora-
tion, Anaheim, California; associate professor, National Chiao-tung University, Taiwan; senior
engineer, Sverdrup-Parcel, Inc., San Francisco; research assistant, University of Washington.

CHRISTENSEN, RICHARD N. (1972) .................................................. Mechanical Engineering
B.S., Brigham Young University, 1968; M.S., Stanford University, 1970; Ph.D., 1974. Associate
Professor.
Experience: Missionary, Brazilian South Mission, Curitiba, Parana, Brazil; research assist-
ant, AEC Ames Laboratory, Ames, Iowa; research assistant, Lawrence Livermore Laboratory,
Livermore, California; teaching assistant, Mechanical Engineering, Stanford University.

CHRISTENSON, ROBERT A. (1970) .................................................. Child Development
B.S., University of Utah, 1963; M.S., Brigham Young University, 1968; Ph.D., 1970. Associate
Professor.
Experience: Teaching assistant, part-time instructor, Brigham Young University.

CIANO, DAVID A. (1973) ................................................................. Director of Judicial Affairs
B.A., University of Redlands, 1966; J.D. University of California, Los Angeles, 1972.
Experience: Legal research assistant, San Bernardino County District Attorney's Office;
teacher, San Bernardino City Schools; Officer, U.S. Army.

CICHOWSKI, ROBERT S. (1971) .................................................. Chemistry
B.S., Purdue University, 1964; Ph.D., Alfred University, 1968. Associate Professor.
Experience: Research chemist, Phillips Petroleum Company.

CIRONE, JOAN M. (1971) ................................................................. Graduate Nurse

CIROVIC, MICHAEL M. (1968) .................................................. Electronic and Electrical Engineering
Experience: Assistant professor, Academy of Aeronautics; engineer, General Cable Corpora-
tion.

CLAUSE, ODILE M. (1976) ................................................................. Foreign Languages
Professor.
Experience: Instructor, University of Wyoming; teacher, Powell High School, Wyoming;
teacher associate, University of Colorado.

CLEATH, ROBERT L. (1968) ................................................................. Speech Communication
B.A., Northwestern College, 1950; M.A., University of Oregon, 1951; Ph.D., University of
Experience: Assistant professor, Westmount College, Whitworth College, University of
California; teaching assistant, University of Washington; instructor, California State Polytech-
nic College; associate editor, Christianity Today, Washington, D.C.

CLERKIN, EDWARD J. (1964) .................................................. Electronic and Electrical Engineering
B.S.E.E., Colorado State University, 1950; M.S.E.E., University of Idaho, 1962; additional
graduate study, Utah State University, Colorado State University, Oklahoma University.
Associate Professor.
Experience: Instructor, University of Idaho and Chico State College; graduate assistant,
Oklahoma University; technical associate, Argonne National Laboratory; engineer, Diversi-
ﬁed Builders, General Electric Company, Rohr Aircraft Corp. Registered professional engi-
neer, California.
Faculty and Staff

CLOGSTON, FRED L. (1960) ........................................... Biological Sciences
Experience: Instructor, public schools; teaching and research assistant, University of Washington; research associate, Office of Naval Research; instructor, Western Washington College; associate, University of California at Santa Barbara.

CLOONAN, CLIFFORD B. (1957) ........................................ Electronic and Electrical Engineering
B.S., University of Colorado, 1955; M.S.E.E., Montana State University, 1961; Ph.D., University of Colorado, 1975. Professor.
Experience: Instructor, U.S. Army Signal Corps; physical science aide and electronic scientist, National Bureau of Standards, Boulder, Colorado; systems design engineer, Collins Radio Company, Cedar Rapids, Iowa; research associate and research assistant, Electronic Research Laboratory, Montana State University; consultant, McDonnell Aircraft Company, St. Louis, Missouri; microwave engineer, Hewlett-Packard Company, Palo Alto; National Science Foundation faculty fellow, University of Colorado.

CLUCAS, GEORGE G. (1956-62) (1968) ................................. Political Science
A.B., University of Michigan, 1947; M.P.A., 1949; Ph.D., University of Southern California, 1969. Professor.
Experience: Senior budget analyst, Office of Legislative Analyst, Sacramento; dean, Finance and Development, California State Polytechnic College; chief, Budget Planning and Operations, Chancellor's Office, The California State Colleges, Los Angeles; director, Research and Development and Interim Dean, School of Business and Social Sciences, California State Polytechnic College.

COATS, DONALD M. (1964) ........................................... Associate Dean, Educational Services

COCHRAN, BURT JR. (1976) ................................................ Medical Officer
M.D., University of Southern California Medical School, Los Angeles, 1949.
Experience: Internship, Los Angeles County Hospital; residency, Los Angeles County Hospital; associate clinical professor, Loma Linda School of Medicine; staff internist, Los Angeles County Medical Center; assistant professor, Department of Medicine, University of California College of Medicine, Los Angeles; associate clinical professor, Los Angeles County-University of Southern California Medical Center.

COCHRANE, MONA (1970) ................................................ Graduate Nurse
R.N., Knapp College of Nursing, Santa Barbara, California, 1953.
Experience: Clinic nursing, Orthopedic and Internal Medicine Specialty, San Luis Medical Clinic; ENT specialty nurse, Phoenix, Arizona; office assistant general surgery, Santa Barbara, California; industrial nursing, Miami Inspiration Copper Co., Miami, Arizona; general staff nurse, San Luis Obispo General Hospital, San Luis Obispo, California.

COLEMAN, EUGENE F. (1972) ........................................... Graphic Communications
B.S., University of Pittsburgh, 1934; graduate study, University of Pittsburgh, Washington University. Associate Professor.
Experience: Physicist, National Bureau of Standards; technical staff member, RCA Laboratories; chief engineer, Hillyer Instrument Corp.; associate research staff, Engineering Experiment Station, Rutgers University; market research manager, Mergenthaler Linotype Co.; lecturer, industrial management, Polytechnic Institute of Brooklyn; research staff member, MGD Graphic Systems.

COLEMAN, JAMES W. (1973) ........................................... Social Sciences
B.A., California State University, Northridge, 1969; M.A., University of California, Santa Barbara, 1971; Ph.D., 1975. Associate Professor.
Experience: Lecturer, Chapman College Vandenberg AFB; Instructor, Ventura College; Graduate Assistant, University of California, Santa Barbara.
COLLINS, THOMAS A. (1973) ................................................................. Medical Officer
B.S., Stanford University, 1935; M.D., Stanford University School of Medicine, 1940; Internship, Residency, Highland-Alameda County Hospital, 1941; M.P.H., Harvard School of Public Health, 1955; Board Certificate, 1956.
Experience: Industrial medicine; private practice; public health physician, Monterey County; staff physician, Santa Cruz General Hospital; U.S. Army.

COLOME, JAIME S. (1972) ........................................................................................................ Biological Sciences
Experience: Teaching and research assistant, pre-doctoral fellow, University of California, Santa Barbara.

COMPTON, LUVENIA (1969) .................................................................................................... Library
A.B., University of Kentucky, 1962; M.S.L.S., 1965; additional graduate study, Allan Hancock College, Temple Buell College. Assistant Librarian.
Experience: Teacher, Floyd County Board of Education; claims adjuster, Social Security Administration; interviewer and office manager, U.S. Employment Service; teacher, Summit Elementary School; librarian, Norwalk High School and Lompoc Unified School District; district librarian, Rim-of-the-World Unified School District.

CONNELLY, JOHN B. (1970) ............................................................... Coordinator, Liberal Studies; Education
B.A., University of Southern California, 1958; Ph.D., 1970. Associate Professor.
Experience: Foreign Service Officer, vice-consul, U.S. Department of State, Munich, Germany; lecturer, California State College at Los Angeles and California State Polytechnic College, Pomona; teacher and chairman of Social Studies Department, Gage Junior High School, Huntington Park; associate dean, School of Human Development and Education, California Polytechnic State University, San Luis Obispo; associate professor, University of Southern California.

CONNER, E. WESLEY (1963) ............................................................ Ornamental Horticulture
B.S., California State Polytechnic College, 1956; M.Phil. (L. Arch), University of Nottingham, England, 1974. Professor.
Manager, Landscape Department, Yosemite Park & Curry Company; landscape consultant, Spencer & Lee, Architects, San Diego and Napa County; assistant to landscape architect, Huettig & Schromm, Palo Alto; Registered Landscape Architect, California.

COOK, BARBARA E. (1972) ..................................................................................................... Social Sciences
Experience: Field work, Fiji Islands; predoctoral and research fellow, National Institute of Mental Health; lecturer, Mills College.

COOK, DAVID W. (1941) ............................................................ Associate Dean, Curriculum and Instruction
B.S., University of California, 1937.
Experience: Examiner, Board of Fire Underwriters of the Pacific; engineer, Insurance Company of North America; instructor, electrical engineering and mathematics; coordinator of navigation instruction, U.S. Naval Flight Preparatory School; registrar, chairman, Mathematics Department, California State Polytechnic College.

COOMBS, LEE CHARLES (1969) .............................................................. Chemistry
B.A., San Diego State College, 1963; M.S., 1965; Ph.D., Purdue University, 1970. Associate Professor.
Experience: Teaching assistant and spectroscopist, San Diego State College; instructor, Purdue University.

COOPER, ALAN F. (1970) ............................................................................ Biological Sciences
B.S., California State Polytechnic College, Pomona, 1964; Ph.D., University of California, Riverside, 1969. Associate Professor.
Experience: NDEA Fellowship, research assistant, postgraduate research nematologist, University of California, Riverside.
COOPER, TERENCE H. (1975) ................................................. Soil Science
B.S., Michigan State University, 1969; M.S., 1970; Ph.D., 1975. Assistant Professor.
Experience: Field and laboratory technician, graduate research assistant and teaching assist-
ant, Department of Crop and Soil Science, Michigan State University; soil scientist, Soil Survey Operation, Michigan Agricultural Experiment Station.

COREY, LOUANNA M. (1975) ............................................. Supervising Nurse
R.N., St. Mary’s Hospital School of Nursing, Waterbury, Connecticut, 1942; B.S., California State University at Los Angeles, 1965; M.S., 1975; Post graduate education as Pediatric Nurse Practitioner, Los Angeles County Health Department, 1967-68; College Health Nurse Practitioner, California Polytechnic State University, San Luis Obispo, 1975-76.
Experience: Office nurse, General Practitioner’s Office; staff nursing and night nurse super-
visor, University of Southern California Medical Center, Los Angeles; night nurse supervisor, Garfield Cottage Hospital, Pomona; public health nursing, Los Angeles County Health De-
partment; school nurse, Bashett Unified School District, La Puente.

COTA, HAROLD M. (1965) ............................................... Environmental Engineering
B.S., University of California, 1959; M.S., Northwestern University, 1960; Ph.D., Oklahoma University, 1966. Professor.
Experience: Engineer, Westvaco (FMC); research engineer, Lockheed Missiles and Space; graduate assistant, University of Oklahoma; consultant, noise control; director, EPA Air Pollution Training Grant; member, Central Coast Regional Water Quality Control Board.

COYES, FRANK G. (1965) ............................................... Agricultural Engineering
B.S., California State Polytechnic College, 1950; M.A., 1957. Professor.
Experience: Instructor, Coalinga Union High School, Coalinga College.

CRANE, FRANKLIN S. (1958) ........................................... Mechanical Engineering
Petroleum Engineer, Colorado School of Mines, 1943; graduate study, Massachusetts Insti-
tute of Technology. Assistant Professor.
Experience: Division engineer, Oil Well Supply Company; chief engineer, Martin-Decker Corporation; secretary-treasurer and director, Decker Engineering Corporation; officer, U.S. Navy; registered petroleum engineer, California.

CRIVELLO, JOHN H. (1971) .................................................. Coach, Physical Education
B.S., California State University, San Jose, 1969; M.S., California Polytechnic State Univer-
sity, 1970.
Experience: Graduate assistant, California Polytechnic State University, San Luis Obispo.

CRUIKSHANKS, RANDAL L. (1972) .................................. Political Science
B.A., University of California, Berkeley, 1963; M.A., University of Oregon, 1965; Ph.D., 1968; additional graduate study, University of Michigan. Associate Professor.
Experience: Research assistant, University of Oregon; consultant, Oregon Research Institu-
t; instructor, Division of Continuing Education, Office of Academic Advising, and School of Community Service and Public Affairs, University of Oregon; Captain, U.S. Army; assistant professor, University of New Mexico.

CULVER, JOHN H. (1975) .................................................. Political Science
B.S., University of Oregon, 1968; M.S., 1970; Ph.D., University of New Mexico, 1975. Assistant Professor.
Experience: Teaching assistant, University of New Mexico; instructor, Southwest Missouri State University.

CUMMINS, CARL C. (1958) .......... Dean, School of Human Development and Education
A.B., University of California, Santa Barbara, 1948; M.S., University of Southern California, 1952; Ed.D., University of California, 1957.
CURTIS, DONALD J. (1960) .................................. Senior Clinical Laboratory Technologist
R.N., Hospital Corps, Medical Department, U.S. Navy.
Experience: Chief warrant officer, USN; nursing and laboratory service, USNH; laboratory
service, USNH, Pearl Harbor; personnel and medical records, USNH; Epidemiology Control
Units, Pearl Harbor; administrative officer, Fourth Marine Division; assistant medical prop-
erty and accounting officer, Camp Pendleton; clinical laboratory technologist, Patton State
Hospital; senior clinical laboratory technologist, Atascadero State Hospital.

CURTIS, WILLIAM D. (1961) .................................. Psychology
B.A., University of Redlands, 1948; M.A., University of California, Los Angeles, 1951; Ph.D.,
University of Denver, 1960. Professor.
Experience: Probation officer, Riverside County, California; school psychologist, San Bern-
adino City Schools; professor, San Bernardino Valley College; psychologist, VISTA; visiting
professor, Portland State College, University of Redlands, University of Denver, University
of Hartford, I.B.M.

CURZON, GORDON (1970) .................................. English
B.S., DePaul University, 1941; B.A., St. Mary’s College, 1945; M.A., Western Washington
State College, 1966; Ph.D., University of California, Riverside, 1969. Associate Professor.
Experience: Research chemist, industrial editor, Georgia-Pacific Corporation; teaching as-
tistant, University of California, Riverside; instructor, College of the Desert.

CUTLER, JOHN P. (1971) .................................. Architecture and Environmental Design
B.Arch, Massachusetts Institute of Technology, 1941; M.Arch, 1943. Associate Professor.
Experience: Designer, Raymond Loewy Associates, New York; chief draftsman and de-
signer, Clarence Mayhew, San Francisco; designer and job captain, John Lyon Reid & Partners,
San Francisco; guest professor in Architecture, Bengal Engineering College; project architect,
Reid, Rockwell, Banwell & Tarics, San Francisco; project architect, Rockwell & Banwell,
Architects, San Francisco; associate, Reid & Tarics, Inc., San Francisco. Registered architect,
California.

D’ALBRO, JAMES A. (1969) .................................. Ornamental Horticulture
B.S., Cornell University, N.Y., 1966; M.S., University of California, Davis, 1969; graduate
study, Michigan State University. Associate Professor.
Experience: Part-time county agricultural agent, commercial greenhouse worker; research
assistant, University of California, Davis; general production manager, commercial cut flow-
ers, Goro Kawai, Inc., Salinas, California.

DALY, JAMES C. (1972) .................................. Computer Science and Statistics
B.S., Gonzaga University, 1966; Ph.D., Oregon State University, 1973. Associate Professor.
Experience: Instructor, teacher and research assistant, Oregon State University.

DAMANN, ALAN S. (1975) .................................. Agricultural Education
B.S., California Polytechnic State University, San Luis Obispo, 1968; M.S., 1974. Assistant
Professor.
Experience: Director of Vocational Agriculture, Hemet High School.

DANGERFIELD, HARVEY (Capt.) (1974) .................................. Military Science
B.A., University of Denver, 1965; Infantry Officers Candidate School, 1966; Intelligence
Officers Course, 1966; Amphibious Warfare Course, 1968; Rotary Wing Flight School, 1969;
Aviation Maintenance Officer Course, 1969; Infantry Officer Advanced Course, 1973. Gradu-
ate study, Georgia Military College, 1973; California Polytechnic State University, 1974.
Experience: Platoon Leader, 9th Infantry Division, Vietnam; operations officer, 5th Infantry
Division (Mech), Fort Carson, CO; Operations Officer, 101st Abn Division, Vietnam, Com-
pany Commander and Battalion Executive Officer, USATC, Ft. Ord, California.

DARNIELLE, MAX E. (1967) ............................... English
B.S., University of Oregon, 1950; M.S., Indiana University, 1967; additional graduate study,
Indiana University. Assistant Professor.
Experience: Teacher, South San Francisco, Oakland, Cincinnati, Columbus; teaching assist-
ant, university fellow, Indiana University.
DATTA, SAMIR KUMAR (1968) ................................ Electronic and Electrical Engineering

DAVIDSON, OTTO C. (1968) .............................................................. Mechanical Engineering
B.S., Bucknell University, 1955; M.S., Massachusetts Institute of Technology, 1956; Ph.D., Stanford University, 1960. Professor.
Experience: Assistant professor, University of Utah, Robert College; officer, U.S. Army; engineer, various engineering firms in New York, Utah, California.

DAVIS, CHARLES P. (1958) ................................................................ Aeronautical Engineering
B.S., Rensselaer Polytechnic Institute, 1948. Professor.
Experience: Instructor and assistant professor, Rensselaer Polytechnic Institute; development engineering and product engineer leader, General Electric Company.

DAVIS, M. LeROY (1976) ................................................................. Agricultural Management
B.S., California State Polytechnic College, 1966; M.S., Iowa State University, 1968; Ph.D., Colorado State University, 1973. Assistant Professor.
Experience: Instructor, Iowa State University; instructor, California State Polytechnic College; research assistant, Colorado State University; extension marketing economist, University of Georgia; associate professor and head of Department of Economics and Finance, Hardin-Simmons University.

DAVIS, MARJORIE A. (1976) .............................................. Clinical Laboratory Technologist
A.A., Santa Rosa Junior College, California 1954; B.S., University of Oklahoma, Norman, Oklahoma, 1956.
Experience: Clinical laboratory technologist, Norwalk Hospital and Camarillo State Hospital, private physician's office, Ventura; chief technologist, private physician's office, Santa Maria; chief technologist/department head, Marian Hospital, Santa Maria; department head, Santa Maria Hospital.

DEAN, ARNOLD M. (1949) ................................................................. Soil Science
B.S., University of Alberta, Canada, 1943; M.S., 1946; Ph.D., University of Wisconsin, 1949. Professor.
Experience: Laboratory assistant, Dominion Department of Agriculture, Edmonton, Alberta; teaching assistant, University of Wisconsin; industrial fellowship, University of Wisconsin.

B.S., Purdue University, 1961; M.S., University of Michigan, 1962; Ph.D., The George Washington University, 1969. Associate Professor.
Experience: Instructor, U.S. Army, Redstone Arsenal; research assistant, University of Michigan Office of Research Administration; physicist, Melpar, Inc., Falls Church, Virginia; instructor, The George Washington University; physicist, Kaman Sciences Corporation, Tucson; lecturer, California Polytechnic State University, San Luis Obispo.

DeJONG, ALVIN A. (1974) ............................................................ Biological Sciences
B.S., Seattle Pacific College, 1965; Ph.D., Washington State University, 1972. Associate Professor.
Experience: Assistant Professor, University of Idaho, Washington State University.

DeJONG, AUGUST (1976) ................................................................. Director, Career Center

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DEKLEINE, HERBERT A. (1974) ................................................................. Mathematics
B.S., Western Michigan University, 1964; M.A., 1965; Ph.D., University of California, Riverside, 1968. Assistant Professor.
Experience: Assistant Professor, State University of New York.

DELANY, JAMES E. (1970) ................................................................. Mathematics
A.B., San Diego State College, 1961; Ph.D., Iowa State University, 1966. Associate Professor.
Experience: Graduate assistant, Iowa State University; assistant professor, University of California, Irvine.

DeLEY, WARREN W. (1971) ................................................................. Associate Dean, Division of Social Sciences
Experience: Teacher, California public schools; Flint Fellowship and teaching assistant, University of California, Los Angeles; director of institutional studies, California State University, Sacramento; lecturer in sociology, California State College, Bakersfield.

DELVAGLIO, PETER A. (1970) ............................................................. Graphic Communications

DELVECCHIO, VALENTINE (1976) ...................................................... Library
Experience: Cataloger, Instructional Resources Lab, College of Education, Arizona State University; director, Instructional Materials Center; department chairman, General Studies Department, Gila River Career Center, Sacatoon, Arizona; instructor, Cinematography, Arizona State University.

DEMPSEY, PAUL L. (1970) ................................................................. Business Administration
B.B.A., University of Miami, 1951; J.D., 1956; L.L.M., New York University, 1958. Associate Professor.
Experience: Editor, Prentice-Hall, Inc., New Jersey; attorney, Miami; Legal staff, American Telegraph & Telephone Co., New York; chief counsel, New York State Senate Judiciary Committee; real estate broker.

DETTLOFF, ERLAND G. (1967) .......................................................... Education
Experience: Teacher, Great Falls, Montana; visiting professor, part-time instructor, assistant professor, University of Wyoming; assistant professor, Northern State College, South Dakota.

DIAZ, JOE V. (1976) ................................................................. Counselor
Experience: Research assistant, Tucson Public Schools, Tucson; family counseling consultant, Title III project, Tucson; career guidance consultant, K-12, Tucson Public Schools; counselor, secondary schools, Santa Maria; U.S. Navy.

DICKERSON, ROBERT H. (1970) ........................................................... Physics
B.S., University of Arizona, 1959; M.S., 1963; Ph.D., 1964. Associate Professor.
Experience: Physicist, U.S. Naval Ordnance Laboratory; teaching and research assistant, University of Arizona; postdoctoral research associate, University of Illinois; assistant professor, California State College, Hayward.

DICKEY, RICHARD K. (1956) ......................................................... Electronic and Electrical Engineering
B.S., University of California, 1948; M.S., 1956; Ph.D., University of California, Santa Barbara, 1969. Professor.
Experience: Project engineer, Berkeley Scientific Co.; design engineer, Remler Co., Ltd.; engineer, Alameda Naval Air Station. Registered professional engineer, California.
Faculty and Staff

DICKSON, BRUCE A. (1952) ........................................................................................ Soil Science
B.S.A., University of British Columbia, Canada, 1940; M.S.A., 1942; Ph.D., University of California, Berkeley, 1952. Professor.
Experience: Teaching assistant, University of British Columbia; teaching assistant, University of California at Berkeley; assistant in plant nutrition, Dominion Experimental Station, Saanichton, B.C.; soil specialist; Dominion Experimental Farm, Agassiz, B.C.

DILLS, CHARLES E. (1963) ........................................................................................ Chemistry
B.S., North Dakota State University, 1949; M.S., George Washington University, 1951; Ph.D., Harvard University, 1956; additional graduate study, Columbia University. Professor.
Experience: Professor, Deep Springs College; assistant editor, American Chemical Society; chemist, National Research Corporation; assistant professor, Northwest Missouri State College.

DINGUS, DELMAR D. (1973) ......................................................................................Soil Science
B.S., Berea College, 1966; M.S., West Virginia University, 1968; Ph.D., Oregon State University, 1973. Associate Professor.
Experience: Appalachian farming, Scott County, Virginia; soil scientist, USDA Soil Conservation Service, Kentucky; graduate research and teaching assistant, West Virginia University and Oregon State University; research associate, University of Hawaii; soil chemistry and clay mineralogy consultant, Bureau of Land Management, Oregon State University.

DIRKES, LOIS M. (1973) .................................................................................................. Counselor
B.S., University of California at Los Angeles; M.S., University of Maryland; Ph.D., University of Maryland, 1973. Associate Professor.
Experience: Assistant Professor, University of Maryland, teaching psychiatric and mental health nursing; group leader and therapist, Human Resources Institute; consultant; public health nurse, Baltimore, Maryland and Los Angeles, California; staff nurse, University of California, Los Angeles, California.

DONALDSON, DOUGLAS D. (1968) ............................................................................ Biological Sciences
A.B., University of California, Berkeley, 1962; M.A., California State College, Los Angeles, 1964; Ph.D., Oklahoma State University, 1969. Associate Professor.
Experience: Herbarium assistant, University of California, Berkeley; unit fellow, Oklahoma Cooperative Wildlife Research Unit, Oklahoma State University; instructor and assistant professor, California State College, Los Angeles.

DONANT, FRANKLIN D. (1972) .................................................................................... Program Counselor
B.A., University of California, Santa Barbara, 1967; M.A., California Polytechnic State University, San Luis Obispo, 1972; additional graduate study, University of California, Santa Barbara.
Experience: Teacher, Horace Mann Junior High School; head resident and student activities graduate assistant, California Polytechnic State University, San Luis Obispo.

DOPP, JAMES W., JR. (1969) ...................................................................................... Library
Experience: Cataloger, Detroit Public Library.

DOURSON, ROBERT H. (1967) .................................................................................... Computer Science and Statistics
B.S., California Institute of Technology, 1935; M.S., 1941; Ch.E., 1942; additional graduate study, Case Institute of Technology, Southern Illinois University. Associate Professor.
Experience: Laboratory chemist, research chemical engineer, Union Oil Company; research chemist, Cutter Laboratories; laboratory assistant, California Technology; various engineering and administrative positions, Shell Oil Company.

DRANDELL, MILTON (1972) .................................................................................... Management
B.A., Southern Methodist University, 1944; M.A., University of Texas, 1945; Ph.D., University of California at Los Angeles, 1951. Professor.
Experience: Instructor, Southern Methodist University, University of Southern California; operations research specialist, Hughes Aircraft Company; Northrop Aircraft Company; Management Science and Computer Systems coordinator—Management Executive Seminars, applications development manager, International Business Machines Corporation; visiting professor, Graduate School of Management, University of California at Los Angeles; management consultant.
DRAVES, ALBERT W. (1969) ................................ Architecture and Environmental Design
B.S.M.E., Purdue University, 1948; B.S.C.E., Rensselaer Polytechnic Institute, 1952; M.B.A., Roosevelt University, 1962; additional graduate study, Arizona State University, University of Michigan. Associate Professor.
Experience: Civil Engineer Corps, U.S. Navy; director, Operational Development Division, Rex Chainbelt, Inc.; manager, Industrial Building Design Division, De Leuw, Cather & Co., Chicago; instructor, Purdue University. Registered professional civil and mechanical engineer, New York, Louisiana, Indiana, Illinois, California. Registered land surveyor.

DUARTE, ARTHUR C. (1965) .............................................. Agricultural Management
B.S., California State Polytechnic College, 1964; M.S., Oregon State University, 1965; Ph.D., Washington State University, 1975. Associate Professor.
Experience: Farming, consulting, graduate research assistant, Department of Agricultural Economics, Washington State University, Pullman.

DUNIGAN, LOWELL H. (1961) ............................................ Director, Institutional Research
B.S., Iowa State University, 1947; M.S., 1948; additional graduate study, University of Southern California.
Experience: Officer, U.S. Navy; instructor in Sociology, Iowa State University; claims adjuster, Employers Mutuals Insurance Company; research technician, California Highway Planning Survey; research technician, California State Department of Education, Division of State Colleges and Teacher Education.

DUNN, JOHN E. (1948-52) (1961) ......................................... Agricultural Engineering
B.S., Oregon State University, 1943; M.A., California State Polytechnic College, 1967; M.S., University of Hawaii, 1970. Associate Professor.
Experience: Engineering officer, USNR; service supervisor, wholesale farm machinery, Pacific Northwest and Southwest territories, and retail farm machinery, Bakersfield, Calif., and Yuma, Arizona, and Anaheim, California; instructor, California State Polytechnic College.

DUSEK, BERNARD W. (1965) .............................................. Art
A.B., University of California, 1951; M.A., University of Southern California, 1955. Associate Professor.

DWYER, GARY COLBURN (1973) ...................... Architecture and Environmental Design
Experience: Assistant landscape architect, U.S. Forest Service; assistant landscape architect, Department of Parks and Recreation; resident, designer and faculty member, Franconia College; partner in charge, Fox Fyre Enterprises; designer, Harmon, O'Donnell & Henninger & Associates; instructor, University of Denver; visiting lecturer, Colorado State University; instructor, Temple Buell College; design consultant, Office of Economic Opportunity; landscape architect, Roark Associates.

EARLY, MANUEL (1973) .............................................. Counselor, Financial Aid
Experience: Recruiter, educational opportunity program, California Polytechnic State University, San Luis Obispo.

EASTHAM, GEORGE M. (1966) ..................................... Economics
B.A., Chico State College, 1961; M.A., University of California, Santa Barbara, 1965; additional graduate study, University of California; Claremont Graduate School. Associate Professor.
Experience: Revenue officer, Internal Revenue Service; teaching assistant and research assistant, University of California, Santa Barbara.
EATOUGH, NORMAN L. (1968) ................................................................. Chemistry
B.S., Brigham Young University, 1947; B.E.S., 1958; M.S., 1959; M.S.Ch.E., 1960, Ph.D., 1968. Professor.
Experience: Senior development engineer, Hercules Powder Company; assistant professor, Dixie Junior College; instructor, Brigham Young University.

EDMISTEN, JOHN W. (1968) .............................................................. Architecture and Environmental Design
B.S., Arch. Engr., California State Polytechnic College, 1965; M.Engr., University of California, Berkeley, 1967. Associate Professor.
Experience: Teaching assistant, University of California, Berkeley; project engineer-designer, Reid & Taries, Architects and Engineers; draftsman, Kenneth Vinolia, Structural Engineer; designer-draftsman, Walter Constant, Structural Engineer. Registered architect, California.

EDWARDS, JAMES G. (1973) ............................................................... Industrial Technology
B.A., California State University, Long Beach, 1972; M.A., 1973; graduate study University of California, Los Angeles and Texas A & M University. Associate Professor.
Experience: Plastics design engineer, Contemporary Carriage Works, Paramount; plastics instructor, Cerritos College; technical assistant to the vice president/technical director, Revell, Inc.

EGGEN, NORMAN R. (1976) ............................................................... Animal Science
B.S., California State Polytechnic College-Kellogg, 1970; M.S., Texas A&M University, 1974. Assistant Professor.
Experience: Foreman, cure and smoke kitchen, Union Packing Co., Los Angeles; manager of processed meats, Urban N. Patman, Inc., Los Angeles; graduate assistant in meats, Texas A&M University; retail meat market research and development, Pitman Industries, Hereford, Texas; vice president and general manager, Meat Mercantile, Costa Mesa.

ELLERBROCK, GERALDINE B. (1973) ......................................................... Management
B.S., Ohio State University, 1941; M.S., 1967; Ph.D., 1970. Associate professor.
Experience: Assistant professor, University of Dayton; management and union consultant; administrative assistant, Ohio State University.

ELLIO TT, W A LT E. (1965) .............................................................. Physics
Experience: Teaching fellow, Northwestern State College of Louisiana; assistant professor of physics and mathematics, Springfield College; visiting professor of physics, Tarrant County Junior Colleges.

ELTZROTH, THOMAS E. (1967) ............................................................. Ornamental Horticulture
B.S., The Ohio State University, 1963; M.S., 1966. Professor.
Experience: Research fellow, The Ohio State University; garden photographer and writer.

EMMEL, JAMES R. (1967) ................................................................. Head, Speech Communication Department
Experience: Chairman, Department of Speech, Bethany Nazarene College; part-time instructor, Pennsylvania State University; speech consultant, U.S. Dependent Schools, Germany; Fulbright professor, Italy; chairman, Division of Letters, full professor of speech, Pasadena College.

EMMONS, MICHAEL L. (1968) ............................................................. Counselor
Experience: Graduate assistant, Counseling Center, University of Wyoming; counselor-teacher, Palatine High School, Illinois; residence hall counselor, Illinois State University.

ENDRES, LELAND S. (1969) .............................................................. Chemistry
Experience: Research and teaching assistant, University of Oregon, University of Arizona; research associate, instructor, University of Nebraska; senior research chemist, 3M Company.
ENGLUND, DAVID L. (1973) ............................................... Head, Child Development Department
B.A., The Ohio State University, 1956; M.A., University of Hawaii, 1965; Ph.D., University of Wisconsin, 1969. Professor.
Experience: Assistant to the dean, College of Arts and Sciences, associate director, Overseas Operations; associate director, Peace Corps Training Programs, University of Hawaii; graduate fellow, University of Wisconsin; assistant professor, Purdue University; U.S. Navy.

EPSTEIN, GARY M. (1969) .......................................................... Mathematics
B.A., University of California at Riverside, 1964; Ph.D., 1969. Associate Professor.
Experience: Research assistant, Riverside Cement Co., University of California, Riverside.

EQUINOA, RICHARD M. (1973) ................................................ Acting Director, Placement
Experience: Instructor, Pacific Grove High School, Pacific Grove, California; placement interviewer, placement supervisor, California Polytechnic State University, San Luis Obispo; U.S. Air Force.

ERICSON, JON M. (1970) ........................................ Dean, School of Communicative Arts and Humanities
Experience: Professor and head of Department of Speech and Drama, Central Washington State College; assistant professor and Director of Forensics, Stanford University; assistant professor, Pacific Lutheran College; instructor, Texas Lutheran College.

ERNATT, EDWARD J. (1958) .......................................... Education
Experience: Elementary school teacher, Taylor Center Schools, Inkster, Michigan; district superintendent, Nankin-Dearborn Schools, Inkster, Michigan; elementary school teacher, Santa Barbara, California; supervising teacher, University of California, Santa Barbara College; district superintendent, West Park School District, Fresno, California.

EVANS, BERNARD B. (1970) ........................................... Computer Science and Statistics
B.A., Long Beach State College, 1959; M.S., Kansas State University, 1962; Ph.D., Purdue University, 1964. Professor.
Experience: Member of technical staff, Space Technology Laboratories; research assistant, Kansas State University; research associate, Purdue University; member of technical staff, Aerospace Corporation; advisory engineer, IBM; senior staff engineer, Geodynamics Corporation.

EVANS, J. HANDEL (1970) ......................................... Associate Dean, School of Architecture and Environmental Design
Experience: Lecturer, California State Polytechnic College, San Luis Obispo; research assistant, Oregon; teaching assistant, University of Oregon; Architectural Practice, United Kingdom & USA. Member, Royal Institute of British Architects. Registered architect, England.

EYLER, MARY F. (1960) ................................................. Associate Director, Financial Aids
B.S., Western Michigan University, 1959; graduate study, California State Polytechnic College.
Experience: Secretary, Simplex Paper Corporation, Adrian, Michigan; Ford Motor Company, Dearborn, Michigan; intermediate stenographer; placement interviewer and Placement Supervisor, California State Polytechnic College; business teacher, San Luis Obispo Adult Evening School; financial aid counselor, California State Polytechnic College.

FABRICIUS, EUGENE DAVID (1970) ......................... Electronic and Electrical Engineering
B.S., Missouri School of Mines, Rolla, 1956; M.S., 1958; D.Sc., Newark College of Engineering, New Jersey, 1968. Professor.
Experience: Associate professor, Rochester Institute of Technology, Rochester, New York; assistant professor, Newark College of Engineering, New Jersey; National Science Foundation Faculty Fellow; senior physicist, Giannini Controls Corporation, Pasadena, California; development engineer, Texas Instruments, Inc., Dallas, Texas; instructor, Texas A & M, College Station, Texas.
Faculty and Staff

FARBSTEIN, JAY D. (1974) .................................... Architecture and Environmental Design
B.A., University of California, 1965; M. Arch, Harvard University, 1969; Ph.D., University of London, 1975. Assistant Professor.
Experience: Lecturer, School of Environmental Studies, University College, London; research assistant, Unit for Architectural Studies, University College, London; architect/planner, Giancarlo De Carlo, Architecture and Planning, Milan, Italy.

FARRELL, GERALD P. (1970) .................................................................................... Mathematics
Experience: Research assistant, University of California, Los Angeles; assistant professor, California State College, Los Angeles, and Hawaii Loa College, Honolulu.

FARRELL, WARREN S. (1967) ........................................................ Agricultural Management
B.S., California State Polytechnic College, 1963; M.S. University of California, Davis, 1964; Ph.D., 1968. Professor.
Experience: Research assistant, Agricultural Economics, University of California, Davis.

FEDERER, M. DALE (1963) .......................................................................................... Psychology
Experience: Officer, U.S. Army; instructor, Saratoga School District, Wyoming; assistant instructor, extension instructor and assistant professor, University of Wyoming.

FEESE, HARRLAND (1976) ...................................................................................... Crop Science
B.S., West Texas State University, 1971; M.S., Kansas State University, 1974; Ph.D., 1976. Assistant Professor.
Experience: Lab technician, Texas A&M Research Station, Texas A&M University; assistant instructor, Kansas State University.

FELDMAN, JACOB (1971) ...................................... Architecture and Environmental Design
B.S., Civil Engineering, University of Delaware, 1961; M.S., 1968. Associate Professor.

FELDMAN, ROBERT L. (1975) ......................................... Natural Resources Management
B.A., Cornell University, 1966; M.S., University of Michigan, 1968; Ph.D., Cornell University, 1975. Assistant Professor.
Experience: Computer programming supervisor, U.S. Public Health Service; teaching assistant, University of Michigan; instructor, Cornell University.

FIERSTINE, HARRY L. (1966) ................................................................. Biological Sciences
Experience: Student assistant, Los Angeles County Museum; teaching and research assistant, cardio-vascular trainee, University of California, Los Angeles; instructor, Long Beach State College.

FINCH, HARRY C. (1962) ............................................................... Biological Sciences
B.S., Iowa State University, 1946; M.S., 1947; Ph.D., 1950. Professor.
Experience: Instructor, Iowa State University; research associate, Iowa State University; assistant professor, North Carolina State College, Agricultural Experiment Station; associate professor, Pennsylvania State University; project leader, fungicide and nematocide research, Monsanto Chemical Company, St. Louis, Missouri.

FINCHUM, WILLIS ARNOLD (1976) ................Head, Engineering Technology
B.S., Utah State University, 1949; M.S., 1959; graduate study at Purdue University. Professor.
Experience: Engineer, Sandia Corporation, Albuquerque, Bell Aircraft Corporation, Point Mugu, and Raytheon Manufacturing Co., Oxnard; missile test engineer, Radio Plane Company, Van Nuys; group supervisor, Coleman Engineering Co., Hurricane, Utah; member technical staff, Ramo Wooldridge; associate professor, Utah State University and Purdue University; head, electrical engineering, University of the Pacific; head, electrical engineering technology, Purdue University.
FITTS, JAMES L. (1967) ................................................................. History
A.B., Seattle University, 1950; M.A., University of Washington, 1951; Ph.D., University of California, Los Angeles, 1970. Professor.
Experience: Teacher, All Hallow's High School; claims supervisor, Social Security Administration; assistant professor, Immaculate Heart College, San Fernando Valley State College.

FITZPATRICK, MICHAEL JOHN (1975) ....................... Electronic and Electrical Engineering
B.S., California State Polytechnic College, San Luis Obispo, 1962; M.S., Ph.D., University of California, Santa Barbara, 1975. Associate Professor.
Experience: Industrial instructor, U.S. Naval Air Station, Point Mugu; teaching associate, University of California, Santa Barbara; senior servo analysis engineer, Lockheed California Company; lecturer and equipment technician, California State Polytechnic College.

FITZPATRICK, MICHAEL JOHN (1975) ....................... Electronic and Electrical Engineering
B.S., California State Polytechnic College, San Luis Obispo, 1962; M.S., Ph.D., University of California, Santa Barbara, 1975. Associate Professor.
Experience: Industrial instructor, U.S. Naval Air Station, Point Mugu; teaching associate, University of California, Santa Barbara; senior servo analysis engineer, Lockheed California Company; lecturer and equipment technician, California State Polytechnic College.

FITZPATRICK, MICHAEL JOHN (1975) ....................... Electronic and Electrical Engineering
B.S., California State Polytechnic College, San Luis Obispo, 1962; M.S., Ph.D., University of California, Santa Barbara, 1975. Associate Professor.
Experience: Industrial instructor, U.S. Naval Air Station, Point Mugu; teaching associate, University of California, Santa Barbara; senior servo analysis engineer, Lockheed California Company; lecturer and equipment technician, California State Polytechnic College.

FITZPATRICK, MICHAEL JOHN (1975) ....................... Electronic and Electrical Engineering
B.S., California State Polytechnic College, San Luis Obispo, 1962; M.S., Ph.D., University of California, Santa Barbara, 1975. Associate Professor.
Experience: Industrial instructor, U.S. Naval Air Station, Point Mugu; teaching associate, University of California, Santa Barbara; senior servo analysis engineer, Lockheed California Company; lecturer and equipment technician, California State Polytechnic College.

FITZPATRICK, MICHAEL JOHN (1975) ....................... Electronic and Electrical Engineering
B.S., California State Polytechnic College, San Luis Obispo, 1962; M.S., Ph.D., University of California, Santa Barbara, 1975. Associate Professor.
Experience: Industrial instructor, U.S. Naval Air Station, Point Mugu; teaching associate, University of California, Santa Barbara; senior servo analysis engineer, Lockheed California Company; lecturer and equipment technician, California State Polytechnic College.

FITZPATRICK, MICHAEL JOHN (1975) ....................... Electronic and Electrical Engineering
B.S., California State Polytechnic College, San Luis Obispo, 1962; M.S., Ph.D., University of California, Santa Barbara, 1975. Associate Professor.
Experience: Industrial instructor, U.S. Naval Air Station, Point Mugu; teaching associate, University of California, Santa Barbara; senior servo analysis engineer, Lockheed California Company; lecturer and equipment technician, California State Polytechnic College.

FITZPATRICK, MICHAEL JOHN (1975) ....................... Electronic and Electrical Engineering
B.S., California State Polytechnic College, San Luis Obispo, 1962; M.S., Ph.D., University of California, Santa Barbara, 1975. Associate Professor.
Experience: Industrial instructor, U.S. Naval Air Station, Point Mugu; teaching associate, University of California, Santa Barbara; senior servo analysis engineer, Lockheed California Company; lecturer and equipment technician, California State Polytechnic College.

FITZPATRICK, MICHAEL JOHN (1975) ....................... Electronic and Electrical Engineering
B.S., California State Polytechnic College, San Luis Obispo, 1962; M.S., Ph.D., University of California, Santa Barbara, 1975. Associate Professor.
Experience: Industrial instructor, U.S. Naval Air Station, Point Mugu; teaching associate, University of California, Santa Barbara; senior servo analysis engineer, Lockheed California Company; lecturer and equipment technician, California State Polytechnic College.

FITZPATRICK, MICHAEL JOHN (1975) ....................... Electronic and Electrical Engineering
B.S., California State Polytechnic College, San Luis Obispo, 1962; M.S., Ph.D., University of California, Santa Barbara, 1975. Associate Professor.
Experience: Industrial instructor, U.S. Naval Air Station, Point Mugu; teaching associate, University of California, Santa Barbara; senior servo analysis engineer, Lockheed California Company; lecturer and equipment technician, California State Polytechnic College.

FITZPATRICK, MICHAEL JOHN (1975) ....................... Electronic and Electrical Engineering
B.S., California State Polytechnic College, San Luis Obispo, 1962; M.S., Ph.D., University of California, Santa Barbara, 1975. Associate Professor.
Experience: Industrial instructor, U.S. Naval Air Station, Point Mugu; teaching associate, University of California, Santa Barbara; senior servo analysis engineer, Lockheed California Company; lecturer and equipment technician, California State Polytechnic College.

FITZPATRICK, MICHAEL JOHN (1975) ....................... Electronic and Electrical Engineering
B.S., California State Polytechnic College, San Luis Obispo, 1962; M.S., Ph.D., University of California, Santa Barbara, 1975. Associate Professor.
Experience: Industrial instructor, U.S. Naval Air Station, Point Mugu; teaching associate, University of California, Santa Barbara; senior servo analysis engineer, Lockheed California Company; lecturer and equipment technician, California State Polytechnic College.
FREY, DENNIS F. (1970) ................................................................. Biological Sciences
B.S., Oklahoma State University, 1963; M.S., Virginia State College, 1967; Ph.D., Oklahoma State University, 1970. Associate Professor.
Experience: Instructor in biology, Classen High School, Oklahoma City Public School District; teaching and research assistant, Oklahoma State University.

FREY, THOMAS G. (1970) ................................................................. Chemistry
B.A., University of Oregon, 1965; Ph.D., University of Idaho, 1970. Associate Professor.
Experience: Technician, University of Oregon; technician, analyst and teaching assistant, University of Idaho.

FREY, WINTON H. (1972) ................................................................. Ornamental Horticulture
B.S., California State Polytechnic College, 1958; M.S., Fresno State University, 1972. Associate Professor.
Experience: Graduate teaching and research assistant, University of Washington, School of Botany; instructor, San Luis Obispo Unified School District, Allan Hancock College, California State Polytechnic College; environmental control consultant, Pacific Gas & Electric Company and Kaiser Steel Company Sand & Gravel Division; garden columnist.

FRIES, JUDITH L. (1973) ................................................................. Chemistry
B.S., Fresno State College, 1966; Ph.D., University of Washington, Seattle, 1971. Associate Professor.
Experience: Research assistant, teaching assistant, instructor, University of Washington.

FRIETZSCHE, ARTHUR H. (1965) .......................................................... English
B.A., University of California, 1944; M.A., 1945; Ph.D., 1949. Professor.
Experience: Teaching assistant, lecturer, University of California; supervisor, technical publications, General Electric Company; associate professor, Utah State University.

FROGGATT, CLARA B. (1964) ............................................................ Psychometrist
B.A., University of Wyoming, 1940; M.A., California State Polytechnic College, 1968.
Experience: Teacher, Secondary School, Wyoming; personnel department, United Air Lines.

FROST, JACK D. (1969) ................................................................. Industrial Technology
B.S., Arizona State University, 1959; M.A., California Polytechnic State University, 1972. Associate Professor.
Experience: Development engineer, Airesearch Mfg. Co., Phoenix, Arizona; associate professor, Oregon Technical Institute; senior research engineer, Lockheed Missle and Space Co.; lecturer, South Australian Institute of Technology; project engineer, General Motors, Woodville, South Australia.

FROST, ROBERT H. (1953) ................................................................. Head, Physics Department
A.B., University of California, 1939; M.A., 1945; Ph.D., 1947, Associate Professor.
Experience: Teaching assistant, University of California; assistant professor, University of Missouri.

GALVEZ, CONNIE J. (1970) ................................................................. Graduate Nurse
B.S., Fresno State College, 1968.
Experience: Staff nurse, Arroyo Grande Hospital and San Leandro Community Hospital; Visiting Nurses Association of Northern Santa Barbara County; public health nurse, Alameda County Children and Youth Project.

GAMBLE, LYNNE E. (1976) ................................................................. Library
B.A., University of Texas at Austin, 1968; M.L.S., 1969, Associate Librarian.
Experience: Acquisitions librarian, University of Texas at Austin.

GAMBS, ROGER D. (1974) ................................................................. Biological Sciences
B.S., University of Idaho, 1963; M.S., 1965; Ph.D., University of Montana, 1973. Assistant Professor.
Experience: Teaching assistant, University of Idaho; instructor, Whitworth College and Wisconsin State University; research and teaching assistant, University of Montana; professor, Arizona Western College.
GANG, DONNA D. (1967) ................................................ Graduate Nurse
R.N., Regina General Hospital, Saskatchewan; additional studies, Jersey City Medical Center, Greystone Park, New Jersey.
Experience: Regina General Hospital, Morristown Memorial Hospital, New Jersey; Weyburn Union Hospital, Saskatchewan; Sierra Vista Hospital, San Luis Obispo.

GARNER, EDWARD R. (1967) .................................................. Mechanical Engineering
B.S., Bradley University, 1962; M.S., University of Arizona, 1965; Ph.D., Montana State University, 1973. Associate Professor.
Experience: Instructor, Rose Hulman Institute of Technology; postdoctoral fellow, Montana State University.

GASKIN, TIMOTHY A. (1970) ................................................... Ornamental Horticulture
B.S., University of California, 1954; M.S., University of Delaware, 1956; Ph.D., Purdue University, 1958; M.B.A., Ohio State University, 1968. Associate Professor.

GEDAYLOO, TEYMOOR (1965) ................................................................................. Physics
B.A., Macalester College, 1957; M.S., University of Washington, 1959; Ph.D., University of Kansas, 1973. Associate Professor.
Experience: Laboratory assistant, chief laboratory supervisor, University of Washington; instructor, Lawrence College; teacher and research associate, Argonne National Laboratory.

GEER, CAROL A. (1973) ................................................... Counselor
B.S., Bowling Green State University, 1960; M.A., The Ohio State University, 1964; Ph.D., Colorado State University, 1972, Associate Professor.
Experience: Counseling psychologist, Counseling Center, University of New Mexico; staff psychologist, Counseling Center, Colorado State University; school counselor, Kettering, Ohio; high school teacher, Crestline, Ohio.

GENEREUX, DOUGLAS G. (1970) ................................................ Agricultural Management
B.S., University of Nebraska, 1964; M.S., 1969. Associate Professor.
Experience: Economic research associate, Management Research Associates; administrative assistant to dean of international programs, and graduate assistant, Department of Agriculture Education, University of Nebraska, instructor, Nehawka Consolidated Schools, Nebraska.

GENTHNER, FREDERICK L. (1952) ................................................ Library
Experience: Periodicals librarian, Ball State Teachers College; officer, U.S. Army; assistant reference librarian, Ohio State University.

GEORGE, DAVID L. (1970) ...................................................... Political Science
A.B., San Diego State College, 1962; M.A., 1968; Ph.D., University of Oregon, 1970; additional graduate study, University of Michigan Survey Research Center. Associate Professor.
Experience: Teaching assistant, San Diego State College; teaching and research assistant, University of Oregon; NIMH post-doctoral fellow in political psychology, Yale University; visiting lecturer, San Diego State University; instructional Computing Supervisor, Division of Information Systems, Office of The Chancellor, The California State University and Colleges, Los Angeles.

GEORGE, MELVIN R. (1975) ................................................ Natural Resources Management
B.S., California State University, Chico, 1967; M.S., Texas Tech University, 1969; Ph.D., Utah State University, 1976. Assistant Professor.
Experience: Graduate research assistant, Texas Tech University, Utah State University; consultant to Utah State University Foundation and VTN Corporation, Denver, Colorado; research associate, Institute for Land Rehabilitation, Utah State University.
GERALD, CURTIS F. (1964) ..................................................... Computer Science & Statistics
B.S., Iowa State University, 1936; M.S., University of Cincinnati, 1938; Sc.D., Massachusetts Institute of Technology, 1941; additional graduate study, University of Chicago Evening School. Professor.
Experience: Graduate assistant, University of Cincinnati, Massachusetts Institute of Technology; research fellow, Massachusetts Institute of Technology; research engineer, supervising research chemist, Universal Oil Products Co.; assistant professor, University of Washington; associate director of research, El Paso Natural Gas Products Co. Registered professional engineer, Illinois.

GERARD, E. DOUGLAS (1951) .......................................................................... Executive Dean
B.S., University of British Columbia, 1950; M.S., University of Saskatchewan, 1951.
Experience: Instructor, University of British Columbia; instructor, University of Saskatchewan; shop superintendent, British Columbia Forest Products, Pitt Lake, British Columbia; service manager, Tractor and Allied Equipment, Limited, Melfort, Saskatchewan.

GERNERT, ALEX M. (1969) ............................................................... Engineering Technology
B.S., Cooper Union School of Engineering & Science, 1967; M.S., Stanford University, 1968; additional graduate study, Santa Clara University, California State Polytechnic College. Professor.
Experience: Technical staff, Bell Telephone Laboratories, New Jersey; consultant, Lawrence Radiation Laboratory and Western Electric Company. Registered professional engineer, California.

GERSTEN, ROY (1967) ...................................... Director, Associated Students, Inc., Business Affairs and University Union
B.S., Sacramento State College, 1966; graduate study, Sacramento State College.

GIBFORD, WILLIAM R. (1955) ........................................... Animal Science
B.S., California State Polytechnic College, 1947. Professor.

GILLHAM, JOHN F. (1975) .................................... Architecture and Environmental Design
Experience: Associate professor, assistant professor, University of Oregon; private landscape architecture practice, Eugene, Oregon; visiting critic, University of California, Berkeley; landscape architect, Harman, O'Donnell & Henninger, Denver; landscape architect, City of Eugene.

GIROLO, JACK E. (1970) ....................................................... Mathematics
B.A., San Jose State, 1964; M.S., Iowa State University, 1966; Ph.D., 1971. Associate Professor.
Experience: Programmer, Sylvania Electronic Systems West; instructor, Drake University; graduate assistant, University of Oklahoma, Iowa State University.

GLASER, MARGARET J. (1973) .......................................................... Education
B.S., Marquette University, 1953; M.Ed., 1970; Ed.D., University of Arizona, 1973, Associate Professor.
Experience: Elementary teacher, supervising teacher, Milwaukee Public Schools; lecturer, Marquette University; University of Arizona.

GLASS, L. JOE (1970) .......................................................... Agricultural Engineering
B.S., Purdue University, 1962; M.S., Texas A&M University, 1965; Ph.D., 1971. Associate Professor.
Experience: Engineering aide and student trainee, Soil Conservation Service Lafayette, Indiana; graduate assistant, instructor, Texas A & M University. Registered professional engineer, California.
GLASSCO, D. EDWARD (1968) ................................................................. Mathematics
B.S., Harvey Mudd College, 1963; M.A., University of Southern California, 1966; Ph.D.,
University of Southern California, 1971. Associate Professor.
Experience: Teaching assistant, University of Southern California.

GLIDDEN, WALLACE F. (1961) ................................................................. Head, Veterinary Science Department
B.S., California State Polytechnic College, 1952; B.S., University of California, Davis, 1955;
Experience: U.S. Army Veterinary Corps; poultry research, U.C.D.; large and small animal
practice, southern California.

GOLD, MARCUS (1947–52) (1954) ......................................................... Audio-Visual Service Coordinator
B.A., University of California, 1942; B.L.S., 1947; additional graduate study, University of
California. Professor.
Experience: U.S. Army; library, University of California; audi-visual librarian, California
State Polytechnic College; research assistant, University of California.

GOLDBERG, SAUL (1970) ............................................................. Electronic and Electrical Engineering
B.S., Fairleigh Dickinson University, New Jersey, 1963; M.E., University of Florida, Gaines-
ville, 1964; Ph.D., 1968. Professor.
Experience: Associate planning engineer, Southern California Edison Co.; assistant profes-
sor, University of Miami, Coral Gables, Florida; research assistant, University of Florida,
Gainesville; project engineer, Bendix Corporation, New Jersey; assistant engineer, Kearfott
Company, Clifton, New Jersey.

GOLDEN, JAMES R. (1966) ................................................................. Industrial Engineering
B.S., U.S. Military Academy, West Point, 1945; M.S., Ohio State University, 1961. Professor.
Experience: Pilot-Navigator, Wing Director of Safety, Strategic Air Command; Reliability
engineer, Chief of Reliability Quality and Maintainability, Space Systems Division; Chief of
Technical Integration, Aero Systems Division, U.S. Air Force. Registered professional engi-
neer, California.

GOLDENBERG, STUART (1970) ............................................................... Mathematics
B.S., University of California, Los Angeles, 1965; M.S., University of California, Riverside,
1969; Ph.D., 1970. Associate Professor.
Experience: Teaching assistant and teaching fellow, University of California, Riverside;
substitute teacher, Riverside Unified Schools.

GONZALEZ, LEONARD A. (1972) ......................................................... Coordinator School Relations
B.A., University of Maryland, 1966; additional graduate study, Chapman College.
Experience: Project engineer, Radar project, India; world wide engineering project officer,
Directorate HQ Ground-Electronic Engineering Installation Agency (GEEIA); emergency
actions officer and HQUSAFE primary alerting project engineer, command pilot, USAF.

GOODEN, REGINALD H., JR. (1970) ................................................. Political Science
B.A., University of California, Los Angeles, 1962; M.A., University of California, Santa
Barbara, 1969; Ph.D., 1972. Associate Professor.
Experience: Research assistant, teaching associate, University of California, Santa Barbara.

GORDON, RAYMOND G. (1967) ......................................................... Mechanical Engineering
B.S., Western New England College, 1966; M.S., University of Michigan, 1967; Ph.D., Uni-
versity of California, Santa Barbara, 1974. Associate Professor.
Experience: Design engineer, Universal Design, Inc.; draftsman, Duchess Design and Devel-
opment, Oriole Engineering Company, Combustion Engineering; laboratory assistant, West-
ern New England College.

GORDON, ROBERT L. (1967) .............................................................. Ornamental Horticulture
Kent State University, Kent, Ohio; Graduate, American Floral Art School, Chicago, Illinois.
Assistant Professor.
Experience: Science librarian, Kent State University; designer, Airport Florist, Akron, Ohio;
owner, Gordon's Floral Art Shop, Akron; designer-manager, Collin's West Towne Florist and
Tauer's Flowers, Akron; assistant director, American Floral Art School, Chicago, Illinois.
GOWGANI, GEORGE G. (1970) .................................................... Crop Science
B.S., California State Polytechnic College, San Luis Obispo, 1964; M.A., 1968; M.S., University of Nevada, 1972; Ph.D., 1975. Associate Professor.
Experience: Director, Agricultural Chemicals, Central Organization of Iranian Farmers Cooperative. Research technician, U.C. Davis; research fellow, University of Nevada; research assistant, Desert Biology Phytotron, Desert Research Institute, University of Nevada System.

GRADY, DAVID V. (1971) ............................................ ........................... Biological Sciences
A.B., University of California, Los Angeles, 1964; Ph.D., University of California, Los Angeles, 1974. Associate Professor.
Experience: Laboratory assistant, teaching assistant, research assistant, University of California at Los Angeles; lecturer, Mt. St. Mary’s College.

GRAHAM, DAVID (1972) ....................................... ........ Health Services Assistant
Experience: X-ray technician, Sierra Vista Hospital, San Luis Obispo; U.S. Air Force.

GRAHAM, PRISCILLA M. (1973) ................................ ..................... Library
B.S., California Polytechnic State University, 1971; M.A.L., California State University, San Jose, 1973. Assistant Librarian.

GRANT, DAVID M. (1950) .................................... Associate Dean, Academic Planning
B.A., Iowa State Teachers College, 1935; M.A., University of Iowa, 1940; Ph.D., Stanford University, 1953.
Experience: Instructor in public schools in Iowa; chairman, Department of Speech, Hastings College, Hastings, Nebraska; officer, U.S. Navy; instructor, Stanford University; Associate Dean, Graduate Studies, California Polytechnic State University.

GRANT, DONALD P. (1967) ............................... Architecture and Environmental Design
Experience: Construction and architectural firms in Utah; Moore Simpson and Partners, London; Ulrich Franzen; Raymond and Rado; Victor Lundy; guest professor Studiengruppe fur System forschung Heidelberg. Registered architect, New York and California; commissioner, San Luis Obispo City Housing Authority.

GRAVES, R. L., JR. (1951–54) (1957) ......................... Architecture and Environmental Design
B.S., Architecture, University of Kansas, 1948; M. Arch. and Urban Design, Cranbrook Academy of Art, 1950. Professor.
Experience: Associate Professor, Auburn University; assistant professor, University of Florida; instructor, Washington State University; private practice, Kansas City; architectural designer-draftsman with architectural firms in North Carolina, Michigan, California; U.S. Naval Construction Battalion. Registered architect, Kansas.

GRAVES, THEODORE G. (1947) ...................................................... Engineering Technology
B.A., Humboldt State College, 1940; M.S., Oregon State College, 1957. Associate Professor.
Experience: Instructor, Paia School, Paia, Maui, Hawaii; instructor, Maui High School, Maui, Hawaii; teacher, San Francisco, California; lecturer, University of California, Santa Barbara College.

GRAYSON, RANDOLPH L. (1972) .................................................... Biological Sciences
B.A., State University of Iowa, 1958; M.A., Washington University, 1963; Ph.D., Michigan State University, 1972. Associate Professor.
Experience: Teacher, Detroit Board of Education; Wayne County Community College.

GREEN, WILFRED M. (1966) .............................................. English
B.S., Drake University, 1951; M.A., California State Polytechnic College, 1965; additional graduate study, University of California and University of Illinois. Assistant Professor.
Experience: Instructor, Bering Institute, Adak, Alaska, Fresno Adult School, Allan Hancock College, San Luis Obispo Adult School; teacher, Hartley High School, Stanwood Consolidated School, Iowa, Fresno High School, Orcutt School; contractor.
GREENE, NELSON D. (1974) ................................ Architecture and Environmental Design

GREENWALD, HARVEY C. (1973) ................................ Mathematics
B.S., Massachusetts Institute of Technology, 1964; M.A., Washington University, 1966; Ph.D., 1970. Associate Professor.
Experience: Instructor, Washington University, St. Louis, Missouri; University of California, Irvine, California.

GREIL, JAMES S. W. (1974) ........................................ Crop Science
B.S., California State Polytechnic College, San Luis Obispo, 1967; M.S., University of Nevada, Reno, 1974. Assistant Professor.
Experience: Research assistant, University of Nevada, Reno and Austin; agricultural research technician, University of Nevada, Reno; U.S. Army.

GRIFFIN, JAMES B. (1971) .................................................. Economics
B.A., University of Illinois, 1956; M.A., Wayne State University, 1963; Ph.D., 1968. Associate Professor.
Experience: Lt. Col., USAF; graduate teaching assistant, Wayne State University; assistant professor, Chico State College.

GRIFFIN, LESLIE J. (1971) .................................................. Program Counselor
B.A., University of Montana, 1967; M.A., California Polytechnic State University, 1971; additional graduate study, University of California, Santa Barbara.
Experience: Youth director, Y.W.C.A.; student activities graduate assistant, California Polytechnic State University, San Luis Obispo.

GRIMES, JOSEPH E. (1973) .............................................. Computer Science and Statistics
B.A., St. Ambrose College, 1963; M.S., Illinois State University, 1968; Ph.D., Iowa State University, 1973. Associate Professor.
Experience: Teacher and coach, Central Catholic High School, Bloomington, Illinois; civil engineer, McLean County Highway Department, Bloomington; instructor, Iowa State University.

GRINNELL, ROBIN R. (1967) ............................................. Agricultural Engineering
B.S., Purdue University, 1955; M.S., University of Minnesota, 1961; additional graduate study, University of Illinois. Associate Professor.
Experience: Research assistant, Iowa State University, Purdue University, University of Illinois; research and teaching assistant, University of Minnesota; student engineer, John Deere Waterloo Tractor Works; assistant professor, University of Guelph, Ontario, Canada; U.S. Army QM and Signal Corps.

GROSZ, DAVID W. (1967) ................................................... Coach, Physical Education
B.S., University of Oregon, 1960; M.S., 1965.
Experience: Professional football player, Saskatchewan, Edmonton, Montreal, Oregon; high school biology instructor, Oregon; substitute teacher, Washington; high school physical education instructor and football coach, Hoquiam, Washington; director, summer program, Hoquiam Park Board.

GROVES, JOHN E. (1968) .............................................. Computer Science & Statistics
B.A., Pasadena College, 1963; M.A., University of California, Riverside, 1965; Ph.D., Kansas State University, 1972. Associate Professor.
Experience: Teaching Assistant, University of California, Riverside; assistant professor, Pasadena College.

HADLEY, ROBERT E. (1967) ...................................................... Animal Science
B.S., California Polytechnic State University, 1955; M.S., 1974. Associate Professor.
Experience: U.S. Army; show horse trainer, Southern California; stallion manager, Shamel Ranch, Murrieta; large animal veterinary assistant, Murrietta; artificial insemination technician-distributor, dairy and beef cattle, Oakdale.
Faculty and Staff

HAFEMEISTER, DAVID W. (1969) ............................................ ........... Physics
B.S., Northwestern University, 1957; M.S., University of Illinois, 1960; Ph.D., 1964. Professor.
Experience: Mechanical engineer, Argonne National Laboratory; teaching and research
assistant, University of Illinois; post doctoral fellow, Los Alamos Scientific Laboratory; assistant
professor, Carnegie-Mellon University.

HAGGARD, KENNETH L. (1967) ......................... Architecture and Environmental Design
Experience: Principal planner, Department of Planning and Renewal, Camden, New Jersey;
designer, Pancoast, Ferindino, Grafton and Skeels, Miami; instructor, University of Miami;
designer, City Planning & Architectural Associates, North Carolina; research scientist, Radio
Biological Laboratory, Balcones Research Center; U. S. Army; tool engineer, Boeing Aircraft.
Registered Architect, Florida.

HALE, THOMAS E. (1966) ............................................ Mathematics
B.S., Indiana State University, 1960; M.S., 1963; M.S., St. Louis University, 1967; Ph.D., 1972.
Professor.
Experience: Teacher, Vigo County School Corporation, Terre Haute, Indiana.

HALL, LLOYD A. (1966) ............................................ Medical Officer
B.A., Stanford University, 1947; M.D., 1952.
Experience: Internship, San Francisco City and County Hospital; residency, Monterey
County Hospital; postgraduate training, anesthesia, Cook County Hospital, Chicago; private
practice, Fort Bragg, California; college physician, Fresno State College.

HALL, MICHAEL H. (1974) ............................................ Animal Science
B.S., California Polytechnic State University, 1973; M.S., Kansas State University, 1975.
Assistant Professor.
Experience: Research assistant, Kansas State University; herdsman, Lucky Clover Ranch,
Atwater, California and Sutherland Farms, Prospect, Kentucky.

HALLETT, JAMES T. (1967) ............................................ Crop Science
B.A., San Francisco State College, 1959; additional study, California State Polytechnic
College. Associate Professor.
Experience: Research biologist, Stauffer Chemical Company; field research agronomist, U.S.
Borax Research Corporation and Germain's Inc.

HALLMAN, BARBARA McCLUNG (1973) ......................... History
B.A., California State University, Los Angeles, 1960; M.A., 1962; Ph.D., University of California,
Los Angeles, 1974. Assistant Professor.
Experience: Assistant professor, Pasadena City College; instructor, California State University,
Los Angeles; fellow, Foreign Area Fellowship Program, Italy.

HAMER, PATRICIA L. (1975) ............................................ Ornamental Horticulture
B.S., California Polytechnic State University, San Luis Obispo, 1970; M.L.A., California
Polytechnic State University, Pomona, 1977; additional graduate study, California Polytechnic
State University, San Luis Obispo. Assistant Professor.
Experience: Landscape designer/draftsperson, Troutner Bros. Landscape Co., San Luis
Obispo; floral designer/sales clerk, Flower View Gardens, Inc., Los Angeles; manager, Cal
Poly Flower Shop; plant specialist/interior plant designer, The Green Leaf, Los Angeles;
visiting lecturer, Universiti Teknologi Malaysia and Institute Teknologi Mara, Kuala Lumpur,
Malaysia.

HAMPTON, JOHN K., JR. (1976) ................................. Head, Biological Sciences Department
B.S., Millsaps College, 1947; Ph.D., Tulane University Graduate School, 1949. Professor.
Experience: Professor, Tulane University; professor, chairman, Department of Physiology,
Graduate School of Biomedical Sciences, University of Texas; member, University of Texas
Dental Science Institute; professor, University of Texas Dental Branch; professor, chairman,
Department of Biology, Adelphi University.

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HANKS, CHARLES J. (1954) ................................................. Head, Mathematics Department
B.S., Pennsylvania State Teachers College at Shippensburg, 1942; M.A., University of Penn-
sylvania, 1949; Ed.D., University of Arkansas, 1954. Professor.
Experience: Assistant professor, Drexel Institute of Technology; assistant football coach,
University of Arkansas; officer, U.S. Coast Guard.

HANNINGS, DAVID W. (1974) .............................................. Ornamental Horticulture
B.S., Auburn University, 1972; M.S., Cornell University, 1974. Assistant Professor.
Experience: Research assistant, Cornell University; teaching aide, Auburn University; sales
and garden maintenance for garden centers. Morrisville, Pennsylvania; grounds maintenance,
Pennsby Schools Fairless Hills, Pennsylvania.

HANNULA, REINO (1962) ....................................................... Computer Science & Statistics
B.A., University of California, Los Angeles, 1960; M.A., 1965; additional graduate study,
Institute of Computer Science, University of London, Tulane University, University of Massa-
chusetts. Associate Professor.
Experience: Manager, grocery, Santa Monica; self-employed, Los Angeles; teacher, Redondo
Beach High School.

HANSEN, PHYLLIS JEAN (1963) ....................................................... Library
Experience: Student assistant, University of Illinois Library; librarian, Queens Borough
Public Library, reference librarian, Community Library, San Leandro, California.

HARDEN, F. SHELDON (1948) ........................................... Physical Education
Experience: Player-coach, Sacramento Nuggets professional football team; playground
supervisor, City of Sacramento; Red Cross swimming instructor, San Luis Obispo High
School; officer, U.S. Army.

HARIRI, MAHMUD S. (1971) ........................................... Mathematics
B.S., Hobart College, 1948; M.A., Columbia University Teachers College, 1953; Ph.D., New
Experience: U.S. Department of State; assistant professor of educational sociology, Ameri-
can University of Beirut; U.S. Information Agency; U.S. Mission to Iran; head of department
of social studies, Beirut College for Women; principal of Broadview School, Saskatchewan;
instructor, Evening Division, Monterey Peninsula College; professor and head of department
of humanities and pedagogy; dean and registrar, Monterey Institute of Foreign Studies.

HARMON, ADELAIDE T. (1974) ............................................... Mathematics
B.S., Fordham University, 1955; M.S., 1964; Ph.D., New York University, 1969. Assistant
Professor.
Experience: Teacher, Cathedral High School, New York City; assistant professor/chairman,
Natural Sciences, St. Thomas Aquinas College, New York City; assistant professor, York
College of the City University of New York, Queens, N.Y.

HARPER, RICHARD R. (1968) ........................................... Coach, Physical Education
B.S., University of California, Los Angeles, 1959; M.S., 1960.
Experience: Assistant freshman coach, UCLA; head football coach, Riverside City College;
line coach, Colorado State University, University of California at Santa Barbara, University
of Colorado.

HARR, BERDY V. (1970) ........................................... Coach, Physical Education
B.A., California State University, Long Beach, 1958; M.S., Chapman College, 1972.

HARRIGAN, JOHN E., JR. (1969) ........................................... Architecture and Environmental Design
B.A., University of California, Berkeley, 1959; M.A., San Jose State College, 1962; Ph.D.,
California State University, 1966. Professor.
Experience: Engineering psychologist, Naval Electronics Lab, San Diego; assistant profes-
sor, Washington State University; teaching assistant, Colorado State University; supervisor
and human factors engineer, Chrysler Corporation; supervisor, human factors research, Mar-
tin Company; instructor, Loyola University; engineer, Lockheed Space and Missile Corpora-
tion.
HARRINGTON, JOHN F. (1976) ........................................................... English
Experience: Assistant professor, University of Massachusetts.

HARRIS, WALTER L. (1973) ................................................................. Educational Opportunity Program Counselor
B.S., California Polytechnic State University, 1973; M.A., 1975.
Experience: Instructor, Modesto Junior College; consultant, Paso Robles School for Boys; public relations, Atlantic Richfield Gas and Oil Company.

HARRIS, MARY ELIZABETH (1969) ..................................................... Library
B.S., San Diego State College, 1950; B.A., University of Oklahoma, 1952; M.S. in Library Science, University of Southern California, 1957. Senior Assistant Librarian.
Experience: Assistant librarian, Southwestern Medical School, University of Southern California; cataloger, U.S. Army Dependents' Education Group, Germany and California Western University; serials librarian, Lafayette College, Wisconsin State University.

HARRIS, ROY M. (1954) ........................................................................ Animal Science
Experience: Butcher, Swift and Co., Ogden, Utah; breeding herdsman, Suncrest Hereford Ranch, Springerville, Arizona; Gibbs Quarter Horse and Hereford Ranch, Mackay, Idaho; livestock husbandman, Utah State University farm, Logan, Utah; U.S. Army.

HASKELL, CHARLES THOMSON (1963) .................................................. Mathematics
Experience: Teacher, Fallon, Nevada, High School; trust clerk, Peoples National Bank of Washington; trust clerk, assistant trust officer, First National Bank of Nevada; graduate assistant, University of Arizona.

HASSLEIN, GEORGE J. (1949) ........................................................... Dean, School of Architecture and Environmental Design
B. of Arch., University of Southern California, 1945.
Experience: Road and bridge design in Mexico and Central America for Pan-American Highway; airport design for Army Engineers; development work at M.I.T. for Gilfillan Bros.; with architects and practice in Los Angeles area; designer for Summer Spaulding and Wurde- man and Becket; chief designer, Kistner, Curtis and Wright. Registered architect, California. NCARB Certificate; F.A.I.A.

HAUSER, RAYMOND J. (1969) .......................................................... Architecture and Environmental Design
B.S.A.E., Northrop Institute of Technology, 1955; M.Ed., Chapman College, 1969; Ph.D., Engineering, California Western University, 1975. Associate Professor.
Experience: Officer, instructor and jumpmaster, U.S. Army; operations engineer and project engineer, Cornell Aeronautical Laboratory, New York; senior research engineer, Lockheed Missiles and Space Company, Huntsville, Alabama; managing engineer, Impulse Base Flow Facility, Northrop Space Laboratories; senior research engineer, Atlantic Research Corporation.

HAWES, MICHAEL (1968) ................................................................. Engineering Technology
B. Engr., University College, Dublin, Ireland, 1958; M.S., Ohio State University, Dayton, Ohio, 1967. Associate Professor.
Experience: Demonstrator, University College, Dublin, Ireland; Electricity Supply Board, Ireland; instructor, Villanova University, Pennsylvania; research engineer, Wright-Patterson Air Force Base, Dayton, Ohio.

HAWLEY, LEWIS B. (1969) ................................................................. Chemistry
B.S., University of North Carolina, 1962; Ph.D., University of Georgia, 1966. Associate Professor.
Experience: Teaching and research assistant, University of North Carolina; N.A.S.A. fellow, University of Georgia; research associate, Indiana University, University of California at Berkeley; instructor, University of California.
HAWTHORNE, DANIEL L. (1973) .................................................. Psychology
Experience: Teaching associate and research assistant, University of California, Berkeley; Fulbright fellow to India; corporation test analyst for Kaiser Aluminum; research fellow at Institute of Industrial Relations, Berkeley; health manpower evaluator for California legislature; writer.

HAYES, JAMES H. (1969) .......................................................... Journalism
B.A., San Jose State College, 1950; M.A., University of Florida, 1966; additional graduate study, University of Minnesota. Associate Professor.
Experience: Instructor and administrative assistant, College of Liberal Arts, University of Minnesota; assistant professor, University of Arizona; visiting lecturer, American University in Cairo, Egypt; freelance writer; copyreader, city editor, reporter, various newspapers in California and Arizona; part-time correspondent, West Coast Edition, Wall Street Journal.

HAZEBROOK, HARRY (1968) ............................................. Electronic and Electrical Engineering
B.S., Michigan College of Mining and Technology, 1949; M.S., University of Wisconsin, 1951. Professor.

HEAD, DWAYNE G. (1966) .................................................. Physical Education
B.S., Jamestown College, 1958; M.S., South Dakota State University, 1963; Ed.D., University of Oregon, 1967. Professor.
Experience: Instructor, West Fargo High School, University of North Dakota (Ellendale); teaching assistant, South Dakota State, University of Oregon; Fulbright professor, University of IFE, ILE-IFE, Nigeria.

HEALEY, JOHN R. (1947) .................................................. Journalism
B.A., San Jose State College, 1941; M.S., University of California at Los Angeles, 1964. Professor.
Experience: Reporter, San Jose News; public relations, McClellan Field, Sacramento; reporter, Sacramento Union; Valley editor, Modesto Bee.

HEATON, RICHARD (1970) .................................................. Coach, Physical Education
Experience: Manager, Peterson Sales & Service, Waterloo, Iowa; part-owner, Heaton Sage Rambler, Waterloo; owner-manager, Heaton Enterprises, Cedar Falls, Iowa; supervisor of recreation, California Men's Colony.

HEINZ, JOHN A. (1953) ............................................. Director, Audio-Visual Services and Production
Experience: Technical and research assistant, University of Washington; production assistant, Korry Film Productions; free lance photographer, Seattle; production co-ordinator, Criterion Films, Inc., Seattle; film editor, KRON-TV, San Francisco.

HENDRICKS, FRANCIS (1969) ............................................. Architecture and Environmental Design
A.B., University of California, Berkeley, 1950; M.City & Regional Planning, 1953. Professor.
Experience: Associate research professor, University of Pittsburgh; lecturer, Stanford University; partner, Planning Research Associates, San Francisco; senior consultant, Arthur D. Little, Inc., Cambridge, Massachusetts; principal, Francis Hendricks & Assoc.; principal planner, 12th Naval District, U.S. Navy; private planning consultant, California; planner, City of Sausalito.
HENDRIKS, HAROLD J. (1952) .................................. Electronic and Electrical Engineering
B.S., Iowa State University, 1940; M.S., 1941; additional graduate study, University of Colorado, 1949. Professor.
Experience: Engineer, Collins Radio Co., Cedar Rapids, Iowa; engineer, U.S. Naval Ordnance Test Station, China Lake; industrial experience program, Westinghouse Electric Corp.; engineer, Radio Corporation of America, Camden, New Jersey; engineer, Burroughs Corp., ElectroData Division, Pasadena; faculty associate, The Boeing Company, Seattle; associate professor, electrical engineering, University of Nevada.

HENNIG, LLOYD R. (1963) ........................................ Medical Officer
B.S., University of California, 1927; M.D., 1932.
Experience: Internship, San Francisco General Hospital; residency, Franklin Hospital, San Francisco; U.S. Army; private practice, Willows.

HENSEL, DONALD W. (1960) ............................................................ History
B.S., University of North Dakota, 1949; M.A., University of Colorado, 1953; Ph.D., 1957. Professor.
Experience: Instructor, public schools in Colorado, New Mexico, Arizona; graduate assistant, University of Colorado, Boulder; instructor in history and coordinator of Arts and Sciences instruction, University of Colorado, Denver; head, Social Sciences Department, Associate Dean, Academic Planning, California State Polytechnic College.

HERLIHY, JOHN J. (1975) ........................................................... Agricultural Management
B.S., Manhattan College, N.Y., 1962; graduate study, University of Southern California. Assistant Professor.

HESCH, EARL R. (1956) ................................................ Engineering Technology
B.S., University of New Mexico, 1955; M.S., Oklahoma A. & M. College, 1956. Associate Professor.

HEWITT, CLARISSA (1976) .............................................................. Art
B.A., California State University, Northridge, 1971; M.F.A., Cranbrook Academy, 1976. Assistant Professor.
Experience: Instructor, Community Services; Charles Stewart Mott Community College, Flint, Michigan.

HICKS, WILLIAM R. (1957) .......................................................... Physical Education
B.S., University of California, Los Angeles, 1950; M.A., Long Beach State College, 1959. Professor.
Experience: United States Army; teacher, Long Beach City Schools; coach, Wilson High School, Long Beach, and Long Beach City College; football, baseball, and golf coach, California Polytechnic State University.

HILL, PATRICK D. (1975) ......................................................... Architecture and Environmental Design
Experience: Lecturer, Fourth Year Design Studio, School of Architecture, University of Illinois; associate partner, designer, Simon, Rettberg, Garrison & Flom, Inc., Champaign, Illinois; designer/senior draftsman, Research and Development Group, U.S. Reduction Co., NASA/ASEE Faculty Fellow, Stanford University/Ames Research Center; finalist, Francis J. Plym Fellowship, University of Illinois; private practice, Champaign, Ill.; registered architect, Illinois, California. Member: AIA, SCARAB, NCARB certified.

HILL, ROBERT W. (1976) .......................................................... Accounting
B.S., University of California, Berkeley, 1956; M.B.A., 1958; D.B.A., University of Southern California, 1975. Associate Professor.
Experience: Staff accountant, Arthur Young and Co., San Francisco; controller, Pacific Delta Gas, Inc., secretary/treasurer, Kelley-Moore Paint Co., San Carlos; assistant professor, California State University, Fresno and California State University, San Jose; instructor, University of Southern California; lecturer, California State University, Hayward; CPA.
HINKLE, THOMAS L. (1972) .................................................... Coach, Physical Education
B.S., California Polytechnic State University, 1966.
Experience: Teacher and coach, Mt. San Antonio Junior College, Lynwood High School, Bishop Amat High School.

HITCHCOCK, VAUGHAN D. (1962) .................................................... Physical Education
Experience: Physical education instructor, football and wrestling coach, Castro Valley High School; physical education instructor, football and wrestling coach, Hayward High School; teacher, Juvenile Hall, Alameda County Special Schools; playground, swimming and recreation director, Hayward Area Recreation Department, Hayward.

HIXON, DOROTHY F. (1974) .................................................... Registered Nurse
R.N. Salem Hospital School of Nursing, 1945; graduate studies, University of California, Santa Barbara Extension, Cuesta College.
Experience: Night supervisor relief, Salem Hospital, Salem, Massachusetts; general duty nurse, Jackson Memorial Hospital, Miami, Florida; clinic nurse, Dr. Burkes and Staff, Fresno, California; general duty nurse, John C. Fremont Hospital, Mariposa; French Hospital, San Luis Obispo; San Luis Obispo General Hospital.

HOFFMAN, GEORGE E. (1956) .................................................... Industrial Engineering
B.S., Carnegie Institute of Technology, 1951; B.S., California State Polytechnic College, 1962; M.B.A., University of Southern California, 1959; M.S., Stanford University, 1960; additional graduate study, Oregon State University. Professor.
Experience: Time and methods engineer, Robertshaw Fulton Controls; Kennecott Copper Corporation, Ray, Arizona. Registered professional engineer, California.

HOFFMAN, KENNETH A. (1974) .................................................... Physics
Experience: Research assistant, University of California, Berkeley; research fellow, University of Minnesota.

HOFFMANN, JON A. (1968) .................................................... Aeronautical Engineering
B.S., University of Wisconsin, 1964; M.S., 1966; additional graduate study, Wisconsin State University. Associate Professor.
Experience: Draftsman, Marathon Electric, Wausau, Wisconsin; engineer, Chemstrand Corporation, Pensacola, Florida; research engineer, Caterpillar Tractor, Peoria, Illinois; instructor, University of Wisconsin; research engineer, Trane Company, LaCrosse, Wisconsin.

HOLAND, V.L. (1972) .................................................... Biological Sciences
Experience: Teaching assistant, Fresno State College; research assistant, teaching assistant, teaching associate, assistant professor, University of California, Berkeley; visiting professor, University of California, Berkeley, Sagehen Creek Field Station.

HOLLEY, F. JERALD (1961) .................................................... Director, Admissions, Records and Evaluations
B.S., Utah State University, 1961; M.A., California State Polytechnic College, 1968.

HOLT, RAY J. (1955) .................................................... Physics
A.B., University of California, 1939; M.A., 1949. Associate Professor.
Experience: Physicist, University of California Radiation Laboratory; aircraft inspector, Consolidated Vultee Aircraft Corporation; high school and junior college teacher.

HOLTZ, WALTER E. (1954–66) .................................................... Head, Environmental Engineering Department
Experience: Professor, California State Polytechnic College, Pomona; project engineer, Baker Engineering Corp.; engineer, Carrier Crop.; engineer, U.S. Naval Air Missile Test Center; U.S. Air Force; consultant, USAID. Registered professional engineer, California.
B.A., University of Washington, 1963; M.A., Bowdoin College, 1968; Ph.D., Purdue University 1972. Assistant Professor.
Experience: Teacher, North Kitsap High School, Poulsbo, Washington; The Charles Wright Academy Tacoma; assistant professor, Prairie View A & M College, Texas; research and teaching assistant, Purdue University; evaluation specialist, Gemrel, Inc., St. Louis.

HOMAN, DENNIS N. (1966) Biological Sciences
B.A., University of Iowa, 1955; M.S., 1958; Ph.D., 1960. Professor.
Experience: Instructor, University of Iowa; assistant professor, Illinois State University; associate professor, Wisconsin State University.

HONESGGER, HARRY H. (1961) Metallurgical Engineering

HOOKS, ROBERT D. (1966) Animal Science
B.S., California State Polytechnic College, 1961; M.S., Iowa State University, 1964; Ph.D., 1966. Professor.
Experience: Swine herdsman, State College of Washington, Pullman, Washington; manager and part-owner, orchard and swine farming enterprise, Orland, California; U.S. Marine Corps.

HOOVER, ROBERT L. (1970) Social Sciences
A.B., University of California, Berkeley, 1965; M.A., 1969; Ph.D., 1971; additional graduate study, University of California, Berkeley, Stanford University. Associate Professor.
Experience: University of California Archaeological Survey, Berkeley; graduate assistant, University of California, Berkeley; instructor, Merritt College, Oakland; visiting professor, Stanford University; midshipman, U.S. Navy; editor and chief archaeologist, San Luis Obispo County Archaeological Society.

HORTON, WILLIAM F. (1968) Electronic and Electrical Engineering
B.S., California Institute of Technology, 1946; M.S., 1948; Ph.D., UCLA, 1966. Professor.
Experience: Department head, senior staff engineer, Hughes Aircraft Company; design specialist, section head, Lear Sigler, Inc.; engineer, Westinghouse Electric; research engineer, associate in engineering, UCLA.

HOSTETTER, H. CLYDE (1958) Director, Communications/Media Production
B.J., University of Missouri, 1949; graduate study, University of Missouri, University of Southern California, American University, Arizona State University.
Experience: Officer, U.S. Navy; public relations director, Kansas Industrial Development Commission; United States Junior Chamber of Commerce; public relations consultant, Hughes Aircraft Company; associate editor, Farm Journal, Inc., free-lance multi-media producer.

HOULIS, JEROME F. (1959) Chemistry
B.S., California State Polytechnic College, 1958; graduate study, California State Polytechnic College, Assistant Professor.

B.S., Oklahoma State University, 1943; M.S., Ohio State University, 1947; additional graduate study, Oklahoma State University. Professor.
Experience: Assistant professor, Oklahoma State University; manager of plant shipments, Furrow and Co., Guthrie, Oklahoma; grower and consultant, Higdon Flower Shop and Nursery, Oklahoma City, Oklahoma; U.S. Army.

HOWARD, LORRAINE H. (1964) Associate Dean, Women
Experience: Assistant buyer, Meier & Frank Co., Portland; assistant chemist, Hawley Pulp and Paper, Oregon City; assistant to director, Fruit & Flower Day Nursery, Portland; teacher, Oregon State University.
HOWELL, ROBERT (1974) ................................................................. Art
Experience: Teacher, Marine Science Institute, Guymas, Mexico; instructor, Brooks Institute;
self-employed, Howell Productions.

HOYT, HOMER E. (1969) ................................................................. Education
Ed.B., Rhode Island College of Education, 1940; M.A., University of California, Berkeley,
1956. Associate Professor.
Experience: Executive director, Northern San Joaquin Valley Counties Supplementary
Education Center; district superintendent, Healdsburg High School and Elementary School
Districts; assistant superintendent, instructional services, San Luis Obispo County Schools;
elementary and junior high school principal, San Rafael City Schools.

HOYUM, RAYMOND A. (1976) .......................................................... Soil Science
B.S., University of Wisconsin, Stevens Point, 1969; M.S., Auburn University, 1973; Ph.D.,
1976. Assistant Professor.
Experience: Research assistant, Auburn University; soil scientist, U.S.D.A., Soil Conservation
Service; farm employee, Libby, McNeal and Libby; U.S. Army.

B.S., National Taiwan University, 1961; M.S., So. Dakota School of Mines and Technology,
1963; Ph.D., Northwestern University, 1968. Professor.
Experience: Engineering officer, R.O.T.C. Nationalist Chinese Airforce, Taiwan; structural
engineer, Taiwan Public Works Bureau; research fellow, South Dakota School of Mines and
Technology; research assistant, Northwestern University; body research engineer in com-
puter-aided design and advance development, Chrysler Corporation; senior engineer, Bechtel
Corporation, San Francisco; NASA-ASEE Research Fellow, NASA Flight Research Center,
Edwards Air Force Base, California; registered professional engineer, California.

HSU, JOHN Y. S. (1970) ................................................................. Computer Science and Statistics
B.S., National Taiwan University, 1959; M.S., University of California, Berkeley, 1964;
Experience: Research engineer, Broadcasting Corporation of China; teaching fellow, re-
search assistant and reader, University of California, Berkeley; research engineer, Gertea
Product; project engineer, Librascope, Fairchild Core Memory; computer architect, Varian
Data Machines.

HUEHN, KEMPTON L. (1968) .......................................................... Mathematics
B.S., Iowa State University, 1957; M.S., 1962; Ph.D., Colorado School of Mines, 1974. Associate
Professor.
Experience: Member technical staff, T.R.W. Systems Group; instructor, Iowa State University.
Colorado School of Mines.

HUFF, EARL D. (1970) ................................................................. Political Science
B.A., San Francisco State College, 1959; M.A., University of Idaho, 1969; Ph.D., 1971. Associate
Professor.
Experience: Instructor, Solano College, Vallejo, California; chairman, Social Studies Depart-
ment, Solano Junior High School, Vallejo; Fulbright exchange teacher, England; NSF fellow,
University of Idaho; Fulbright fellow, American University of Beirut, Lebanon.

HUGHES, LUTHER B., JR. (1971) ........................................................ Soil Science
B.S., Western Kentucky University, 1966; M.S., Purdue University, 1970; Ph.D., 1971. Associate
Professor.
Experience: Soil conservationist, U.S.D.A. Soil Conservation Service, Lexington, Kentucky;
graduate research and teaching assistant, Purdue University.

HUOT, ROBERT J. (1963) ................................................................. English
B.A., University of Washington, 1946; M.A., 1951; Ph.D., University of Utah, 1971; additional
graduate study. Professor.
Experience: Salesman and sales instructor, A. S. Aloe Surgical Supply Company; teaching
fellow, University of Washington; instructor, Tulane University; associate, University of
Washington; instructor, Montana State College; graduate assistant, University of Utah.
Faculty and Staff

HUTCHINSON, JAMES R. (1971) ............................................. Graphic Communications
Experience: Vice president, advertising art and production, The Albert Woodley Co., Inc.;
senior media planner, Young and Rubicam, Inc.

HUTTON, REX L. (1966) .......................................................... Mathematics
B.S., Baldwin Wallace College, 1959; M.S.T., Illinois Institute of Technology, 1964; Ed.D.,
Arizona State University, 1972. Professor.
Experience: Vice president, advertising art and production, The Albert Woodley Co., Inc.;
senior media planner, Young and Rubicam, Inc.

HYER, EDGAR A. (1951) .......................................................... Agricultural Management Department
B.S., Utah State College, 1939; M.S., 1942; Ph.D., Cornell University, 1948. Professor.
Experience: Land use economist, Utah; field supervisor of A.A.A., Utah; Economist, U.S.
Forest Service, Ogden, Utah; U.S. Army; graduate assistant, Cornell University; assistant
professor of agricultural economics, Oregon State College.

HYNES, C. DENNIS (1957) ..................................................... Biological Sciences
B.A., Macalester College, 1951; M.S., University of Michigan, 1953; Ph.D., University of
Florida, 1957. Professor.
Experience: Museum assistant, University of Michigan; teaching assistant and research
assistant, University of Florida.

IKENOYAMA, GEORGE K. (1964) ........................................... Architecture and Environmental Design
Experience: Draftsman and associate, John Badgley; private practice, California; lecturer,
California State Polytechnic College; visiting lecturer, University of Hawaii. Registered
architect, California.

ITZKOWITZ, HOWARD F. (1974) ........................................... Architecture and Environmental Design
B. Arch., Rice University, 1963; M. Arch., Cranbrook Academy of Art, 1974. Assistant
Professor.
Experience: Architect, Ann Arbor, Michigan, and San Francisco; project architect, Hertzka
& Knowles; designer, Mario J. Ciampi; designer, Emery Roth & Sons; designer, Port of New
York Authority, Aviation Planning Department.

JACKS, MADGE A. (1964) ....................................................... Medical Officer
M.D., Loyola University Medical School, Chicago.
Experience: Internship, Cook County Hospital, Chicago; residency, Municipal Contagious
Disease Hospital, Chicago; residency, Illinois Research & Educational Hospital, Chicago; private
practice, Chicago; St. Joseph's Hospital Laboratory, San Francisco; residency, San Luis
Obispo General Hospital.

JACOBS, JAMES W. (1967) ..................................................... Animal Science
B.S., Oklahoma State University, 1967; M.S., California Polytechnic State University, 1975.
Associate Professor.
Experience: Livestock showing, judging, and ranching operations.

JACOBSON, RALPH A. (1965) ................................................ Chemistry
B.A., Montclair State College, 1962; Ph.D., Cornell University, 1966. Assistant Professor.
Experience: Research fellow, California Institute of Technology; assistant professor, University
of Oklahoma.

JAMES, RUTH H. (1971) ....................................................... Homes Economics
B.S., Iowa State University, 1943; M.A., California State College, Los Angeles, 1960; Ed.D.,
University of California, Los Angeles, 1968. Professor.
Experience: Teacher, Chowchilla Union High School and Carmel Unified Schools; home
economist, Southern California Gas Company; lecturer, California State College, Los Angeles;
counselor, School of Education, University of California, Los Angeles; instructor, California
State College, Long Beach; assistant professor, San Fernando Valley State College.

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JAMESON, GLORIA (1967) English
B.A., Texas Woman's University, 1941; M.A., Teacher's College, Columbia University, 1944; Ph.D., University of Texas, 1966. Professor.
Experience: Librarian, Galveston Public Schools; elementary teacher in Houston, San Antonio, Texas; Muskogee, Oklahoma; and Montgomery County, Maryland; consultant in education, Montana, and Christ Church, Alexandria, Virginia; professor of English, Ewha Woman's University, Seoul, Korea; research associate, linguistics, University of Texas; director, intensive English, Vietnamese Leadership/Scholarship Program; acting head, Foreign Languages Department, California Polytechnic State University.

JANEWAY, ROBERT K. (1972) Engineering Technology
B.S., California State Polytechnic College, 1951; graduate study, University of California, Los Angeles, California Polytechnic State University. Assistant Professor.

JANKAY, PETER (1973) Biological Sciences
B.A., San Fernando Valley State University, 1966; M.S., 1969; Ph.D., University of California, Santa Barbara, 1973. Associate Professor.
Experience: Technical assistant, graduate assistant, lecturer, equipment technician, San Fernando Valley State University; teaching associate, University of California, Santa Barbara.

JENKINS, STARR (1961) English
B.A., University of New Mexico, 1948; M.A., Stanford University, 1959; Ph.D., University of New Mexico, 1972. Professor.
Experience: Navy and Army; instructor, Albuquerque Public High Schools; laborer, firefighter, smokejumper and aerial observer with U. S. Forest Service, California, Oregon, Montana, and Idaho; national park ranger, Yosemite; information specialist (writer-photographer), U. S. Forest Service, Southwestern Regional Office, Albuquerque, New Mexico; free-lance writer-photographer.

JENNINGS, CHARLES W. (1968) Art
Experience: Factory worker, IBM; graduate assistant, Northern Illinois University.

JOHNSON, BOYD WALKER (1969) Mathematics
B.S., United States Naval Academy, 1951; M.S., North Carolina State College, 1956; Ph.D., North Carolina State University, 1963. Professor.
Experience: Assistant professor. U.S. Air Force Academy and Florida Presbyterian College; Dean of Men, Florida Presbyterian College.

JOHNSON, CORWIN M. (1961) Head, Crops Science Department
B.S., State College of Washington, 1950; M.S., 1951; Ph.D., Cornell University, 1953. Professor.
Experience: Field and laboratory technician, research assistant, Department of Agronomy, State College of Washington; research assistant, Department of Agronomy, Cornell University; research agronomist, Northwestern Washington Experiment Station; assistant professor and agronomist, Mississippi State University.

JOHNSON, ERIC V. (1969) Biological Sciences
B.A., Brown University, 1964; Ph.D., Cornell University, 1969. Associate Professor.
Experience: Teaching and research assistant, assistant curator of birds, Cornell University.

JOHNSON, MEAD R. (1956) English
B.A., University of Denver, 1939; M.A., 1949; additional graduate study, University of Denver. Professor.
Experience: Advertising manager, Sterling (Colorado) Farm Journal; U. S. Army; instructor in Colorado and California public schools; instructor, Colorado School of Mines; associate professor, Central Missouri State College.
JOHNSON, MILES B. (1957) ................................................... English
B.A., Gustavus Adolphus College, 1947; M.A., University of Minnesota, 1951; M.A., University of Denver, 1953; M.A., University of Iowa, 1966; additional graduate study, University of Washington, University of Southern California, University of Iowa. Associate Professor.
Experience: Instructor and publications adviser, Florence State College; instructor and publications chairman, Memphis State University; instructor, University of Tennessee, Memphis; assistant professor, Luther College; instructor, University of Puget Sound; presidential assistant, Johnson Wholesale and Manufacturing Company; author.

JOHNSON, RICHARD F. (1950) ........................................... Head, Animal Science Department
Experience: U.S. Army; instructor, College of Agriculture and assistant animal husbandman, Experiment Station, State College of Washington, Pullman, Washington.

JOHNSON, S. SUE (1975) ............................................. Director, Learning Assistant Center
B.A., University of Iowa, 1957; M.A., University of Minnesota, 1965; Ph.D., 1975.
Experience: Instructor, University of Minnesota; Director, student activities and instructor, Lakewood Community College, Minnesota; instructor, Anuka-Ramsey Community College, Minnesota; program consultant, West Bank Union, University of Minnesota; music instructor, Dubuque and Anamosa, Iowa.

JOHNSON, WILLIAM A. (1973) ........................................... Chemistry
B.S., University of Puget Sound, 1963; Ph.D., Oregon State University, 1967. Assistant Professor.
Experience: Chemist, U.S. Oil and Refining Co.; chemist, Reichold Chemical Company, Tacoma, Washington; teaching and research assistant, Oregon State University; assistant professor, Whitworth College, Purdue University.

JOHNSON, WILLIAM V. (1966) ........................................... Music
Experience: Instrumental music instructor, Seeger Memorial High School, Indiana; musical director, Light Opera Company, Illinois; assistant to conductor and member of band staff, University of Michigan.

JOHNSTON, THOMAS V. (1967) ........................................... Head, Art Department
Experience: Head, Department of Art, Palmerston North Teachers College, New Zealand; head, Department of Art, Waihi College, New Zealand; lecturer, Glasgow School of Art and Architecture; newspaper art critic; internationally recognized sculptor.

JONES, ANDREW D. (1972) ............................................. Head, Civil Engineering Department
B.S., University of Houston, 1953; M.S., University of Texas, 1965; Ph.D., Purdue University, 1972. Professor.
Experience: Graduate research instructor, Purdue University; district construction engineer, Texas Highway Department; lecturer, University of Texas; supervising planning engineer, Texas Highway Department; senior design engineer, Texas Highway Department. Registered professional engineer, Texas.

JONES, DANIEL R. (1976) ............................................. Chemistry
B.A., University of Utah, 1969; Ph.D., Stanford University, 1974. Assistant Professor.
Experience: Research assistant, Kennecott Research Center; instructor, DeAnza Community College; teaching and research assistant, Stanford University; research associate, University of Uppsala, Sweden; instructor/research associate, University of Utah.

JONES, DOUGLAS C. (1976) ...................................... Student Activities Information Director
B.A., University of California, Los Angeles, 1971.
JONES, HAZEL J. (1974) ........................................ Vice President for Academic Affairs  
B.A., Western State College, Colorado, 1938; M.A., University of California, Berkeley, 1943;  
Experience: Teacher, Colorado and California Schools; English department chair, director  
of in-service education, Whittier Schools; professor, California State University, Los Angeles;  
professor of English and dean, School of Humanities and Social Sciences, California State  
University, Fullerton.

JONES, JACK B. (1969) ..................................................................... Education  
B.A., University of California, Santa Barbara, 1937; M.A., 1965; Ed.D., University of Ari-  
zona, 1970. Associate Professor.  
Experience: Administrative officer, U.S. Army; sergeant, Santa Barbara Police Department;  
elementary teacher, Santa Barbara, Goleta; graduate assistant, University of Arizona; instruc-  
tor, Ventura College.

JONES, RICHARD V. (1969) .......................................... ......................................... Education  
Professor.  
Experience: Teacher, Fresno City Schools; consultant in Field Service, research assistant,  
staff associate and Director of Research, extension teacher, University of California; principal,  
Petaluma Senior High School; superintendent, Oroville Union High School District; Director  
of Continuing Education and Placement Services, Chico State College.

JORGENSEN, NANCY ANN (1968) ............................................... Counselor  
B.A., University of Hawaii, 1957; graduate study, Institute of Psychology, University of  
Paris, University of Hawaii, University of California, Santa Barbara. Associate Professor  
Experience: Graduate assistant, University of Hawaii; psychometrist, California State Poly-  
technic College; senior psychometrist, University of California, Berkeley; junior assistant-  
research, U.C.L.A.; psychometrist and associate psychologist, San Luis Obispo County Com-  
munity Mental Health Services.

JUDD, W. BOYD (1956) ............................................................. Mathematics  
B.S., St. Mary's College, 1939; M.A., University of California, 1951; D.Ed., the Pennsylvania  
State University, 1969. Professor.  
Experience: High school teacher, California; instructor, Army specialized training program,  
University of Santa Clara; research mathematician, University of California; computer labora-  
tory, in charge of statistical operations, Bureau of Research and Guidance, Office of Los  
Angeles County Superintendent of Schools; tabulator machine supervisor, State of California,  
Department of Public Health; participant in National Science Foundation Institute, New  
Mexico State University.

KABAT, HERBERT R. (1952) ............................................................. Physics  
B.S., United Stated Naval Academy, 1938; M.A., Stanford University, 1951; additional gradu-  
ate study, University of Southern California, Stanford University, University of Colorado.  
Professor.  
Experience: Officer, U.S. Navy; research analyst, Rheem Mfg. Co.; instructor, Pasadena City  
College, College of the Sequoias.

KALATHIL, JAMES S. (1965) ............................................................. Physics  
B.S., University of Madras, 1956; M.A., Southern Illinois University, 1963; Ph.D., University  
of Nevada, 1977. Assistant Professor.  
Experience: Instructor, Frostburg State College; graduate fellow, University of Nevada;  
research associate, Desert Research Institute; assistant, U.S. Embassy, Kabul, Afghanistan.

KANE, JOHN J. (1969) ............................................................. Head, Mechanical Engineering Department  
B.S., U.S. Naval Academy, 1951; M.S., University of Pittsburgh, 1959, Ph.D., 1961. Professor.  
Experience: Adjunct Professor, University of Pittsburgh; engineer, Westinghouse Electric  
Corporation, Pittsburgh; lecturer, University of Southern California; member technical staff,  
Aerospace Corporation; self-employed, Sales Management; officer, U.S. Marine Corps.
<table>
<thead>
<tr>
<th>Name</th>
<th>Degree Details</th>
<th>Department</th>
<th>Experience</th>
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<tbody>
<tr>
<td>KANN, DAVID J.</td>
<td>B.A., Brandeis University, 1964; M.A., New York University, 1966; Ph.D., Occidental College, 1971</td>
<td>English</td>
<td>Teaching associate, Occidental College; instructor, Polytechnic School, Pasadena.</td>
</tr>
<tr>
<td>KATEKARU, JAMES</td>
<td>B.S., University of Oregon, 1956; M.S., University of Arizona, 1961; Ph.D., University of Cincinnati, 1965</td>
<td>Chemistry</td>
<td>Research assistant, University of Arizona; analytical chemist, Federal Food and Drug Administration; teaching assistant, University of Cincinnati; research chemist, North American Aviation; editor, Chemical Abstract Service; chemist, Naval Radiological Defense Laboratory.</td>
</tr>
<tr>
<td>KAY, THOMAS D.</td>
<td>B.S., Wayne State University, 1957; M.A., California State Polytechnic College, 1967</td>
<td>Engineering Technology</td>
<td>Assistant training director, Ex-Cello-O Corporation; apprentice instructor, Chrysler Corporation; radio team chief and refrigeration mechanic, U.S. Army; machinist, Detroit-Timken Axle Company; apprentice, Goodyear Tire and Rubber Company.</td>
</tr>
<tr>
<td>KEETCH, ROGER A.</td>
<td>B.S., California State Polytechnic College, 1955; M.S., University of Southern California, 1964</td>
<td>Mechanical Engineering</td>
<td>Engineer, Menasco Manufacturing Co., Rocky Mt. Arsenal, Lockheed Aircraft; president, Dynalytic Engineering Co.; instructor, California State Polytechnic College, Pomona.</td>
</tr>
<tr>
<td>KEELING, DAVID L.</td>
<td>B.S., Arizona State University, 1969; Ph.D., University of Hawaii, 1974</td>
<td>Chemistry</td>
<td>Chemist, Shell Chemical Co.; visiting assistant professor, lecturer, assistant professor, University of Hawaii.</td>
</tr>
<tr>
<td>KEEP, ROGER L.</td>
<td>B.S., Church College, 1957; M.S., Stout State University, 1968; Ed.D., Utah State University, 1972</td>
<td>Industrial Technology</td>
<td>Building construction supervisor, Polynesian Cultural Center, Hawaii; foreman, Perkins Machine Company; licensed general building contractor.</td>
</tr>
<tr>
<td>KEETCH, BRENTH</td>
<td>B.A., Utah State University, 1965; M.A., 1966; Ph.D., University of Utah, 1971</td>
<td>English</td>
<td>Research aide, Utah State University Forestry Department, U.S. Forest Service; senior assistant, Utah State University; U.S. Army; staff writer, The Salt Lake Tribune; correspondent, newsman, The Associated Press, Utah, Arizona.</td>
</tr>
<tr>
<td>KEIF, RODNEY G.</td>
<td>B.S., Kansas State University, 1949; M.S., Kansas State University, 1975</td>
<td>Environmental Engineering</td>
<td>Sales and application engineer, O'Connor-Oklahoma Company, Oklahoma City; registered professional engineer, Oklahoma; consultant, Naval Weapons Center, China Lake; private practice.</td>
</tr>
<tr>
<td>KELLER, ELMO A., JR.</td>
<td>B.A., Brigham Young University, 1959; M.A., 1961; Ph.D., Iowa State University, 1972</td>
<td>Computer Science and Statistics</td>
<td>National Science Foundation trainee, Iowa State University; instructor, Iowa State University; instructor, Church College of Hawaii; graduate teaching assistant, Brigham Young University.</td>
</tr>
<tr>
<td>KELLERMAN, MARTIN</td>
<td>B.S., Polytechnic Institute of Brooklyn, 1953; Ph.D., University of Washington, 1966</td>
<td>Chemistry</td>
<td>Research assistant, Polytechnic Institute of Brooklyn, University of Washington, University of California at San Diego; analytical chemist, Continental Baking Company.</td>
</tr>
</tbody>
</table>
KELLEY, HELEN P. (1966) ................................................................. Art
B.P.A., Brooks Institute of Photography, 1966; M.S., California State University, San Jose, 1971. Professor.
Experience: Free-lance writing and newspaper work, Arcadia and Preston, Kansas; free-lance photography and writing.

B.S., East Central State College, 1962; M.S., University of Utah, 1964; Ph.D., 1972. Assistant Professor.
Experience: Lecturer, San Diego State University; teaching assistant, University of Utah; research assistant and lecturer, University of Alberta; associate professor, Universidad De Simon Bolivar, Caracas, Venezuela.

KENNEDY, ROBERT E. (1940) ............................................................... President
Experience: Editorial Staff, San Diego Sun, San Diego Daily Journal, San Luis Obispo Telegram-Tribune, Palo Alto Times; at California State Polytechnic College: Chairman, Journalism Department; Director of Public Relations, Assistant to the President; Dean, Arts and Sciences; Vice President.

KENNELLY, BRUCE (1947) ............................................................... Chemistry
B.S., University of Kentucky, 1944; M.S., Purdue University, 1946; Ph.D., Cornell University, 1952. Professor.
Experience: Chemist, department of agricultural chemistry, Purdue University; research chemist, department of biochemistry and nutrition, Cornell University.

KENNYON, PAUL (1957) ................................................................. Business Administration
J.D., Southern Methodist University law school, 1949; M.A., California State Polytechnic College, 1959. Associate Professor.
Experience: Insurance legal staff, investment counseling, methods analyst, and business systems and procedures analyst.

KERR, JOHN F. (1967) ................................................................. English
B.A., Arkansas State University, 1953; M.A., University of Michigan, 1956; Ph.D., University of Texas, 1964. Professor.
Experience: High school journalism and speech teacher, Missouri; assistant professor, Westminster College, Missouri; instructor, University of Missouri; teaching assistant, University of Texas; assistant professor, Louisiana State University.

KERSTEN, TIMOTHY W. (1971) ............................................................... Economics
Experience: Radio announcer, KXRZ radio station; survey interviewer, California Department of Water Resources; graduate research assistant, California Coordinating Council for Higher Education.

KIM, CHI SU (1974) ................................................................. Library
Experience: Manager, Committee of Refugees; administrative assistant, Office of Prime Minister, Republic of Korea; librarian, California State University, Humboldt. Officer, Republic of Korea Army; graduate assistant, University of Oregon.

KIMBALL, KENNETH R. (1967) ............................................................... Industrial Technology
B.E., University of Southern California, 1956; M.S., 1959; B.S., 1963; additional graduate study, Arizona State University. Associate Professor.
Experience: Resident engineer and executive officer, Engineer District; member, War Department General Staff; chief of management branch, Major Air Command; air installation officer and wing staff engineer; member of technical staff and supervisor of Electronics Manufacturing, Hughes Aircraft; industrial engineer, chief of overhaul and repair, engineering group leader, Autonetics; manufacturing manager, California Steel and Tube; general manager, Climax Manufacturing; head, plant maintenance, and chief, industrial engineering, Rocketdyne; staff consultant, H. B. Maynard and Company. Registered professional engineer.
KLAUSTERMEYER, JAMES L. (1964-70) (1975) .................................................. Crop Science
B.S., California State Polytechnic College, 1960; M.A., 1965; M.S., University of California, Davis, 1971; Ph.D., 1976. Associate Professor.
Experience: Agriculture instructor, Santa Paula and Camarillo high schools; research assistant and postgraduate research plant physiologist, University of California, Davis.

KLEPPINGER, EDWARD H. (1975) .................................................. Library
Experience: Reference librarian, San Jose State University.

KNABLE, ANTHONY E. (1973) .................................................. Natural Resources Management
Experience: Graduate research assistant, Southern Illinois University; graduate teaching assistant, Southern Illinois University; natural resources planner, West Virginia Department of Natural Resources.

KNECHT, GEORGE N. (1973) .................................................. Biological Sciences
B.S., Rutgers University, 1962; M.S., 1969; additional graduate study, University of Arizona. Assistant Professor.
Experience: Laboratory technician, Rutgers University; research associate, University of Arizona.

KOBERG, DONALD J. (1962) .................................................. Architecture and Environmental Design
B.Arch., Tulane University, 1958; M.Arch., University of Washington, 1970. Professor.
Experience: Architectural practice as designer and draftsman in Louisiana; instructor, North Dakota State University; lecturer, University of California at Berkeley; research associate, Architectural Prototypes, Berkeley; minister, Church of Universal Life; registered architect, Louisiana; visiting lecturer, University of North Carolina.

KOGAN, IRVIN J. (1957) .................................................. Engineering Technology
Experience: Instructor, Orange Coast College; U.S. Air Force.

KOMBRINK, RICHARD T. (1955) .................................................. Engineering Technology
A.B., Loyola University, 1946; B.S.M.E., University of Southern California, 1964. Associate Professor.
Experience: Pilot, U.S. Army Air Corps; draftsman, Hess Greiner, and Polland; sales engineer, T. H. Creears Corp.; civil designer, City of Culver City; assistant project engineer, RCA Radar and Missile Division; consultant, South San Francisco Naval Shipyard. Registered technologist.

KORSMEYER, RUSSELL (1958) .................................................. Electronic and Electrical Engineering
B.S.E.E., University of Missouri, 1950; M.S.E.E., University of Southern California, 1958. Associate Professor.

KOURAKIS, JOSEPH M. (1970) .................................................. Architecture and Environmental Design
Experience: Self employed, Berkeley; planner and project manager, Architect/planner, Whisler Patri, San Francisco; planning officer for physical design, Redevelopment Agency, City of Oakland; senior architectural designer and urban planner, Wilsey, Ham & Blair, San Mateo; assistant planner, Oakland City Planning Department; military installations planner, 12th Naval District; architectural draftsman, Perkins and Will, Architects; registered architect, California.

KRANZDORF, RICHARD B. (1971) .................................................. Political Science
Experience: News editor, WBZ-TV, Boston; lecturer, University of Nigeria, Nsukka.

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KREJSA, RICHARD J. (1968) .......................................................... Biological Sciences
Experience: Instructor and assistant professor, Western Washington State College, University of Hawaii, Columbia University.

KRIEGER, DANIEL E. (1971) ................................................................. History
Experience: Associate in history, University of California, Davis; graduate teaching fellow, San Francisco State College.

KRUPP, WILLIAM E. (1969) ................................................................. Engineering Technology
B.S., University of California, Berkeley, 1942; M.S., Stanford University, 1955; additional graduate work, University of California, Santa Cruz. Associate Professor.
Experience: Engineering Aide, Standard Oil Company of California; Captain, U.S. Army Corps of Engineers; construction, self-employed; test engineer, North American Aviation; staff engineer, Sandia Corporation; engineer, North American Aviation, Santa Susana; Coleman Engineering Company, Hurricane, Utah; staff engineer, Lockheed Missile and Space Company, Santa Cruz and Sunnyvale; instructor, Monterey Peninsula College, Monterey and Cabrillo College, Santa Cruz. Registered professional engineer, California.

LABHARD, LEZLIE A. (1967) ............................................................... Home Economics
B.S., University of California, 1965; M.S., 1967. Associate Professor.
Experience: Resident assistant, laboratory assistant, research assistant, University of California, Davis.

LAMBERT, ROYCE L. (1969) ............................................................... Soil Science
B.S., Purdue University, 1964; M.S., 1966; Ph.D., 1969. Associate Professor.
Experience: Farm operator and manager; welder; building products, warehouse manager, graduate teaching assistant and research assistant, Purdue University; consultant and soil conservationist, National Park Service.

LAMBERT, WALTER M. (1975) ...................................................... Off-Campus Housing Coordinator
B.A. California State University, Long Beach, 1962.
Experience: Advertising sales and management, Pacific Telephone, Los Angeles; employment counselor and director of operations, Image West, Los Angeles; general manager, Tropicana Village housing, San Luis Obispo.

LAMOURIA, LLOYD H. (1965) ......................................................... Agricultural Engineering
B.S., Michigan State University, 1949; M.S., Iowa State University, 1950. Professor.
Experience: U.S. Air Force; instructor, Iowa State University; associate professor and associate agricultural engineer, University of California; manager of product planning, J. I. Case Company, Racine, Wisconsin. Registered professional engineer, California.

LANDRETH, JAMES R. (1956) ............................................................ Director, Business Affairs
B.A., Mexico City College, 1954; M.B.A., Stanford University, 1956; additional graduate study, Claremont University College.
Experience: Instructor, U.S. Army; explosive ordnance disposal, U.S. Army; college personnel officer, assistant to dean of the college, California State Polytechnic College, Kellogg campus; personnel relations and business management analyst, San Luis Obispo.

LANDWEHR, ALFRED W. (1970) ......................................................... English
Experience: Instructor, Northern Arizona University; University of Missouri.

LANE, BOBBIE A. (1970) ................................................................. Coach, Physical Education
B.S., Baylor University, 1963; graduate study, Baylor University, San Diego State College, Central Washington State College.
Experience: Player, San Diego Chargers football club; physical education instructor and coach, Yakima Valley Community College; head football coach, University of California, San Diego.
LANG, MARTIN T. (1969) ................................................................. Mathematics
Experience: Teaching assistant, University of Kansas; assistant instructor, University of Kansas, University of Texas at Austin; assistant professor, San Diego State College.

LANGWORTHY, WILLIAM C. (1973) ............ Dean, School of Science and Mathematics
Experience: Chemist, DuPont Company; research chemist, American Cyanamide; assistant professor, Alaska Methodist University; professor, California State College Fullerton; associate dean, School of Letters, Arts and Sciences, California State College Fullerton.

LANSMAN, PAUL S. (1964) ................................................................. Mathematics
A.B., M.A., Washington University, 1932; Ph.D., 1934; additional graduate study, California Institute of Technology. Associate Professor.
Experience: Instructor, St. Louis Junior College; mathematician, Subterrex Geophysical Company, Airborne Instruments Laboratory and Stoddart Aircraft Radio Company; engineer, Lockheed Corporation; Lawson Crystal Company and Lawson Import Company.

LARSEN, STUART E. (1969) .............................................................. Aeronautical Engineering
B.S., University of Cincinnati, Cincinnati, Ohio, 1963; M.S., 1965; M.S. Eng., Arizona State University, Tempe, Arizona, 1969. Associate Professor.

LARSON, LOIS L. (1962) ................................................................. Graduate Nurse
R.N., Swedish Hospital, School of Nursing, Minneapolis, Minnesota.
Experience: General duty, office nurse.

LaSALLE, TIMOTHY J. (1974) ......................................................... Dairy and Poultry Science
B.S., California State Polytechnic College, 1970; M.S., Virginia Polytechnic Institute and State University, 1972. Assistant Professor.
Experience: Research assistant, extension specialist, Virginia Polytechnic Institute and State University.

LASCOLA, RUSSELL A. (1970) .......................................................... Acting Head, Philosophy
B.A., California State College at Los Angeles, 1962; M.A., University of Southern California, 1964; Ph.D., 1969. Associate Professor.
Experience: Teaching assistant, University of Southern California; lecturer, Mt. Saint Mary's College; instructor, Glendale College, Los Angeles City College; educational consultant, Educational and Youth Opportunities Agency, Los Angeles.

LASSANSKE, DANIEL E. (1974) ...................................................... Ornamental Horticulture
B.S., California Polytechnic State University, San Luis Obispo, 1970; M.S., 1971. Assistant Professor.
Experience: Vocational Agriculture instructor, Poway, California.

LAU, JAMES B. (1971) ................................................................. Management
A.B., Eastern State University, Michigan, 1948; M.A., 1950; Ph.D., University of Michigan, 1954. Professor.
Experience: Teaching fellow and research assistant, Research Center Group Dynamics, University of Michigan; Detroit Edison Company; chief, Psychological Services, Executive and Organizational Development-C.I.A.; lecturer, Behavioral Sciences, George Washington University; professor, Organizational Behavior and dean, Federal Executive Institute, Charlottesville, Virginia; visiting professor of Organizational Behavior, Graduate School of Business Administration, University of Virginia; officer, U.S. Army.

LAUMANN, GEORGE C. (1957) ............................................................... Mathematics
A.B., Chico State College, 1952; M.A., 1953; additional graduate study, University of Oregon, University of California at Los Angeles. Associate Professor.
Experience: Instructor, Ordnance Department, United States Army; teacher California high schools; instructor, Adult Evening College, Chico; participant, National Science Foundation Institute, Portland State College.
LAWSON, JOHN D. (1951) ................................................................. Director, Activities  
B.S., University of California, Berkeley, 1938; M.Ed., University of California, Davis, 1955;  
Experience: Vocational instructor; officer, U.S. Navy; special supervisor, State Bureau of  
Agricultural Education.

LEE, THOMAS J. (1952) ....................................................... Physical Education  
B.A., San Jose State University, 1949; M.A., Stanford University, 1950; M.A., Los Angeles  
State University, 1951. Professor.  
Experience: Player-coach, All American Professional Basketball Team; instructor, private  
gymnasium, Oakland; playground director, Hayward Recreation District; swimming instruc-  
tor, Adult Night School; U.S. Army.

LEONESIO, ROBERT B. (1972) ........................................  
Metallurgical Engineering  
B.S., University of Massachusetts, 1963; M.S., Stanford University, 1964; Ph.D., Lehigh  
University, 1970. Associate Professor.  
Experience: Instrumentation development engineer, Sandia Corporation, Livermore, Cali-  
ifornia; research and teaching assistant, Lehigh University; assistant professor, Naval Post-  
grade School, Monterey, California.

LEONG, KINGSTON L. (1970) ................................ ........  
Biological Sciences  
B.S., University of Hawaii, 1963; M.S., 1966; Ph.D., Oregon State University, 1970. Associate  
Professor.  
Experience: Research assistant, University of Hawaii and Oregon State University; termite  
control advisor, Fumaseal-Honolulu.

LESCZYNSKI, DAVID B. (1976) ........................................  
Soil Science  
B.S., Wisconsin State University, Stevens Point, 1967; M.S., University of Wisconsin, Madison,  
1969; Ph.D., 1976. Assistant Professor.  
Experience: Research assistant, University of Wisconsin; soil conservationist, U.S.D.A.; Soil  
Conservation Service; U.S. Army.

LEWIS, GEORGE M. (1967) ........................................... Mathematics  
B.A., Stanford University, 1961; M.A., University of Southern California, 1964; Ph.D., 1970.  
Associate Professor.  
Experience: Instructor, San Fernando Valley State College; teaching, research assistant and  
instructor, University of Southern California.

LINDAMOOD, CHARLES H. (1958) ........................................ English  
B.A., University of Minnesota, 1949; M.A., Columbia University, 1951; additional graduate  
study, University of Minnesota, Stanford University, 1957. Associate Professor.  
Experience: Teacher, high school, Salinas; instructor, University of Minnesota, College of  

LINDVALL, JOHN R. (1973) ........................................ Business Administration  
B.A., Whitman College, 1962; M.B.A., Indiana University, 1971; Ph.D., 1973. Associate Pro-  
fessor.  
Experience: Management trainee, People's National Bank; salesman, Moor Business Forms;  
salesman, Xerox Corporation.

LINT, ROBERT G. (1967) .................................................. English  
A.B., University of Michigan, 1948; M.A., 1948, 1950; Ph.D., Ohio University, 1967. Profes-  
sor.  
Experience: High school teacher, Michigan, Washington; instructor, Lower Columbia Col-  
lege; teaching fellow, instructor, assistant professor, Ohio University.
Faculty and Staff

LITCHFIELD, PETER M. (1970) ............................................ Psychology
Experience: Part-time English instructor, Centro Cultural-San Jose, Costa Rica; owner, guitar importing firm, Ann Arbor, Michigan; owner, truck firm, Guatemala and Costa Rica; partner, Quality Latin Imports, San Diego; social worker, County of San Diego; laboratory instructor and research assistant, University of Portland.

LITTLE, H. CLAY (1973) ........................................................ Agricultural Management
B.S., University of Missouri, 1950; M.S., 1957; Ph.D., 1965. Associate Professor.
Experience: Agricultural extension agent, graduate research assistant, University of Missouri; assistant professor of agricultural economics, University of Nevada; water resources economist, University of Nevada; U.S. Army.

LOH, ALICE C. (1974) ........................................... Architecture and Environmental Design
Experience: Assistant professor, Department of Architecture, North Dakota State University; landscape architect/architect, M. O. Foss, Sr., Architects, Fargo, N.D.; architecture instructor, Northern Alberta Institute of Technology, Edmonton, Alberta; project architect, Bell, McCullough & Spotowski, Architects, Edmonton; architect coordinator, St. Louis Junior College District.

LOONEY, MICHAEL A. (1973) ........................................ ......... Health Educator
Experience: Teacher/intern, National Teacher Corps, Oregon; director/teacher, Warm Mountain School, California; director, Biofeedback Clinic, San Luis Obispo.

LOPER, WILLARD H. (1955) ........................................................... Agricultural Engineering
B.S., New York College of Agriculture, Cornell University, 1953. Associate Professor.

LOUGHRAN, BERNICE B. (1958). .................................... ........................ Art
B.S., Newark State Teachers College, 1940; M.A., Ohio State University, 1946; Ed.D., Stanford University, 1958. Professor.
Experience: Elementary school teacher, Southbury, Conn., Santa Barbara, California, and Redwood City, California; elementary art teacher, Irvington, New Jersey; art instructor, Johnson Teachers College, University of Connecticut and Danbury Teachers College.

LOWRY, JOHN J. (1962) .................................................. Mathematics
B.S., United States Military Academy, West Point, 1947; M.A., California State Polytechnic College, 1963; M.S., University of Illinois, 1967; Ed.D., Arizona State University, 1974. Professor.
Experience: Officer and navigation instructor, U.S. Air Force; engineer, Boeing Company.

LUCAS, ROBERT A. (1975) ............................................. Coordinator, Research Development
Experience: Program representative, Division of Research Development and Administration, University of Michigan; lecturer, assistant professor, English Department, University of Michigan; teaching assistant, instructor, English Department, University of Illinois; research assistant, English Department, University of Illinois and National Council of Teachers of English.

LUKES, THOMAS M. (1962) .............................. Head, Food Industries Department
B.S., San Jose State University, 1947; M.S., University of California at Berkeley, 1949. Professor.
Experience: Microbiologist for Real Gold Citrus Products, Anaheim; laboratory supervisor, Gentry Division of Consolidated Foods, Gilroy.
LUM HO, BOBBY T., CAPT (1976) ................................ ........... Military Science
B.B.A., University of Hawaii, 1969; Armor Officers Basic Course, 1969; MATA Course, Defense Language Institute, 1971; Airborne School, Pathfinder School, 1972; Organizational Maintenance Officer's Course, 1974; Armor Officer's Advanced Course, 1974; M.S., University of Southern California, 1976.

LUSCHEI, MARTIN L. (1969) ................................................................................ English
B.A., Nebraska Wesleyan University, 1952; M.F.A., University of Iowa, 1960; Ph.D., University of New Mexico, 1970. Professor.
Experience: Instructor, U.S. Army, Japan, University of Iowa, University of Texas; assistant cultural affairs officer, U.S. Information Service, Colombia.

LUTHRA, SHAM S. (1972) ........................................ Computer Science and Statistics
B.A., Panjab University, India, 1952; M.A., 1954; M.S., University of Alberta, Edmonton, Canada, 1969; Ph.D., University of Minnesota, 1974. Associate Professor.
Experience: Lecturer, Government College, Panjab, India; teaching/research assistant, University of Alberta, Edmonton, Canada; administrative assistant, research assistant, teaching associate, University of Minnesota; instructor, College of St. Thomas, St. Paul, Minnesota.

LUTRIN, CARL E. (1970) ........................................................................... Political Science
B.A., Adelphi University, 1962; M.S., University of Wisconsin, 1965; Ph.D., University of Missouri, 1971 additional graduate work, Stanford University. Associate Professor.
Experience: Instructor, Kellogg Community College; assistant instructor, University of Missouri.

MacDONALD, LACHLAN P. (1968) ........................................ Director, Public Affairs
M.A., University of Chicago, 1957.
Experience: Journalist: Anchorage Daily Times; Associated Press; KBYR; Chicago Review; Los Angeles City News Service; public relations: U.S. Army; Alaska National Guard; Cal Poly, Pomona; teacher; University of Chicago; Webb School of California; Cal Poly, Pomona and Cal Poly, San Luis Obispo, publisher and literary agent.

MACH, GEORGE R. (1954) ................................................................................. Mathematics
B.A., Iowa State Teachers College, 1950; M.S., State University of Iowa, 1951; Ph.D., Purdue University, 1963. Professor.
Experience: National Science Foundation faculty fellow, Purdue University; graduate teaching assistant, Purdue University; visiting professor, National Science Foundation Summer Institute, Washburn University, Kansas; officer, U.S. Navy.

MacKENZIE, F. HELEN (1966) ........................................................................ Library
B.A., University of California, Berkeley, 1941; Certificate of Librarianship, 1943; M.A., University of Denver, 1961. Senior Assistant Librarian.
Experience: Librarian, Mary Holmes Junior College, West Point, Mississippi; cataloger, Los Angeles County Law Library, University of Dubuque Seminary Library, California State Library, Sutro Branch, San Francisco, California.

MADSEN, EUGENE F., M.D. (1974) ................................................................. Medical Officer
B.A., University of Rochester, 1949; M.D.C.M., McGill University; Internship, Southern Pacific Hospital, San Francisco, 1957; Residency, Contra Costa County Hospital, California, 1958; M.P.H., University of Hawaii, 1969.
Experience: Schering Pharmaceutical Corporation; private practice; Government of Guam; Project HOPE; Department of Public Health, Washington, D.C.; staff physician, University of Massachusetts; president, director, Institute for Venereal Disease Programs; medical director, staff physician, Olmstead Medical and Surgical Group, Rochester, Minnesota.

MAGER, HANS L. (1949) .................................................................................. Architecture and Environmental Design
M.S., Royal University of Technology, Stockholm, 1947; Doctorate, Technical University of Vienna, Austria, 1973. Professor.
Experience: Registered professional engineer, California.
MAGUR, LEON W. (1958) .................................................................Physics
Experience: Teaching and laboratory assistant, University of Northern Colorado; instructor, Aims Junior College, Greeley, Colorado.

MAKSODIAN, Y. LEON (1963) ...........................................Computer Science & Statistics
B.S., California State Polytechnic College, 1957; M.S., University of Minnesota, 1961; Ph.D., University of Minnesota, 1970. Professor.
Experience: Instructor, Westminster College, Northwestern College; teaching assistant and instructor, University of Minnesota; junior development engineer, Minneapolis Honeywell Company.

MALINOWSKI, STANLEY A., JR. (1973) .......................................Music
B.A., Columbia University, 1969; M.A., Cornell University, 1972; additional graduate study, Cornell University. Assistant Professor.
Experience: Choral conductor, Cornell University.

A.B., Tufts University, 1965; M.A., 1970; Ph.D., 1971. Associate Professor.
Experience: Sessional lecturer, University of Alberta; associate professor, Indiana University of Pennsylvania; actor; author.

MALMBOG, FREDRICK B. (1969) ........................................Mechanical Engineering
B.S., New York University, 1955; M.S., Columbia University, 1966. Associate Professor.

MANLEY, WILLIS L., MAJ. (1976) ....................................................Military Science
Field Artillery Officer's Basic Course, 1957; Associate Battery Officer's Course, 1960; U.S. Army Aviation School, 1961; Instrument Flight Examiner School, 1966; Field Artillery Advance Course, 1970; B.S. Business Administration, Cameron State University, 1971; Command and General Staff College, 1975.
Experience: Flight Commander, U.S. Army Aviation School; battery commander, Ft. Rucker, Alabama; S1, Infantry Battalion, Aviation Company Commander, 183rd Aviation Company, Vietnam; Artillery Battalion S3 and executive officer, Lance Missile Battalion, First of the Twelfth Field Artillery.

MARK, WALTER R. (1972) .............................................................Natural Resources Management
B.S., Utah State University, 1968; M.S., Colorado State University, 1970; Ph.D., 1972. Associate Professor.
Experience: Forest technician, Forest Service, U.S.D.A.; graduate research and teaching assistant, Colorado State University; research associate, Rocky Mountain Forest and Range Experiment Station.

MARLOWE, ROY H. (1971) ...........................................................Child Development
B.A., Brigham Young University, 1966; M.S., 1968; Ph.D., Florida State University, 1971. Assistant Professor.
Experience: Graduate teaching assistant, Brigham Young University; instructor, The Church College of Hawaii, Laie, Hawaii; graduate teaching assistant, Florida State University; part-time counselor, Florida State University Counseling Center and Wakulla High School, Tallahassee.

MARTINEZ, ANGELINA (1966) ........................................................Library
B.A., Inter-American University, San German, Puerto Rico, 1943; B.S., Louisiana State University, 1945; M.S., University of Illinois, 1957. Librarian.
Experience: Assistant Librarian, Inter-American University; Cataloger Pan-American Union, Organization of American States; head librarian Inter-American Institute of Agricultural Sciences of the Organization of the American States, Costa Rica; head reference librarian, University of California, Davis; director of reader services, Nevada State Library.
MAUGHAN, SCOTT J. (1965) ................................................. History
B.A., Brigham Young University, 1957; M.A., University of Utah, 1959; Ph.D., 1968. Professor.
Experience: Instructor, Eastern Montana College, University of Utah; U.S. Army.

MAYO, EDWARD L. (1968) .................................................. History
Experience: Securities analyst, Title Insurance and Trust Company; sales representative, Western Airlines; instructor, Pitzer College, Mt. San Antonio College.

McCALEB, DONALD L. (1962) ............................................. Public Information Officer
B.S., California State University, Los Angeles, 1958; California Polytechnic State University, 1970.
Experience: Public information, U.S. Air Force; representative, office manager, Billy Graham Films; teaching, public relations officer, Maryville Union High School; public relations director, associated students, California State University, Los Angeles.

McCOMBS, JOHN W. (1960) ................................................. Electronic and Electrical Engineering
B.S., Clemson University, 1950; B.S., 1957; M.S., 1961; M.A., Northern Arizona University, 1971. Professor.

McCORKLE, ROBERT E. (1962) ........................................... Agricultural Management
B.S., California Polytechnic State University, 1960; M.S., University of California, 1962; additional graduate study, Oregon State University, University of Wisconsin. Professor.
Experience: Farming and ranching; research statistician, Department of Agricultural Economics, University of California; research assistant, Farm Economic Division, Economic Research Service, United States Department of Agriculture; chief of party, Cal Poly-A.I.D., Zambia; chief farm management officer, Ministry of Agriculture, Lusaka, Zambia; Director, International Education, California Polytechnic State University.

McCORMAC, WESTON A. (1968) ................................ Management
Experience: Account executive, Merrill Lynch, Pierce, Fenner & Smith; instructor in public speaking, teaching techniques, personnel management, planning methods and leadership, Ft. Sill Artillery School; manpower and administrative analyst. Office of Assistant Secretary of Defense (Manpower) Troop Command and General Staff assignments, Europe and Pacific; executive officer for Chief of Public Information of the Army, Washington, D.C.; director of Army Personnel Management Program; Commanding Officer of the Army Personnel Center at Oakland Army Base.

McDILL, JEAN M. (1973) .................................................. Mathematics
B.S., University of Texas, 1957; M.S., University of Florida, 1968; Ph.D., 1971. Associate Professor.
Experience: Assistant engineer, Texas Instruments, Inc.; instructor, San Jose State College; programmer, System Development Corp.; assistant professor, Northern Virginia Community College; lecturer, George Mason University.

McDONNELL, ROBERT (1975) ........................................... Head, English Department
B.A., St. John's University, 1951; M.A., University of Minnesota, 1954; Ph.D., 1958. Professor.
Experience: Associate professor, Ohio University; professor and chairman of English Department, Western Washington State College.


 experience: Teaching and research assistant, Washington State University; director of Black Special Services, San Diego State University; coordinator of communications, HEW Special Program, University of New Hampshire; instructor and director of forensics, Southwestern College; instructor, Northern Illinois University.


 experience: Associate, Weaver & Drover, Architects; project manager, Kerr-Beggs, Architectural Engineers; draftsman, Blakey Architects, Langhart Architect; registered architect, California.


 experience: Instructor, Brig. Commander, HHC (Ft. Ord); CoD USAIS (Ft. Bragg); command and staff assignments USAEUR (Germany) (Vietnam); assistant professor military science, ROTC (Michigan State University); deputy controller, USAE (Washington, D.C.); budget officer, Hq USAEUR (Germany).


 experience: Internal Revenue Agent; Foreign Service Officer; instructor, University of Kansas and Drake University; assistant professor, associate professor, Political Science Department chairman, University of Nebraska; Dean School of Business and Social Sciences, California Polytechnic State University, San Luis Obispo.


 experience: Acting Instructor, NIMH Traineeship; Teaching Assistant, University of California, Berkeley.


 experience: Teacher, Venice High School; instructor and Assistant to Dean of Men, University of Southern California.


 experience: Teaching assistant, lecturer, California Polytechnic State College, Pomona; research assistant, Los Angeles State and County Arboretum; teacher, Anaheim Union High School, South Whittier School; graduate teaching assistant, graduate fellow, Arizona State University.


 experience: Technician, Western Electric Company, Shell Development Company; member of the technical staff, Bell Telephone Laboratories, Murray Hill, New Jersey; electronics engineer, Lawrence Radiation Laboratory, Livermore, California and Jet Propulsion Laboratory, Pasadena.
McNEAL, LYLE G. (1969) ................................................................. Animal Science
B.S., California State Polytechnic College—Kellogg, 1964; M.S., University of Nevada, 1966;
additional graduate study, Utah State University. Associate Professor.
Experience: Agricultural extension agent, University of Nevada Cooperative Extension
Service, Gardnerville, Nevada; graduate research assistant in animal breeding, University of
Nevada; ranching operations in Nevada, Montana, and Utah; assistant manager, Riding Stable,
Aguora, California.

McNEIL, ROBERT J. (1976) ................................................................. Crop Science
B.S., Rutgers University, 1967; M.S., 1970; Ph.D., 1975. Assistant Professor.
Experience: Research assistant, Department of Horticulture and Forestry, Rutgers Univer-
sity; officer, U.S. Army; tree sprayer and salesman, Ranger, Inc., Point Pleasant Beach, New
Jersey; assistant professor of Horticulture, Mercer Community College, New Jersey; assistant
professor, Horticulture, Kansas State University.

McRAE, GLEN NG. (1963) ................................................................. Counselor
Experience: Graduate assistant, fellow, teaching assistant, University of Florida; instructor,
St. Petersburg Junior College; visiting summer lecturer, Mississippi State University,
Louisiana State University, Northwest Louisiana State College, and State College of Iowa.

McROBBIE, MAC (1962) ................................................................. Head, Industrial Technology Department
A.B., San Jose State College, 1950; M.A., San Diego State College, 1953; Ed.D., University
of Northern Colorado, 1963; additional graduate study, Purdue University, 1967. Professor.
Experience: Patternmaker, The Boeing Company, Seattle; trade-technical instructor and
civilian personnel recruiter, Puget Sound Naval Shipyard, Bremerton; industrial arts teacher,
Santa Clara County; industrial arts teacher-consultant, San Diego County Schools; coordinator
of industrial education, Tulare County Schools.

MENG, SHIEN YI (1968) ................................................................. Electronic and Electrical Engineering
B.S., Taiwan Provincial Cheng Kung University, 1953; M.S., Oklahoma State University,
1958; Ph.D., Ohio State University, 1968. Associate Professor.
Experience: Research associate, Ohio State University; research assistant, Cornell University;
engineer, Taiwan Provincial Government.

MERIAM, JAMES L. (1972) ................................................................. Mechanical Engineering
B.E., Yale University, 1939; M.Engr., 1941; Ph.D., 1942. Professor.
Experience: Engineer, Pratt and Whitney Aircraft and General Electric Company; Lt. (jg)
U.S. Coast Guard; assistant, associate, and full professor of mechanical engineering and engi-
neering mechanics, assistant dean of graduate studies, and chairman, Division of Mechanics
and Design, University of California, Berkeley; Board of Directors, Engineers Council for
Professional Development; dean, School of Engineering and director, Research and Develop-
ment, Duke University.

MERRIAM, JOHN L. (1958) ................................................................. Agricultural Engineering
B.S., California Institute of Technology, 1938; graduate study, California Institute of Tech-
nology. Professor.
Experience: Instructor, California Institute of Technology; junior civil engineer, U.S. Army
Engineers and private consulting engineers; civil area engineer, Soil Conservation Service,
USDA; senior irrigation engineer, Ministry of Agriculture, Kingdom of Saudi Arabia; consulting
irrigation engineer, The Ralph M. Parsons, Co., Egypt UAR; Institute Fomento Nacional
de Nicaragua, and Food and Agricultural Organization, Riyadh, Saudi Arabia; irrigation
engineer, California State Polytechnic College Project, USOM, Thailand. Registered profes-
sional engineer, California.

MESLER, FLORENCE (1962) ................................................................. Graduate Nurse
R.N., Patterson General Hospital, New Jersey, 1939.
Experience: Industrial nurse, Wright Aero Corporation, Patterson, New Jersey; general
duty nurse, Santa Monica Hospital, and French Hospital, San Luis Obispo; private duty, San
Luis Obispo.
MEYER, THOMAS O. (1955) ......................................................... Food Industries
B.S., State College of Washington, 1949; M.S., 1953. Professor.
Experience: Instructor and meats specialist, State College of Washington; assistant animal
husbandman, Experiment Station, State College of Washington, Pullman, Washington; poultry
specialist, Cal Poly A.I.D., Yemen.

MILLER, ALLEN D. (1960) .......................................................... Mathematics
B.S., Iowa State University, 1945; M.S., 1948; Ph.D., 1953. Professor.
Experience: High school mathematics teacher, Iowa, Nebraska, Wisconsin, and California;
college mathematics teacher, Wisconsin, Illinois, Iowa and California; research development
in industry, Hughes Aircraft Company; participant in National Science Foundation institutes,
Stanford University, Bowdoin College, University of Arizona, University of Southwest
Louisiana, Columbia University.

MILLER, ERNEST C. (1968) .......................................................... Acting Head, Management Department
B.A., University of Chicago, 1941; M.B.A., 1946; Ph.D., University of Denver, 1954. Associate
Professor
Experience: Supervisor, sales promotion, U.S. Rubber Company; director of personnel,
controller, O. P. Baur Conf. Corp., Denver; part-time instructor, University of Denver;
assistant general manager, Western Reddi-Wip Company; lecturer, University of Alaska and

MILLER, GRANT D. (1972) ......................................................... Psychiatrist
M.D., University of Minnesota Medical School, 1968; Internship, Santa Barbara Cottage and
General Hospitals; Residency, University of Oregon Medical School, 1972.

MILLER, HAROLD R. (1968) .......................................................... Financial Manager
B.S., University of Missouri, 1958; M.S., 1959.
Experience: First Lieutenant, U.S. Air Force; staff accountant, Williams, Keepers, Oliver,
Payne & Rakers, CPA’s, Columbia, Missouri; comptroller, Ozark Tractor and Implement,
Springfield; instructor, Southwest Missouri State College; C.P.A.

MILLER, STEVEN (1976) ............................................................. Coach, Physical Education
B.S., Bradley University, 1966.
Experience: Teacher, coach, Bloom Township High School, Illinois; editor, publisher, Time-
ly Times, Illinois Track and Field News; head track coach, United States Junior Team in
Germany, France, England and Holland; pole vault and weight training coach, United States
Track and Field Federation tour of Africa.

MILLIKEN, KEITH R. (1975) ......................................................... Mathematics
B.A., Occidental College, Los Angeles, 1968; Ph.D., University of California, Los Angeles,
1975. Assistant Professor
Experience: Technical staff, Autonetics Division, Rockwell International; teaching fellow,
University of California, Los Angeles.

MISIC, DRAGOSLAV M. (1970) ..................................................... Environmental Engineering
Diploma Engineer, University of Ljubljana, Yugoslavia, 1957; M.S., Ph.D., Northwestern
University, Evanston, Illinois, 1963. Associate Professor.
Experience: Research engineer, Whirlpool Corporation, Benton Harbor, Michigan; research
associate, B.A.S.F., Western Germany; postdoctoral fellow, University of California, Davis.

MOERMAN, KAREN SUE (1969) ................................................... Home Economics
B.S., University of Georgia, 1964; M.S., 1967. Associate Professor.
Experience: Research technician, Georgia Agricultural Experiment Station; assistant profes-
sor, University of Georgia and Georgia Agricultural Experimental Station; visiting professor,
Colorado State University.

MOIR, NEIL J. (1970) ................................................................. Chemistry
B.S., Lewis and Clark College, 1962; M.S., University of Oregon Medical School, 1966; Ph.D.,
1968. Associate Professor.
Experience: Graduate teaching instructor, University of Oregon Medical School; post doc-
toral fellow and research associate, Cornell University.
MONTES, JOSEPH M. (1976) .......................................................... Counselor
B.A., University of Redlands, 1971; M.A., Ohio State University, 1972; Ph.D., Ohio State University, 1976.
Experience: Counselor, developmental education, Ohio State University; academic advisor and tutorial program coordinator, University College, Ohio State University.

MONTGOMERY, DAVID H. (1956) .................................................. Biological Sciences
B.S., California State Polytechnic College, 1954; M.A., College of the Pacific, 1956; additional graduate study, Friday Harbor Laboratories, University of Washington and University of California. Professor.
Experience: Laboratory assistant and teaching assistant, California State Polytechnic College; teaching fellow, College of the Pacific; summer faculty, Pacific Marine Biological Station, University of the Pacific; National Science Foundation fellow, Friday Harbor Laboratories; National Science Foundation fellow, University of California.

MOORE, LARRY D. (1967) .......................................................... Electronic and Electrical Engineering
A.B., Centre College, 1936; M.S., U.S. Naval Postgraduate School, 1951. Associate Professor.

MOORE, SHEILA (1973) .......................................................... Economics
B.A., George Washington University, 1969; M.S., Baylor University, 1970; Ph.D., University of Arizona, 1975. Assistant Professor.
Experience: Lecturer, California Polytechnic State University, San Luis Obispo; teaching assistant, Baylor University; teaching assistant, University of Arizona; research assistant, University of Arizona.

MORIERA, SIXTO EMILIO (1972) ........................................... Architecture and Environmental Design
B.S., University of Oklahoma, 1950; M. Arch., 1971; additional graduate study, University of California, Los Angeles. Associate Professor.
Experience: Designer, Henry Klumb, FAIA, San Juan, Puerto Rico; design consultant, Health Dept., San Juan; contract specialist, U.S. Naval Facilities, San Diego and Puerto Rico; teaching assistant, School of Architecture, University of Oklahoma; assistant professor, School of Architecture, Idaho State University; Registered architect, Puerto Rico.

MOREY, KRISHNAKUMAR S. (1970) ........................................ Home Economics
B.S., Nagpur University, India, 1955; M.S., 1958; M.S., U.C. Medical Center, San Francisco, 1963; Ph.D., University of California, Berkeley, 1967. Associate Professor.
Experience: Research scholar, Nagpur University; teaching assistant, University of California Medical Center; graduate biochemist, teaching assistant, University of California, Berkeley; research associate, Temple University Medical School; participant National Science Foundation Faculty Research Participation Program, A. E. Staley Company.

MORGAN, DONALD E. (1968) .................................................. Head, Industrial Engineering Department
B.S., Oregon State College, 1940; M.S., Stanford University, 1962; Ph.D., 1963. Professor.
Experience: Staff technical consultant, ARINC Research Corporation; staff member and partner, Decision Studies Group; professor, Stanford University; manager and partner, Intermountain Surgical Supply Company; engineer, Westinghouse Electric Corporation. Registered professional engineer, California.

MORRIS, DON M. (1957–62) (1969) ........................................... Associate Dean, Continuing Education
Experience: Resident supervisor-counselor and assistant personnel analyst, California State Polytechnic College; officer and pilot, U.S. Navy; instructor, University of California, Santa Barbara Extension Division; director of adult and summer schools, San Luis Obispo and Simi Valley Unified School Districts; instructor, assistant dean of instruction and coordinator community services, Moorpark College.
MOSHER, LYNN S. (1974) ........................................ ......... Industrial Technology
B.S., State University College, Oswego, New York, 1963; M.Ed., St. Lawrence University, 1966; Ed.D., Utah State University, 1972. Assistant Professor.

MOTT, JOHN H., SR. (1967) ................................................ English
Experience: Special agent, U.S. Military Forces; art instructor, Boise Junior College; high school English and art teacher, Oregon, California; graduate assistant, Colorado State College.

MOTT, ROBERT A. (1946) ............................................ Graphic Communications
B.S., University of Akron, 1938; M.A., University of Southern California, 1946; Ed.D., Stanford University, 1953. Professor.
Experience: Physical education instructor and athletic coach, Akron Public School System; officer, U.S. Navy; teaching assistant, University of Southern California; visiting professor, University of Colorado; chairman, P.E. Department and chief of party, U.S. AID program, Evelyn Hone College of Further Education, Lusaka, Zambia; physical education specialist, Uganda, Somalia, and Ethiopia, U.S. State Department. Head Physical Education Department, California Polytechnic State University.

MOTT, W. STEPHEN (1972) ............................................ Graphic Communications
Experience: Production technician, California State Polytechnic College; lithographer, Commercial Printers, Tucson, Arizona; ten years additional experience in printing industry.

MOTTMANN, JOHN (1974) ............................................ Physics
Experience: Teaching assistant, University of California, Los Angeles; astronomer, National Radio Astronomy Observatory, U.S. Naval Observatory, Aerospace Corp.; instructor, Santa Monica Community College.

MOY, CARL F. (1968) .................................................. Dairy and Poultry Science
B.S., University of Wisconsin, 1967. Associate Professor.

MULDER, GEORGE (1968) ............................................ Director, Counseling & Testing
Experience: Associate Dean (Counseling) and counselor, California State Polytechnic College, Kellogg-Voorhis; teacher, Excelsior Union High School District; counselor-instructor, Cerritos College; electronic technician, U.S. Army Ordnance; drafting, tool design, and technical illustration, Goodyear Tire and Rubber and Shoffer Tool Company.

MURPHY, PAUL F. (1970) ............................................ Mathematics
A.B., Catholic University of America, 1961; M.A., Brooklyn College, 1966; Ph.D., Michigan State University, 1971. Associate Professor.
Experience: Graduate assistant, Michigan State University; participant, National Science Foundation Seminar, Bowdoin College.

NAJERA, DANIEL (1971) ............................................ Foreign Languages
B.A., Chilapa Seminary, 1956; graduate study, Graduate School of Theology, Mexico, California Polytechnic State University. Assistant Professor.
Experience: Administrative trainee, Economic Opportunity Commission; social worker and teacher, Instituto Mexicano del Seguro Social; instructor, Seminario de Acapulco.
NEEL, PAUL R. (1962) .......... Director, School of Architecture and Environmental Design

NEELANDS, JAMES G. (1957) . Equipment Technician, Physical and Biological Sciences
B.S., California State Polytechnic College, 1956; graduate study, University of Washington.
Experience: Teaching assistant and research assistant, University of Washington; naval aviator and officer, U.S. Marine Corps.

NELSON, LAWRENCE H. (1972) .................................................. Mechanical Engineering
B.S., California Institute of Technology, Pasadena; M.S., University of California, Davis, 1971; Ph.D., 1972. Associate Professor.

NELSON, LINDEN L. (1970) ......................................................... Psychology
B.A., University of Northern Iowa, 1966; Ph.D., University of California, Los Angeles, 1970. Associate Professor.
Experience: Teaching assistant, research assistant, Department of Psychology, University of California, Los Angeles.

NELSON, RICHARD F. (1960) ............... ..................... Biological Sciences
B.S., Brigham Young University, 1955; M.S., 1957; Ph.D., State University of Iowa, 1960. Professor.
Experience: Teaching assistant, Brigham Young University, State University of Iowa; research associate in radiation biology, State University of Iowa.

NICHOLSON, LOREN L. (1956) ............................. Acting Head, Journalism Department
A.B., San Jose State College, 1946; M.B.A., Stanford University, 1947; additional graduate study, Stanford University. Professor.
Experience: Advertising sales representative, Watsonville Register-Pajaronian; advertising sales correspondent, Sunset Magazine; advertising director, Redding Record-Searchlight.

NICKELL, DELL O. (1965) .................................................. Architecture and Environmental Design
B.A., San Jose State College, 1950; M. Engr. Science, Arizona State University, 1974; additional graduate study, Arizona State University. Professor.
Experience: Assistant engineer, San Jose Water Works; associate bridge engineer, California State Bridge Department; partner, Gillette-Harris & Associate, Auburn; assistant road commissioner-surveyor, San Luis Obispo County. Registered civil engineer, California.

NICOLAIDES, JOHN D. (1975).............................. Head, Aeronautical Engineering
B.A., Lehigh University, 1943; M.S.E., Johns Hopkins University, 1953; Ph.D., The Catholic University of America, 1962. Professor.

NIELSEN, KEITH E. (1959) ................................................ Speech Communication
Experience: Graduate assistant, Michigan State University; communication consultant, California Department of Education and Agency for International Development; secondary teacher, State of Michigan.
NILES, PHILIP W.B. (1967) ................................................... Environmental Engineering
B.S., University of California, 1957; M.S., 1958; additional graduate study, University of California, Los Angeles. Professor.
Experience: Consultant, Rand Corporation; teaching assistant and post-graduate research engineer, University of California, Los Angeles; senior research engineer, Rocketdyne.
NIU, SHIEN HWEI (1969) ................................................... Library
B.A., National Taiwan University, 1951; M.A., Bucknell University, 1957; additional graduate studies, University of Wisconsin; M.A., Library Science, Indiana University, 1967. Assistant Librarian.
Experience: Assistant catalog librarian, Drake University Library.
NOBLE, WILLIAM E. (1973) ................................................... Ornamental Horticulture
B.S., University of Maryland, 1964; M.S., 1969; Ph.D., University of Florida, 1974. Associate Professor.
Experience: Graduate research assistant, University of Maryland; Horticulturalist, Woodside Gardens, Inc., Rockville, Maryland; graduate teaching assistant, University of Florida.
NORDQUIST, RAYMOND E. (1964) ...................................... Architecture and Environmental Design
NOSHY, AMEEN I. (1969) ................................................... Architecture and Environmental Design
B. Arch., Cairo University, 1963; M.S. Arch., Illinois Institute of Technology, Chicago, 1969; additional graduate work, University of Strathclyde. Associate Professor.
Experience: Draftsman in architectural firms in Cairo and West Berlin; designer and field supervisor in Development and Popular Housing Corp., Cairo; instructor at Al-Azhar University, Cairo; designer, Cairo, P. L. Nervi, Rome and C. F. Murphy, Assoc., Chicago.
NOYES, O. ROBERT (1974) ................................................... Food Industries
Experience: Science teacher, Hardwick Academy, Hardwick, Vermont; Fellow, NSF Academic Year Institute, Biology Department, University of Georgia; teaching and research assistant, Department of Food Science, University of Georgia.
NUTTER, DAVID E. (1974) ................................................... Accounting
A.B., West Virginia University, 1954; M.B.A., Indiana University, 1958; D.B.A., University of Southern California, 1974. Professor.
Experience: Audit and personnel manager, Peat, Marwick, Mitchell & Co.; assistant professor, University of Hawaii; instructor, University of Southern California, C.P.A. Indiana.
NYE, MARLENE (1975) ................................................... Senior Clinical Laboratory Technologist
B.S., California Polytechnic State University, San Luis Obispo, 1967.
Experience: Sierra Vista Hospital, San Luis Obispo; San Luis Medical Clinic, Pismo Beach and San Luis Obispo.
O'CONNOR, EUGENE L. (1964) ......................................... Acting Head, Business Administration
B.S., St. Louis University, 1957; M.S., 1963. Associate Professor.
Experience: President, Western Data Management, San Luis Obispo, California.
OFFERMANN, GENE P. (1970) ........................................ Crop Science
B.S., Southern Illinois University, 1964; M.S., 1965; Ph.D., University of California, Davis, 1970. Associate Professor.
Experience: Research assistant, Southern Illinois University and University of California, Davis; general farming.
O'LEARY, MICHAEL J. (1951) ............................................ Social Sciences
A.B., San Francisco State College, 1950; M.A., Stanford University, 1951; additional graduate study, Stanford University, University of Oregon. Professor.
OLSEN, BARTON C. (1968) ................................................. History
Experience: Teacher, South High School, Salt Lake City, Washington Union and Sanger Union High School, California; principal, Cardston School District, Cardston, Alberta.

O'NEIL, THOMAS D. (1973) ................................................ Mathematics
Experience: Electronic development technician, General Dynamics/Astronautics; electronic research engineer, The Boeing Company; teaching assistant, San Diego State College, University of Wyoming; instructor, University of Wyoming; instructor, U.S. Navy.

O'NEILL, GERTRUDIS M. (1972) ...................................... Library
B.A., Inter-American University, Puerto Rico, 1955; M.F.A., University of Cincinnati, 1962; M.L.S., Western Michigan University, 1967; additional graduate study, Art Academy of Cincinnati. Assistant Librarian.
Experience: Graduate assistant, Western Michigan University; reference librarian, Public Library of Cincinnati and Hamilton County.

ORELLI, IVAN (1976) ................................................................. Library
B.A., John Carroll University, Cleveland, Ohio, 1963; M.L.S., Western Reserve University, Cleveland, Ohio, 1966; M.S., 1968. Senior Assistant Librarian.

ORLICK, STEVEN C. (1972) ................................................. Architecture and Environmental Design
Experience: Junior consulting assistant, Resources, Applications, Designs and Controls, Inc., Los Angeles; teaching assistant, research assistant, research associate. Urban Transportation Research and Training Program, University of Washington; assistant graduate program advisor, Department of Urban Planning, University of Washington.

B.A., University of California, Santa Barbara, 1959; M.A., San Francisco State College, 1963; Ph.D., Claremont Graduate School, 1974. Associate Professor.
Experience: Teaching assistant, University of New Mexico; instructor, Chico State College.

ORTIZ, MARIA E. (1972) ................................................. Biological Sciences
B.S., Southwest Texas State University, 1968; M.A., 1970; Ph.D., Texas Women's University, 1973. Associate Professor.
Experience: Laboratory instructor, Southwest Texas State University; laboratory instructor and research assistant, Texas Woman's University.

OSBALDESTON, ROGER (1972) ........................................... Architecture and Environmental Design
Experience: Architectural assistant, Michael Moss, Architect, Nottingham; landscape designer, Lawrence Halprin and Associates; landscape designer, Dan Kiley and Partners; landscape designer, Cornell, Howland, Hayes and Merryfield; visiting lecturer, University of Oregon. Registered landscape architect, Washington, Oregon.

OSTEYEE, LEON F. (1957) .................................................. Mechanical Engineering
B.M.E., Rensselaer Polytechnic Institute, 1945; M.M.E., 1957; additional graduate study, Massachusetts Institute of Technology. Professor.

O'TOOLE, FREDERICK J. (1972) ......................................... Philosophy
B.A., University of California, Los Angeles, 1966; M.A., University of California, Davis, 1968; Ph.D., 1972. Associate Professor.
Experience: Lecturer, California State College, Hayward; associate in philosophy, University of California, Davis; teaching assistant, University of California, Davis and Los Angeles.
OZAWA, KENNETH S. (1963) ................................................................. Physics
B.S., John Carroll University, 1959; M.S., 1960; Ph.D., University of Kansas, Lawrence, 1975.
Associate Professor.
Experience: Graduate assistant and instructor, John Carroll University.

PAGE, PERRYMANN L. (1963) ................................................................. Library
B.A., University of Mississippi; M.S.L.S., Louisiana State University, 1963. Senior Assistant Librarian.

PAPAKYRIAZIS, PANAGIOTIS A. (1971) ................................................. Economics
B.A., Athens School of Economics and Business Science, 1964; Ph.D., University of California, San Diego, 1974. Associate Professor.
Experience: Cost analyst, Marinopoulos Pharmaceutical Corporation, Greece; research assistant, Center of Planning and Economic Research, Board of Experts, Greece; teaching and research assistant, University of California, San Diego.

PARKER, LEE R. (1974) ................................................................. Biological Sciences
B.S., Brigham Young University, 1966; M.S., 1968; Ph.D., Michigan State University, 1976. Assistant Professor.
Experience: Teaching assistant, Brigham Young University; range analyst, U.S. Forest Service, Provo, Utah; visiting associate professor, University of Oregon; instructor, Michigan State University.

PAUL, GORDON J. (1969) ................................................................. Accounting
B.S., Montana State College, 1957; M.B.A., University of New Mexico, 1966. Assistant Professor.

PAUTZ, ROLAND K. (1959) ................................................................. Dairy and Poultry Science
B.S., Oregon State College, 1957; M.S., Oregon State University, 1968. Professor.

PELLATON, EVELYN I. (1966) ................................................................. Physical Education
Experience: Director, Oakland Recreation Department; official and gym supervisor, San Francisco Recreation Department; summer camp counselor; WAVE athletic officer, Special Services, U.S. Navy; instructor, Marin Catholic High School, Portola Junior High School; dean-counselor, Portola Junior High School, Downey Junior High School.

PENDSE, PRATAPSINHA C. (1966) ............................................................. Biological Sciences
B.S., Bombay University, 1947; M.S., Poona University, 1951; M.S., Utah State University, 1959; Ph.D., 1965; additional graduate study, Stanford University, Yale University, McGill University, The Johns Hopkins University, School of Medicine. Professor.
Experience: Lecturer, Bombay and Poona Universities; teaching and research assistant, Utah State University; assistant professor, Colgate University.

PERELLO, DOMINIC B. (1954) ................................................................. Economics
A.B., University of California, Santa Barbara College, 1951; M.S., University of Wisconsin, 1952; additional graduate study, University of California at Los Angeles. Professor.
Experience: Officer, U.S. Air Force; partner, Perello and Sons; teaching assistant, University of California at Los Angeles.

PEREZ, MARINA E. (1975) ................................................................. Graduate Nurse
B.S., University of the Philippines, 1961.
Experience: Staff nurse, Jefferson Medical College Hospital P.A., 1963; clinical instructor, medical surgical nursing, Mary Chiles General Hospital School of Nursing; staff nurse, ICCU and Medical Floor, Harkness Community Hospital, San Francisco; staff nurse and relief supervisor, ICCU, Sierra Vista Hospital.

PERRYMAN, ELIZABETH K. (1972) ............................................................. Biological Sciences
B.S., Memphis State University, 1964; M.S., Texas Technological College, 1967; Ph.D., The University of Arizona, 1972. Associate Professor.
Experience: Teacher, West Memphis High School; teaching assistant, Texas Tech University; instructor, The Victoria College, Victoria, Texas.
PETERS, JAMES M. (1958-60) (1963) ............................................ Chemistry
A.B., University of California, 1953; Ph.D., 1957. Professor.
Experience: Biochemist, University of California; instructor, California State Polytechnic
College; biochemist, Baltimore City Hospitals; assistant professor, University of Maryland.
PETERS, RALPH A. (1969) ................................................................. Physics
B.S., Georgetown University, 1949; M.S., Pennsylvania State University, 1951; Ph.D., Fordham
University, 1967. Professor.
Experience: Assistant professor, Lewis College; instructor, Michigan State University; as-
assistant professor, Fordham University; associate professor, University of the Pacific.
PETERSON, JAMES J. (1964) ................................................................. English
B.A., Bradley University, 1952; M.A, University of Pennsylvania, 1956; additional graduate
study, Temple University, University of Pennsylvania. Associate Professor.
Experience: Assistant instructor, University of Pennsylvania; substitute teacher, Philadel-
phia Public Schools; high school instructor, Bryn Mawr, Pennsylvania; instructor, Susquehan-
n University, New York State University.
PEZO-SILVA, ARMANDO A. (1973) .......................................... Associate Director, Educational
Opportunity Program
B.S., California Polytechnic State University, 1970; M.A., 1974.
Experience: Law clerk, California Rural Legal Assistance; consultant, Santa Barbara County
Affirmative Action; consultant for Bilingual education, Preschool and Community Develop-
ment, Health Education and Welfare.
PHAKLIDES, WILLIAM J. (1963) ....................................................... Engineering Technology
B.S., California State Polytechnic College, 1956; graduate study, Montana State University.
Professor.
Center, China Lake. Registered professional engineer, California.
PHILLIPS, JOHN C. (1974) ............................................................. Crop Science
B.S., Washington State University, 1967; M.S., Colorado State University, 1969; Ph.D.,
Oregon State University, 1974. Assistant Professor.
Experience: Research assistant, Department of Agronomy, Colorado State University; labo-
atory assistant, U.S. Army Biological Defense Research Center; research assistant, Depart-
ment of Agronomic Crop Science, Oregon State University; U.S. Biological Defense Research
Center, Fort Detrick, Maryland; research assistant, Farm Crops Department, Oregon State
University.
PHILLIPS, PETER K. (1968) ............................................................ Facilities Planner
B.S., California State Polytechnic College, 1959.
Experience: Designer-draftsman, John R. Ross and Associates, Inc., San Luis Obispo and
Arendt/Mosher/Grant, Architects, Santa Barbara; private practice. Registered architect, Cali-
ifornia; A.I.A.
PHILLIPS, WILLIAM R. (1957) ...................................................... Director, School of Architecture
and Environmental Design
Professor.
Experience: Designer, W. H. Harrison, Architect; designer and engineer, U.S. Engineer
Department; engineer, North American Aviation, Inc.; fallout shelter analysis, Office of Civil
Defense, Dept. of Army; private architectural practice in California. Registered architect, Cali-
ifornia.
PILLSBURY, NORMAN H. (1974) .................................................... Natural Resources Management
B.S., Humboldt State University, 1968; M.S., 1972; Ph.D., Colorado State University, 1976.
Assistant Professor.
Experience: Instructor, Humboldt State University, Jamestown Community College, Colo-
rado State University; forest researcher, U.S. Forest Service; watershed research in erosion,
sedimentation, and slope stability; U.S. Navy.
PIMENTEL, RICHARD A. (1952) ................................................................. Biological Sciences
Experience: Officer, U.S. Army; teaching assistant, Oregon State College; ranger-naturalist, Crater Lake National Park; associate professor, University of California Extension Nature Study Institute at Santa Barbara; lecturer, National Science Foundation Science Program.

PINARD, LEO W., II (1970) ............................................................... Social Sciences
Experience: Teaching assistant, University of Notre Dame; lecturer, Immaculate Heart College; fertility research, USAID, Philippines.

PIPER, CURTIS DEAN (1964) ................................................................. Head, Soil Science Department
B.A., W. J. Bryan University, 1953; M.S., Michigan State University, 1959; Ph.D., 1967. Professor.
Experience: Farm operator; food service director, Kings College; instructor in research and teaching, Michigan State University; coordinator of agricultural Peace Corps training programs, Niger, Chad, and Morocco, Africa, Rajasthan, India, and Thailand; director of in-country training program Jaipur, Rajasthan, India 1968; consultant, Morocco Peace Corps; consultant, in-country Morocco Peace Corps.

PIPPIN, LOUIS D. (1970) ................................................................. Education
B.S., West Texas State College, 1952; M.Ed., 1956; Ed.D., North Texas State University, 1970. Associate Professor.
Experience: Teacher, Baird, Happy and Amarillo, Texas; counselor, Amarillo High School; visiting professor, North Texas State University; U.S. Army.

POHL, JENS G. (1973) ................................................................. Architecture and Environmental Design
B. Arch., University of Melbourne, Australia, 1964; M. Building Science, University of Sydney, Australia, 1967; Ph.D., 1970. Professor.
Experience: Private practice and consultant, Sydney, Australia; senior lecturer, University of New South Wales, Australia; post-graduate tutor, Department of Education and Science, Commonwealth of Australia; demonstrator, University of Sydney, Australia; architect, Public Works Department of Victoria, Australia. Registered architect, Vic. and N.S.W., Australia, F.R.A.I.A., A.I.C.

POLK, BENJAMIN K. (1966) ................................................................. Architecture and Environmental Design
Diploma, School of Planning and Research in Regional Development, England, 1952. Associate Professor.

PRATT, RUTH M. (1972) ................................................................. Graduate Nurse
Experience: Public health nurse, Ross Loos Medical Group; office nurse, Glendale; general duty nurse, San Luis Obispo Convalescent Hospital.

PRICE, D. JOHN (1975) ................................................................. Mechanical Engineering
Experience: Engineer, British Electricity Authority; assistant planning engineer, British Columbia Telephone Co.; technical assistant, Vickers Armstrong Ltd.; officer, RCAF.

PRITCHARD, EILEEN ELLEN (1973) ................................................ Library
B.A., California State University, Chico, 1961; Ph.D., University of Kansas, 1967; M.L., Kansas State Teachers College, 1972. Senior Assistant Librarian.
Experience: Graduate assistant, University of Kansas; trainee, national Institutes of Health, University of Kansas; assistant professor, Northern Arizona University.

PROCTOR, ANDREW J. (1973) ................................................................. Physical Education
B.S., California Polytechnic State University, 1970; M.S., 1971; additional graduate study, University of Utah. Assistant Professor.
Experience: Graduate teaching assistant, California Polytechnic State University; graduate teaching assistant, University of Utah; Officer, U.S. Army.
PUNCHES, GERALD N. (1971) ............................................................. Registrar
B.A., Western Washington State College, 1970; M.Ed., 1971; additional graduate study, University of California, Santa Barbara.

QUICK, LILLIAN F. (1972) ............................................................. Graduate Nurse
R.N., St. John's Episcopal Hospital, 1959.
Experience: Head nurse, St. John's Episcopal Hospital; evening charge nurse, Washington Hospital Center; general duty nurse, Nyack Hospital, New York, and Ramapo General Hospital, Spring Valley, New York; supervisor, Out Patient Department, Children's Hospital, Louisville, Kentucky; Peace Corps volunteer, India; general duty nurse, Arroyo Grande Community Hospital; part-time nurse, Health Center, California Polytechnic State University.

QUINLAN, CHARLES W. (1966) .......................................................... Architecture and Environmental Design
B.Arch., Cornell University, 1959; M.A., University of Sheffield, 1974. Professor.
Experience: Private practice, urban planning and architecture; instructor, University of New Mexico; registered architect, California; NCARB certified.

QUINN, JAMES M. (1973) ............................................................. Physical Education
B.A., Eastern Montana College, 1960; M.S., California State University at Hayward, 1968; Ph.D., University of Utah, 1970. Assistant Professor.
Experience: Teacher, Custer County High School and Junior College; instructor, California State University at Hayward; assistant professor, Idaho State University; coach-manager, U.S. Gymnastic Team.

QUINN, RONALD J. (1976) ............................................................. Ornamental Horticulture
B.S., California Polytechnic State University, San Luis Obispo, 1972; M.S., 1976; additional graduate study, California Polytechnic State University. Assistant Professor.
Experience: Lecturer, California Polytechnic State University; instructor's aide, Floral Design Short Course; independent landscape design and plant consultant; visiting lecturer, Universiti Teknologi Malaysia and Institute Teknologi in Mara, Kuala Lumpur, Malaysia.

RA BE, PETER (1967) ............................................................. Psychology
B.A., Ohio State University, 1943; M.A., Western Reserve University, 1948; Ph.D., 1949. Associate Professor.
Experience: Self-employed psychological counseling, therapy, writer; research fellow, Jackson Laboratory, Bar Harbor, Maine; lecturer, Western Reserve University.

RADEMAKER, PIERRE (1972) ............................................................. Art
B.A., California State College, Long Beach, 1970. Assistant Professor.
Experience: Art director and production manager. The Sunshine Studio; assistant art director, Martin Advertising and Public Relations; graduate assistant, California State College, Long Beach; instructor, Serra High School; recreation graphic specialist, County of Los Angeles Parks and Recreation Department, City of Lawndale; free-lance publication designer, graphic designer, and illustrator.

RAILEY, JIMMY H. (1977) ............................................................. Head, Physical Education Department
B.S., Murray State University, 1959; M.S., Indiana University, 1959; D.P.E., 1969. Professor.
Experience: Chairman, Health, Physical Education and Recreation, director of athletics, Georgetown College, chairman, Physical Education, Marshall University; associate professor, Weber State College; head coach, head athletic trainer, Utah State University; assistant coach, athletic trainer, Arizona State University; high school coach, Bridgeport, Illinois.

RALSTON, DAVID W. (1976) ............................................................. Medical Officer
B.A., University of California at Irvine; B.S., 1969; M.D., University of Southern California, 1973.
Experience: Internship, Los Angeles County-University of Southern California Medical Center; internal medicine residency, Emanuel Hospital, Portland, Oregon.
Faculty and Staff

RAPPA, JOHN B. (1959) ................................................ Electronic and Electrical Engineering
B.S., University of California, 1940; B.D., Princeton Theological Seminary, 1948; M.S., San Jose State College, 1967. Professor.
Experience: Design engineer, General Electric Company; project engineer, Collins Radio Company; field engineer, United Fruit Company; instructor, Princeton University. Registered professional engineer, California.

RATCLIFFE, RONA LD V. (1963) .............................................................. ..................... Music
B.A., University of Washington, 1956; M.M., University of Southern California, 1958. Professor.

RATHBUN, LARRY P. (1970) ........................................... Head, Agricultural Education Department
B.S., California Polytechnic State University, San Luis Obispo, 1964; M.A., 1967; Ph.D., Ohio State University, 1974. Associate Professor.
Experience: Director of agriculture, Rio Vista High School; director of agriculture, coordinator of vocational education, coordinator of Manpower Development Act, Los Banos High School; evening instructor, Modesto Junior College and Merced College.

B.S., College of St. Catherine, 1943. Associate Librarian.
Experience: Librarian, College of the Holy Cross, Worcester, Massachusetts; librarian, Charity Hospital School of Nursing, New Orleans; cataloger, California State Polytechnic College.

REED, JAMES W. (1975) ..................................................... Speech Communication
Experience: Chairman, Division of Language Arts, University of Guam; instructor, Southern Illinois University.

REESE, JEANETTE M. (1976) .................................... ............. Health Educator
B.A., University of California at Santa Barbara, 1975.
Experience: E.O.C. Family Planning Center, San Luis Obispo; Private physician office, San Luis Obispo; Overland Express, San Luis Obispo.

REIF, GARY D. (1967) ............................................................. Dairy and Poultry Science
B.S., Kansas State University, 1962; M.S., University of Nebraska, 1964; Ph.D., Iowa State University, 1967. Associate Professor.
Experience: Research assistant, University of Nebraska; research and teaching assistantship, director of dairy and food products analysis laboratory, Iowa State University.

REYNOLDS, GERALD D. (1969) ..................................................... Counselor, Financial Aid
Experience: Manufacturers representative, Mead-Johnson Nutritionalis; territory sales representative, Home Garden Division, Ferry-Morse Seed Company; company representative, Canned Milk Division, Carnation Company; Student Affairs Internship, California State Polytechnic College; training officer, U.S. Coast Guard Reserve.

REYNOLDS, ROBERT G. (1963) ..................................................... Art
Experience: Artist, Creative Arts Studio, San Luis Obispo; free-lance illustrator-painter, Los Angeles and San Luis Obispo; art instructor, San Luis Obispo Adult School and Cuesta College; staff artist, production coordinator, instructor, California Polytechnic State University; regional artist for Ford Times magazine.

REYNOLDS, R. WALLACE (1953) ..................................................... Engineering Technology
B.S., California (Pa.) State Teachers College, 1940; M.S., Purdue University, 1946; additional graduate study, University of Pittsburgh, University of Southern California, University of California, Berkeley. Professor.
Experience: Weight engineer, Douglas Aircraft Company; ordnance engineer, Naval Ordnance Laboratory; instructor, Purdue University; head, engineering drawing, Washington and Jefferson College; assistant professor, University of Santa Clara; engineering designer, Hughes Aircraft Company.

RHOADS, HOWARD (1956) ........................................................................ Crop Science
B.S., Montana State University, 1951; M.S., 1952. Professor.
Experience: Fieldman, Great Western Sugar Co., Billings, Montana; instructor and assistant, Montana State University.

RICE, WALTER E. (1964) ........................................................................ Economics
Experience: Assistant floor manager, Roos/Atkins; student teacher, College of San Mateo; tutor, San Francisco; instructor, California State Polytechnic College, Kellogg-Voorhis.

RICH, GLENN W. (1953) ........................................................................... Agricultural Engineering
Experience: Journeyman carpenter, U.S. Coast Guard; instructor, California State Polytechnic College.

RICHARDS, THOMAS L. (1969) ............................................................. Biological Sciences
B.S., California State College, Long Beach, 1964; M.A., 1966; Ph.D., University of Maine, 1969. Associate Professor.
Experience: Technical and research assistant, California State College, Long Beach; research assistant, NDEA fellow, Ira C. Darling Marine Laboratory, Walpole, Maine.

B.S., Ohio State University, 1950; M.S., 1954; Ph.D., 1958. Professor.
Experience: Assistant Herdsman, research assistant, in charge of federal dairy breeding program, Ohio State University. Dairy Department, California State Polytechnic College, San Luis Obispo; Extension Dairy Specialist, Ohio State University.

RIDDLE, STEVEN G. (1975) ................................................................. Coordinator, Alumni Services
B.A., California Polytechnic State University, 1969.
Experience: Public relations and advertising director, Set-Ro Company, Sacramento; post publications officer, Ft. Ord; division manager, Environmental Marketing Group, Sacramento; sales manager, KFBK-FM, Sacramento.

RIDER, ROL W., JR. (1960) ....................................................... Business Administration
B.A., University of California, 1941; M.A., 1967; Ph.D., University of Oregon, 1972. Professor.
Experience: U.S. Naval Aviation (Reserve); Flight operations and airport management, Pan American Airways; national sales manager, Royal Rinse, Inc.; divisional product-advertising manager, Carnation Co., Inc.; account executive, N.W. Ayer & Son, Inc.; account supervisor, Young & Rubicam, Inc.; management and marketing consultant.

RIEDLSPEIGER, MAX E. (1969) .............................................................. History
Experience: Teacher, Eastern High School, Bay de Noc Community College; teaching associate, University of Colorado; instructor, Temple Buell College; Fulbright Scholar, University of Salzburg.

RIFE, WILLIAM C. (1977) ................................................................. Head, Chemistry Department
Experience: Associate professor, Parsons College; patent scientist, Owens-Illinois Corporation, toledo; chairman, chemistry department, North Central College; visiting lecturer, University of Illinois; chairman, humanities division, North Central College; NEH fellow, Pennsylvania State University.

RIGGINS-PIMENTEL, RHONDA L. (1972) ............................................. Biological Sciences
B.S., Austin Peay State College, Tennessee, 1966; M.S., Iowa State University, 1969; Ph.D., 1972. Associate Professor.
Experience: Teaching assistant, Iowa State University.
RIHAL, SATWANT S. (1969) ......................................................... Architecture and Environmental Design
B.S., University of Delhi, India, 1961; M.S., University of Minnesota, 1964; Ph.D., University of New Mexico, 1969. Professor.
Experience: Civil engineer, Central Water and Power Commission, New Delhi; structural engineer, T. T. Burnett Engineering Inc., Albuquerque; instructor, Department of Civil Engineering, Univ. of New Mexico; structural engineer, Pre-Stressed Concrete Products, Inc., Albuquerque; consultant, Hydro-Conduit Corporation, Albuquerque; structural engineer, Benito A. Sinclair and Associates, Los Angeles; senior structural engineer, Skidmore, Owings, and Merrill, Architects and Engineers, San Francisco; registered civil engineer, California.

ROACH, DAVID M. (1966) ........................................................................... Physics
B.S., South Dakota School of Mines and Technology, 1961; M.S., 1963; Ph.D., Oregon State University, 1974. Associate Professor.
Experience: Graduate assistant, instructor, South Dakota School of Mines and Technology; instructor, Wisconsin State University, Northrop Institute of Technology; engineer, Leach Corporation.

ROCKMAN, ILENE F. (1975) ................................................................. Library
B.A., 1972, University of Southern California; M.L.S., 1974, University of California, Los Angeles; additional study.
Experience: Education Librarian, Washington State University, Pullman, Washington; Assistant Librarian.

RODGERS, HELEN M. (1970) ................................................................. Admission Counselor
Experience: Elementary school teacher, California; program associate, Office of International Education, Cal Poly, San Luis Obispo.

ROEST, ARYAN I. (1955) ........................................................................ Biological Sciences
B.S., University of Virginia, 1945; B.S., Oregon State College, 1948; M.S., 1949; Ph.D., 1954. Professor.
Experience: Officer, U.S. Navy; teaching and research assistant, Oregon State College; assistant professor, Central Oregon College; forester, Oregon State Board of Forestry; lecturer, Extension Division, University of California; visiting assistant professor, University of California, Santa Barbara; lecturer, National Science Foundation Summer Science Program.

ROGALLA, JOHN A. (1959) ................................................................ Agricultural Management
B.S., California State Polytechnic College, 1956; M.S., Cornell University, 1958; Ph.D., 1968. Professor.
Experience: Teaching and research assistant, Department of Agricultural Economics, Cornell University; farm management consultant, material control analyst, Ryan Aeronautical Company; U.S. Air Force.

B.S., Marion College, 1962; M.S., Kansas State University, 1966; Ph.D., Virginia Polytechnic Institute and State University, 1975. Assistant Professor.
Experience: Teacher, Jefferson Township High School; teacher, Army Education Center, Fort Riley, Kansas; graduate teaching assistant, Kansas State University; lecturer, California State Polytechnic College, San Luis Obispo.

ROGERS, LEO E. (1954) ........................................................................ Engineering Technology
B.S., California State Polytechnic College, 1950. Professor.
Experience: Instructor, San Luis Obispo High School; designer, Division of Highways, San Luis Obispo.

ROGERS, ROBERT L. (1974) ........................................................................ Engineering Technology
B.S., California Maritime Academy, 1969; M.S., Stanford University, California, 1972. Assistant Professor.
ROGERS, ROLF E. (1975) ............................................................ Management
M.A., University of Washington, 1968; Ph.D., 1970. Professor
Experience: Chief, management systems staff, Boeing Company; director, systems analysis
staff, lecturer, University of Washington; associate professor, professor of management, Uni-
versity of Alberta, Canada; independent management consultant, United States and Canada.
ROLLINGS, DAVID R. (1968) .......................................... English
A.B., University of Louisville, 1948; M.A., University of Michigan, 1949; additional graduate
study. Assistant Professor.
Experience: Assistant professor, Eastern Michigan University, Wisconsin State University,
University of Puerto Rico, East Kentucky State College, Wisconsin State College.
ROMNEY, JOSEPH B. (1969) .......... Associate Dean, Communicative Arts and Humanities
B.S., University of Utah; J.D., 1963; M.A., 1967; Ph.D., 1969. Associate Professor.
Experience: Musician, Utah Symphony Orchestra; research clerk, Utah Supreme Court;
assistant, Utah State Attorney General; lawyer, Romney & Boyer; teaching assistant, Univer-
sity of Utah.
ROSEN, ARTHUR Z. (1953) ....................................... Physics
A.B., University of California, 1941; Ph.D., 1952. Professor.
Experience: Physicist, University of California Radiation Laboratory; U.S. Navy; teaching
and research assistant, University of California; lecturer, University of California, Santa Bar-
bara College.
ROSENBERG, ROBERT L. (1970) ..................................................... History
B.A., Stanford University, 1944; M.A., University of Washington, 1964; Ph.D., 1971. Associ-
ate Professor.
Experience: Lecturer, supervisor of student teaching. University of Washington; teacher,
Bellevue Community College, Highline Senior High School, Washington
ROSENMAN, MONA G. (1971) .......................................... English
B.A., University of Michigan, 1955; M.A., Case-Western Reserve University, 1960; Ph.D.,
Kent State University, 1970. Assistant Professor.
Experience: Teacher, Independence, Ohio, Winchester, Massachusetts, Beachwood, Ohio;
teaching fellow, Kent State University.
ROSENTHAL, BIANCA (1971) ....................................... Foreign Languages
Experience: Teacher, Federal Way Senior High School, Washington; predoctoral associate;
research assistant, University of Washington; instructor, Lake Washington Continuing Educa-
tion; medical technologist, private physician’s office and Providence Hospital.
ROSKE, MILDRED E. (1967) ..................................................... Home Economics
B.A., University of California, 1955; M.A., 1958; Ph.D., University of Oregon, 1975. Associate
Professor.
Experience: Interior designer, Sherman Oaks; teaching assistant, instructor, University of
California; teacher, adult education, Los Angeles City Schools; instructor, Rochester Institute
of Technology; teacher, Oxnard Evening School; graduate teaching fellow, University of
Oregon.
RUEHR, THOMAS A. (1974) ........................................................... Soil Science
B.S., Ohio State University, 1966; M.S., Iowa State University, 1970; Ph.D., Colorado State
University, 1974. Assistant Professor.
Experience: Graduate teaching assistant, Iowa State University; instructor in teaching and
research, Colorado State University.
RUGGLES, PHILIP K. (1966-67) (1971) ................................ Graphic Communications
B.S., West Virginia Institute of Technology, 1965; M.S., South Dakota State University, 1966.
Associate Professor.
Experience: Consultant, Branch of Printing, U.S. Geological Survey, Department of Interi-
or; chairman, Printing Management Technology, Columbus Technical Institute; consultant
for printing industry of Central, Ohio; instructor, Arkansas State University; graduate teach-
ing assistant, South Dakota State University.
RUSSELL, CHARLES R. (1968) ............................................................ Mechanical Engineering
B.S., Washington State College, 1936; M.S., California Institute of Technology, 1946; Ph.D.,
University of Wisconsin, 1941. Professor.
Experience: Section head, General Motors Corp., U.S. Atomic Energy Commission; pro-
gram administrator, Navy Bureau of Ordnance; engineer, Procter and Gamble, Dow Chemical.
Registered professional engineer, California, Michigan, Virginia, and District of Columbia.
RUSSELL, JOHN G. (1968) ...................................................................................................... Music
Experience: Pianist; composer; instructor, Fresno State College; assistant professor, Chico
State College; conductor, Mozart Festival Singers.
RUTHERBECK, DENNIS (1970) ............................................................ Building Manager, University Union
Experience: Assistant building manager, Mankato, Minnesota.
RUTHERFORD, ROBERT T. (1974) ............................................................ Animal Science
B.S., University of California, Davis, 1970; graduate study, University of California, Davis,
1971. Assistant Professor.
Experience: Director of vocational agriculture, El Cajon Valley High School, El Cajon.
SAAM, PATRICIA (1966) ............................................................ Home Economics
B.S., College of St. Catherine, St. Paul, Minnesota, 1950; M.S., California Polytechnic State
University, 1973. Associate Professor.
Experience: Dietetic internship, research-pediatrics dietitian, University of Minnesota; head
dietitian, Paso Robles War Memorial Hospital, Sierra Vista Hospital; dietitian, dining hall,
California Polytechnic State University.
SABOL, JOSEPH E. (1972) ............................................................ Agricultural Education
B.S., Fresno State College, 1963; M.Ed., University of California, 1965; Ph.D., Colorado State
University, 1976. Associate Professor.
Experience: Instructor, Vocational Agriculture, Orestimba Union High School, Newman;
instructor, Agricultural Sciences, Mount San Antonio College.
SABTO, JACQUES C. A. (1968) ............................................................ Electronic and Electrical Engineering
Coordinator, Engineering Science
B.E.E., Cairo University, 1948; Ingenieur Radio-ESE, Ecole Superieure D'Electricite, Paris,
1951; E.E., Columbia University, 1959; additional graduate study, New York University. Pro-
fessor.
Experience: Lecturer, City College of New York and Institute of Technology, Hoboken,
New Jersey; Adjunct Professor, Newark College of Engineering; development engineer,
I.T.T., Nutley, New Jersey; technical staff, Bell Telephone Laboratories, Holmdel, New Jer-
sy; ASEE-NASA fellow, Norcus Fellow; visiting professor, Arizona State University, Tempe.
SALO, GLENN W. (1955) ............................................................ Agricultural Engineering
B.S., Montana State College, 1950; M.S., University of Idaho, 1955; additional graduate work,
University of California, Davis. Professor.
Experience: Shops officer, U.S. Air Force; instructor and assistant agricultural engineer,
University of Idaho; Research Fellow, University of Idaho; junior civil engineer, California
Department of Water Resources; agricultural engineer, Anderson Steel Buildings. Registered
professional engineer, California.
SANCHEZ, DAVID J. (1970) ............................................................ Head, Ethnic Studies Department
B.B.A., University of Texas at El Paso, 1950; graduate study, University of California, Santa
Barbara. Associate Professor.
Experience: Junior high teacher, Tornillo, Texas; insurance agent; teacher, Lucia Mar Uni-
fied School District, Pismo Beach; lecturer, California State Polytechnic College, San Luis
Obispo.
SANCHEZ, RICHARD M. (1972) ................................................................. Associate Dean, School of Human Development and Education
B.S., Northern Arizona University, 1964; M.A., California Polytechnic State University, 1971; Ed.D., Western Michigan University, 1972. Associate Professor.

SANDERSON, JAMES D. (1967) ......................................................... Coach, Physical Education
Experience: Teacher and coach, Tulare Western High School, Tulare, and Sierra High School, Tollhouse.

SANDLIN, DORAL R. (1969) .............................................................. Aeronautical Engineering
B.S., U.S. Naval Academy, 1954; M.S., Air Force Institute of Technology; Ph.D., University of Arizona, 1972. Professor.
Experience: Flight test maintenance officer and pilot, U.S. Air Force; missile branch chief, Holloman Air Force Base, New Mexico; chief, aeromechanics branch, Flight Dynamics Laboratory, Wright-Patterson Air Force Base, Ohio.

SANKOFF, LEO (1946) ................................................................. Dairy and Poultry Science
B.S., California State Polytechnic College, 1942; M.A., 1956. Professor.
Experience: Agricultural instructor, Fillmore High School.

SAVEKER, DAVID R. (1968) ........................................... Architecture and Environmental Design
A.B., Stanford University, 1941; Certificate Naval Architecture, U.S. Naval Academy Post Graduate School, 1942; M.S., Naval Architecture & Marine Engineering, Massachusetts Institute of Technology, 1946; Certificate Naval Warfare, U.S. Naval War College, 1959; additional graduate study, California Polytechnic State University, 1968-69. Associate Professor.
Experience: Engineering duty officer, officer in charge of Underwater Explosions Research Division, Norfolk Naval Shipyard, navet test program officer, new construction and ship repair, Puget Sound Naval Shipyard; Pacific Fleet Staff; officer in charge, Naval Engineering Curricula, Naval Post Graduate School, Monterey; senior management and command duties, U.S. Navy; ocean engineering consultant.

SCHAFFNER, DAVID J. (1972) ............................................................. Agricultural Management
B.S., University of California, Davis, 1964; M.B.A., University of California, Berkeley, 1970. Associate Professor.
Experience: Marketing analyst, Calcot Ltd., Bakersfield; specialty food marketing, Holly World Foods, Inc., San Francisco; Officer, U.S. Army.

SCHEFFER, PAUL E. (1964) ............................................................... Industrial Engineering
B.M.E., University of Minnesota, 1947; M.S., University of Southern California, 1959. Professor.
Experience: Chief industrial engineer, Crane Company; senior industrial engineer, U.S. Rubber Company; engineering, Appraisal Service Company; instructor, University of Minnesota. Registered professional engineer, California.

SCHLEICHER, HELMUT L. (1970) ....................................................... Architecture and Environmental Design
B.A., Kaiser-Friedrich Mannheim College, Germany, 1936; M.S., Technical University, Munich, Germany, 1945; Ph.D., University of Munich, Germany, 1948; additional graduate study, University of Hawaii. Professor.

SCHROEDER, WALTER P. (1957) .............................................................. Head, Education Department
B.S., Michigan State University, 1940; M.A., 1947; Ph.D., 1953. Professor.
Experience: Three years technical and management work in agriculture, business and industry; teacher, supervising teacher, and administrator in junior and senior high schools and unified districts, assistant professor, vocational education and education, Michigan State University; assistant placement director, Michigan State University.
SCHULTZ, NED W. (1976) ............................................. Child Development
M.S., Pennsylvania State University, 1973; M.A., 1974; Ph.D., Ohio State University, 1976. Assistant Professor.
Experience: Head graduate teaching associate, teaching assistant, Ohio State University; educational consultant to Borden, Inc.; program associate, Applied Behavior Analysis Project.

SCHUMANN, THOMAS G. (1971) ....................................................... Physics
B.S., California Institute of Technology, 1958; M.A., University of California, Berkeley, 1960; Ph.D., 1965. Associate Professor.
Experience: Research assistant, Lawrence Radiation Laboratory; research associate, Brookhaven National Laboratory; assistant professor, City College of City University of New York; lecturer, California State College, Hayward.

SCHWARTZ, ARTHUR L. (1975) ............................................. Business Administration
Experience: Production control supervisor, Wolverine Knitting Mills, Bay City, Michigan; investment analyst, Prudential Insurance Company, Newark, New Jersey; assistant vice-president, Watling, Lerchen and Company, Inc. (Members N.Y.S.E.), Detroit, Michigan; teaching fellow and research assistant, University of Oregon.

SCHWARTZ, KENNETH E. (1952) .............................. Director, School of Architecture and Environmental Design
B. Arch., University of Southern California, 1952; graduate study, Pennsylvania State University, Rensselaer Polytechnic Institute, University of Manchester, England. Professor.
Experience: Draftsman, Douglas Aircraft Company; draftsman-designer, various Los Angeles architectural firms; private practice, San Luis Obispo; San Luis Obispo Planning Commission; Mayor, San Luis Obispo. Registered architect, California.

SCOTT, CHESTER H. (1952) ....................................... Mathematics
B.A., Municipal University of Wichita, 1938; electronics diploma, U.S. Navy, 1945; M.S., Montana State College, 1950; additional graduate study, Stanford University. Professor.
Experience: Instructor, Sheridan High School, Wyoming; instructor, mathematics and navigation, Civilian Pilot Training School; counselor, Y.M.C.A.; instructor, mathematics, electronics, U.S. Navy; assistant professor, mathematics; Montana School of Mines; statewide counselor, University of Montana.

SCOTT, JACK F. (1967) ............................................ Agricultural Management
Experience: Director of Vocational Agriculture, Galt Joint Union High School, Galt.

SCOTT, KENNETH C. (1975) .............................................. Agricultural Management
B.A., Brigham Young University, 1970; Ph.D., Washington State University, 1975. Assistant Professor.
Experience: Research Assistant, Department of Agricultural Economics, Washington State University; PreDoctoral Staff Associate, Cooperative Extension Service, Washington State University; research associate, State of Washington Water Research Center; research consultant, U.S. Bureau of Reclamation.

SCOTT, PAULA ROSEMARY (1973) ................................ Library
B.A., University of California, Los Angeles, 1965; M.L.S., University of California, Los Angeles, 1966; graduate study, Monterey Institute of Foreign Studies. Assistant Librarian.
Experience: Serials-Reference librarian, Biomedical Library, University of California, Los Angeles; reference librarian, University of California, Santa Cruz; translator, Joint Publications Research Service, San Francisco.

SCOTTO, KENNETH C. (1970) ..................................................... Animal Science
B.S., California State Polytechnic College, San Luis Obispo, 1966; M.S., University of Nevada, 1969; Ph.D., Washington State University, 1975. Associate Professor.
Experience: Instructor, University of Nevada, Reno; graduate research associate, University of Nevada; ranch and farming operations, California.

SEABERG, DUANE O. (1965) ..................................................... Agricultural Management
Experience: Farming; instructor, Ferndale Union High School.
SEDLETZKY, MARCEL E. (1976) ........................ Architecture and Environmental Design

SEEBER, GLENN E. (1954) ........................................... Engineering Technology
Experience: Instructor in biology and welding, Lassen Union High School and Junior College; welder and foreman, Interstate Steel Co., Chico; welder, Anderson's Welding Shop, Chico; welder and foreman, Pollock Shipbuilding Corp., Stockton; locomotive fireman, Western Pacific Railroad.

SENNETT, ROBERT EARL (1970) ..................................... Civil Engineering
Experience: Assistant professor, University of California, Santa Barbara; senior structural dynamicist, General Motors Defense Research Laboratories, Santa Barbara; assistant instructor-teaching fellow, University of Pennsylvania; research engineer, Dyna/Structures, Inc., Springfield, Pennsylvania.

SERVATIUS, OWEN L. (1947) ............................................. Management
Experience: Brokers' clerk, Baker-Fentress & Co., Chicago, Illinois; U.S. Navy; Department Head, Business Administration, California State Polytechnic College.

SETTLE, ALLEN K. (1970) ........................................ Political Science
B.A., University of California, Santa Barbara, 1966; M.A., 1967; Ph.D., 1970. Associate Professor.
Experience: Instructor, Santa Barbara City College; intern-fellow, American Political Science Association; research assistant, University of California, Santa Barbara; San Luis Obispo Planning Commission.

SHAFFER, RICHARD A. (1974) ........................................... Social Sciences
B.A., Stanislaus State College, 1971; M.A., University of Notre Dame, 1974; Ph.D., 1975. Assistant Professor.
Experience: NIMH Traineeship, University of Notre Dame.

SHAH, RAMESH T. (1969) .................................................. Mechanical Engineering
B.E., Maharaja Sayajirao University of Baroda, India; Dr. Ing., Hochschule Fur Schwermaschinenbau, Magdeburg, Germany, 1959. Professor.
Experience: Professor, reader, lecturer, and demonstrator, Faculty of Technology and Engineering, University of Baroda, Baroda, India.

SHARP, HARRY, JR. (1975) .................. Acting Head, Speech Communication Department
A.B., University of the Pacific, 1959; M.S., Purdue University, 1961; Ph.D., 1967. Assistant Professor.
Experience: Instructor, The College of Wooster; visiting lecturer, Humboldt State College; assistant professor, University of California at Davis.

SHAW, WAYNE F. (1966) .................................................. Sports Information Director
B.A., University of Iowa, 1951.
Experience: Sports writer-editor, reporter for newspapers at Sibley, Ottumwa, Boone and Sioux City, Iowa, Twin Falls, Idaho; Sports Informations Director, South Dakota State; Assistant SID Indiana University; member, Board of Directors College Sports Information Directors of America (1976–79).

SHEIK, HABIB (1967) .................................................. English
B.S., Fresno State College, 1959; A.B., 1960; M.A., California State Polytechnic College, 1961; M.A., University of California at Los Angeles, 1966; additional graduate study, University of Nebraska. Assistant Professor.
Experience: English tutor, project "Upward Bound," University of California; instructor, Vietnamese Leadership/Scholarship Program, California State Polytechnic College.
SHELTON, DONALD L. (1973) ......................................... Director, Personnel Relations
B.G.E., University of Omaha, 1958; B.S., University of Southern California, 1960; M.S., 1960.
Experience: Director of personnel, air force bases in Spain, Louisiana, Japan, California; chief of officer assignments, Strategic Air Command, Omaha; professor of aerospace studies, Loyola University, Los Angeles; director of officer personnel, Headquarters Air University, U.S. Air Force; principal personnel analyst, The California State University and Colleges.

SHRODE, L. IRENE (1965) ........................................ Graduate Nurse
R.N., Knapp College of Nursing, Santa Barbara.
Experience: Warren State Hospital, Warren, Pennsylvania; Sierra Vista Hospital, San Luis Obispo.

SHUTT, NOEL M. (1975) ................................................ Animal Science
B.S., California State Polytechnic College, 1971; M.S., University of Missouri, 1972; Ph.D., 1976. Assistant Professor.
Experience: Cattle herdsman and hog farming, Hessel Farms, Holt, Missouri; instructor, University of Missouri; research assistant, Electron Microscopy, University of Missouri; certified artificial inseminator.

SILVA, CLAUDIO Y. (1975) ........................................ Foreign Languages
B.A., Claremont Men's College, 1951; M.A., University of Southern California, 1964; Ph.D., 1970. Associate Professor.
Experience: Assistant professor, San Jose State University; teacher, Whittier, Anaheim, and Riverside High School Districts.

SILVER, GORDON A. (1964) ........................................ Physics
B.S., University of California, Los Angeles, 1959; M.S., 1961; additional study, University of California, Berkeley. Associate Professor.
Experience: Instructor, American Television Labs, Los Angeles Valley College; research engineer, Electrosonic Systems, Inc.; associate investigator, Children's Hospital, Los Angeles.

SIMMONS, JAMES E. (1966) ...................................... English
B.A., University of California, Santa Barbara, 1959; M.A., University of Wisconsin, 1960; Ph.D., 1966. Professor.
Experience: Assistant professor, Wisconsin State University; associate dean, School of Applied Arts, California Polytechnic State University.

SIMMONS, ORIEN W. (1961) ........................................ Metallurgical Engineering
B.S.E., University of Michigan, 1935; M.S.E., 1948. Professor.
Experience: Metallurgist, Carnegie-Illinois Steel Company; Packard Motor Car Company; instructor, Rose Polytechnic Institute; officer, U.S. Navy; research engineer, Battelle Memorial Institute; senior research engineer, Frankford Arsenal; Rem Cru Titanium Company and Crucible Steel Company; Climax Molybdenum Company; registered professional engineer, Ohio and California.

SMITH, DALE A. (1973) ........................................ Veterinary Science
B.S., School of Veterinary Medicine, University of California, Davis, 1971; D.V.M., 1973. Associate Professor.
Experience: Large animal practice, San Joaquin Valley.

SMITH, HOWARD F. (1968) ......................................... Economics
A.B., Wayne State University, 1940; M.B.A., Harvard University, 1942; M.A., American University, 1952; Ph.D., 1963. Professor.
Experience: Economist, War Production Board; economic advisor, supreme commander for Allied Powers, Tokyo and Okinawa; international economist, Department of State; foreign service officer, Thailand, Ceylon, Congo; member of Presidential Study Mission to Korea; deputy director, U.S. Aid Mission, Congo; coordinator, U.S. Aid to Africa; director, Ghana Aid Program; officer, U.S. Army.

SMITH, J. MURRAY (1960) ........................................ Speech Communication
Experience: Instructor in English and speech, Denver University, Michigan State University and Wichita University; technical director, Denver Civic Theater; president, the Knitter Company (mfg.), Denver; staff director, Pasadena Playhouse; officer, U.S. Marine Corps.
SMITH, NELSON L., III (1962) ......................................................... Industrial Technology
B.S., Lowell Technological Institute, 1960; M.S., 1962; additional graduate study, University of Iowa. Professor.
Experience: Senior systems analyst, quality control engineer, Raytheon Company, Lowell, Massachusetts.

SMITH, R. ELBERTON (1970) ...................................................... Economics
Experience: Program economist, USAID Mission to Turkey; program economist and commodity import advisor, U.S. Mission to Cambodia; program economist, ICA Mission to Japan, economic advisory to Japan Productivity Center; economic historian and author, Office of Military History, War Department and Department of the Army; officer, U.S. Navy; economist, War Production Board; visiting professor, Indiana University; lecturer, University of Maryland; professor, Northwestern University; instructor, University of Denver; branch manager, B. B. Kirkbride Bible Company; divisions expert, Elgin, Joliet and Eastern Railway.

SNETSINGER, JOHN G. (1970) .................................................. History
A.B., University of California, Los Angeles, 1963; M.A., University of California, Berkeley, 1966; Ph.D., Stanford University, 1969; additional graduate study, Stanford School of Law. Associate Professor.
Experience: Teaching assistant, graduate assistant, Stanford University; instructor, San Jose State College.

SNYDER, DAVID H. (1970) ......................................................... Admissions Officer
B.A., California Polytechnic State University, San Luis Obispo, 1973; M.A., 1975. Experience: Credit manager, Sears Roebuck & Co., Glendale; supervising clerk, assistant administrative analyst, California Polytechnic State University, San Luis Obispo.

SNYDER, ROBERT (1975) ......................................................... Natural Resources Management
B.S., University of Illinois, 1961; M.F., Oregon State University, 1962. Assistant Professor. Experience: Forester, International Paper Company; teaching and research assistant, Oregon State University; assistant professor, University of Alaska.

SORENSEN, L. ROBERT (1966) .................................................. Head, Psychology Department
Experience: Assistant to dean of students, Pomona College; lecturer, assistant director Industrial Relations Center, administrative assistant Jet Propulsion Lab, and associate director of development, California Institute of Technology; assistant in development, assistant dean, Claremont Graduate School.

SPARLING, SHIRLEY R. (1963) ................................................... Biological Sciences
B.S., Iowa State College, 1950; M.S., 1951; Ph.D., University of California, 1956; additional graduate study, University of Michigan, Stanford University. Professor.
Experience: Instructor, Central College; lecturer and instructor, University of British Columbia; instructor and assistant professor, University of California at Santa Barbara; University of Oregon Institute of Marine Biology.

SPENCER, RUTH G. (1967) ......................................................... Library
B.A., Milwaukee-Downer College, 1938; B.L.S., University Library of Chicago, 1945; additional graduate study, University of Wisconsin. Senior Assistant Librarian.
Experience: Cataloger and reference librarian, Milwaukee Public Library; librarian, U.S. Public Health Service, Cincinnati; cataloger, Northrop Aircraft; reference librarian, Los Angeles Public Library.

STAHL, VERLAN H. (1968) ......................................................... Head, Foreign Languages Department
Experience: American program officer, Fulbright Commission and in-service English teacher, Standard Electric Co., Madrid; instructor, Wake Forest College, Winston-Salem; teaching assistant, Florida State University; secretary to Vice President, W. B. Camp & Sons, Inc., Bakersfield.
STALLARD, MARY L. (1965) ........................................ ......................... Physical Education
B.A., Fresno State College, 1957; M.S., University of Washington, 1965; Ph.D., University of Utah, 1974. Professor.
Experience: Instructor, Hamilton Junior High, Fresno; teaching assistant, University of Washington; part-time instructor and coach, University of Utah.

STANSFIELD, WILLIAM D. (1963) .................................. ......... Biological Sciences
B.S., California State Polytechnic College, 1953; M.A., 1959; M.S., University of California, Davis, 1962; Ph.D., 1963. Professor.
Experience: Cadet teacher, Chaffey Union High; line officer, U.S. Naval Reserve; vocational agriculture teacher, Fortuna Union High School; teaching assistant and research assistant, University of California.

STEARNS, JOSEPHINE S. (1969) ......................................................... Child Development
Experience: Nursery school teacher, Lansing, Michigan; associate 4-H Youth Development Agent, Milford, N.H.; utility demonstrator, Malden, Massachusetts.

STECHMAN, JOHN V. (1960) .......................................................................... Animal Science
B.S., University of California, Davis, 1957; M.S., 1960. Professor.
Experience: Range aid, U.S.D.A. Forest Service, Agricultural Research Service; research assistant, University of California, Davis; biological assistant, U.S. Army; range consultant, State of California, Modoc County, Kern County, and private industry.

STEELE, F. RAYMOND, JR. (1968) ............................................................ Food Industries
B.A., California Polytechnic State University, 1956; M.S., Cornell University, 1967; Ph.D., 1968. Associate Professor.
Experience: Teaching assistant, University of Southern California; division manager, Sears Roebuck and Co.; brewer, Pabst Brewing; instructor, California State Polytechnic College; participant, Academic Year Institute, radiation biology, and research assistant, Department of Food Science, Cornell University; naval aviator, U.S. Navy.

STEINBERG, HOWARD (1970) ..................................... .................................... Mathematics
B.M.E., City College of New York, 1950; M.S., New York University Graduate School, 1966; Ph.D., 1969. Professor.
Experience: Manager of Missile Equipment and Ordnance Department, Maxson Electronics Corp.; manager mechanics program, Kollsman Instrument Corp.; engineering and mathematical consultant; assistant professor, Mathematics Research Center, University of Wisconsin.

STEUCK, FRED H. (1947) ............................................. ................................... Electronic and Electrical Engineering
B.S., Iowa State College, 1937. Professor.
Experience: Engineer, Nebraska Power Co.; manager, O'Brien Co.; Rural Electric Co-op, Iowa; instructor, Iowa State College; officer, U.S. Navy; registered professional engineer, California.

STOFFEL, EDWARD O. (1957) ................................................................. Mechanical Engineering
B.M.E., University of Santa Clara, 1950; M.E., University of Santa Clara, 1955; M.S.M.E., Oregon State University, 1968. Professor.
Experience: Engineer, Autonetics, Aerojet-General, Northrop Aircraft; Robertshaw-Fulton Controls, Norris-Thermador Corp.; chemist, U.S. Industrial Chemicals; registered professional engineer, California.

STOOKEY, ELLEN T. (1961) ................................................. ................. Home Economics
B.S, University of Illinois, 1943; M.A., 1950; additional graduate study, Stanford University. Professor.
Experience: Elementary teacher, Illinois; vocational home economics teacher, Illinois; supervising teacher, University of Illinois; teacher trainer, University of Illinois; special service, U.S. Army Air Force; regional supervisor, Bureau of Homemaking Education.

STOWE, KEITH S. (1971) ......................................................... Physics
University of Gottingen, Gottingen, Germany, 1964; B.S., Illinois Institute of Technology, 1965; Ph.D., University of California, San Diego, 1971. Associate Professor.
Experience: National Science Foundation trainee, research assistant, University of California, San Diego.
STRASSER, J. EDWARD (1960) ....................................................... Industrial Technology

STRICKMEIER, HENRY B. (1970) ....................................................... Mathematics
B.S., Texas Lutheran College, 1962; M.A., University of Texas, 1967; Ph.D., 1970. Associate Professor.
Experience: Teacher, Galveston Independent School District; teaching assistant and teaching associate, University of Texas.

STROHMAN, ROLLIN D. (1969) ................................................. Agricultural Engineering
B.S., University of Illinois, 1962; M.S., 1965; Ph.D., Purdue University, 1969. Associate Professor.
Experience: Research engineer, John Deere Company; agricultural engineer, USDA, ARS, WORDD.

STRONG, CHARLES W. (1971) ....................................................... English
B.S., Arizona State University, 1965; M.A., University of Missouri, 1969. Assistant Professor.
Experience: Supervisor, technical communication, Motorola Semiconductor Products, Inc.; instructor, University of Missouri; teacher, Judson Private School, Scottsdale, Arizona.

STUART, JOHN S. (1964) ....................................................... Architecture and Environmental Design
B.Arch., Texas Technological College, 1950; M.A., California Polytechnic State University, San Luis Obispo, 1974. Professor.
Experience: Private practice, Schmidt & Stuart; designer and supervisor, Atcheson & Atkinson, Architects. Registered architect and registered engineer, Texas.

B.S., Purdue University, 1960; M.S., Rensselaer Polytechnic Institute, 1962; Ph.D., 1973. Professor.
Experience: Teaching assistant, Purdue University; engineer, Knolls Atomic Power Laboratory; instructor, California State Polytechnic College, San Luis Obispo.

SUCHAND, GEORGE J. (1971) ....................................................... Social Sciences
Experience: Assistant professor, Georgia Southwestern College; teaching assistant, University of Oklahoma; map librarian, University of Florida; U.S., Navy.

SUHR, MOON JA MINN (1969-71) (1972) ....................................................... Physical Education
B.S., Ewha Women's University, Seoul Korea, 1963; M.A., Colorado State College, 1969. Associate Professor.
Experience: Dance instructor, Kong-Ju Teacher's College, Middle and High School, King-Ju, Korea; dance instructor, Sook Myoung Girls' Middle High School, Seoul, Korea; ballet instructor, Creative Art Center, Greeley Colorado.

SULLIVAN, GERALD J. (1968) ....................................................... English
Experience: Instructor, University of Wisconsin, University of Arizona; teaching assistant, University of Oklahoma; assistant professor, University of North Texas State.

SUMMERS, MARY JO (1962) ....................................................... Graduate Nurse
R.N, University of Oregon, Eugene, 1939; B.S., 1939.
Experience: Los Angeles County Hospital.
SUTLIFF, DALE A. (1973) ................................. Architecture and Environmental Design
B.S.L.A., California State Polytechnic University, Pomona, 1965; M. Regional Planning,
Experience: Landscape architect/planner, Rahenkamp, Sachs, Wells and Associates, Phila-
delphia; landscape architect/planner, State of California Department of Parks and Recreation,
Sacramento, Santa Barbara; landscape designer, Julio Juan Veyna, ASLA, Santa Barbara.
Registered Landscape Architect, California.

SWANSEN, VERN (1971) ................................. Architecture and Environmental Design
B. Arch., University of Southern California, 1939; M. Arch., University of Strathclyde, 1975.
Associate Professor.
Experience: Post arts director, Special Services, Fifth Army Headquarters; lecturer, West-
mont College; instructor, Santa Barbara City College; curator of education, Santa Barbara
Museum of Art.

SWANSON, BESSIE R. (1977) .......................... Head, Music Department
Professor.
Experience: Professor and chairman, Music Education Department, University of Michigan;
associate professor and chairman, Music Education Department, University of Washington;
consultant, Sacramento County Schools; teacher/supervisor of music, Visalia Public Schools;
special music teacher, Vista Public School.

SWANSON, CLIFTON E. (1967) .......................... Music
B.A., Pomona College, 1963; M.M., University of Texas, 1965; additional graduate study,
University of California. Associate Professor.
Experience: Visiting assistant professor, Portland State College; member, Group for Con-
temporary Music, Portland; conductor, San Luis Obispo Mozart Festival and San Luis Obispo
County Symphony.

B. Arch., Oklahoma State University, 1968; M. Arch., University of Illinois, 1972. Assistant
Professor.
Experience: Manager Test Quality Control, Rocketdyne; plant engineer, Space and Informa-
tion Systems, Division North American Aviation, Inc.; chief facilities engineer, chief industrial
engineer, plant engineer, Autonetics; electrical engineer, Convair, San Diego; C. F. Braun and
Company, Alhambra; sales engineer, California Electric Works, San Diego, Registered profes-
sional engineer, California.
TELLEW, FUAD H. (1960) .................................................. Head, Economics Department
B.S., College of Commerce and Economics, Baghdad, Iraq, 1950; M.A., University of Southern
California, 1954; Ph.D., 1959; Post-doctoral research, University of California, Berkeley,
Experience: Accountant, Engineering Department, Iraqi State Railways; supervisor, Testing
Bureau, University of Southern California; teaching assistant and lecturer, University of Southern
California.
TERRY, RAYMOND D. (1974) .................................................. Mathematics
B.S., State University of New York, 1966; M.S., Michigan State University, 1968; Ph.D., 1972.
Assistant Professor.
Experience: Teaching assistant, Michigan State University; instructor, Georgia Institute of
Technology.
THOMAS, GUY H., JR. (1968) .................................................. Graphic Communications
Experience: Equipment technician, California State Polytechnic College; chief machinist,
Union-Tribune Publishing Company, San Diego; head machinist, Magoffin Typographers,
Hollywood and Evening Outlook, Santa Monica; machinist Chicago Sun-Times; field engi-
neer, Mergenthaler Linotype Company, Chicago and San Francisco.
THOMAS, JOHN W. (1968) .................................................. Biological Sciences
B.A., Los Angeles State College, 1957; Ph.D., University of Southern California, Los Ange-
les, 1968. Professor
Experience: Chemist, Atkinson Laboratory; public health microbiologist, Los Angeles City
Health Department; teacher, Durate Unified School District; research associate, University of
Southern California.
THOMSON, DAVID H. (1946) .................................................. Biological Sciences
B.S., University of Arizona, 1944; M.A., Claremont Graduate School, 1948; additional gradu-
ate study, Oregon State College and University of Oregon. Professor.
Experience: Laboratory instructor, Pomona College; ranger-naturalist, Sequoia National
Park.
THRASHER, FRANK P. (1963) .................................................. Crop Science
B.S., Montana State College, 1951; M.S., 1963. Professor.
Experience: Recruit instructor, U.S. Navy; farmer-owner, Bozeman, Montana; research
agronomist, Agricultural Research Service, U.S. Department of Agriculture, Bozeman, Mont-
ana.
THURMOND, WILLIAM (1951) .................................................. Biological Sciences
A.B., University of California, 1948; M.A., 1950; Ph.D., 1957. Professor.
Experience: Instructor, San Mateo Junior College; associate in zoology, University of Cali-
fornia; instructor, summer session, University of California, 1957–59; Director, National
Science Foundation, Summer Science Training Program for secondary students, California
State Polytechnic College; visiting professor, University of Frankfurt, Germany.
TICE, RUSSELL L. (1965) .................................................. Chemistry
B.S., Marshall University, 1960; Ph.D., University of California, Los Angeles, 1965. Profes-
sor.
Experience: Teaching and research assistant, University of California, Los Angeles; U.S.
Navy.
TIMONE, BARNEY R. (1969) .................................................. Assistant to the Dean of Students
Experience: Teacher, Chico Unified School District; head resident and placement interview-
er, Idaho State University.
TOONE, HARMON (1952) .................................................. Head, Dairy and Poultry Science Department
B.S., University of Idaho, 1940; M.A., California State Polytechnic College, 1956. Professor.
Experience: Director of vocational agriculture at Moreland, Ucon, and Firth high schools,
Idaho; superintendent, Firth High School, Idaho; director of vocational agriculture, Riverdale
High School; special supervisor, Bureau of Agricultural Education.
TOWNSEND, NEAL R. (1965) ............................................. Mathematics
B.S., Wisconsin State College. 1953; M.A., San Diego State College, 1961; Ph.D., Purdue University, 1972. Professor.
Experience: Teacher, San Bernardino City Schools, Grossmont Union High School District; assistant professor, Wisconsin State University, Stevens Point; graduate instructor, Purdue University; instructor, Hancock College.

TROY, BERNARD A. (1970) ............................................................................................ Education
B.A., University of Notre Dame, 1957; S.T.L., Universidad Catholica de Chile, 1961; M.A., University of Notre Dame, 1965; Ph.D., University of Southern California, 1974. Associate Professor.
Experience: Chaplain/foreign student advisor, University of Notre Dame; chaplain, St. Charles Boys' Home, Milwaukee; curate, Diocese of Santiago de Veraguas, Santiago; teacher/counselor/school psychologist, Monrovia Unified School District.

TRUEX, JOSEPH W. (1954) ......................................................................................... Graphic Communications
B.S., California State Polytechnic College, 1952; M.S., South Dakota State University, 1966. Professor.

TRYON, BETTE W. (1976) ......................................................................................... Child Development
B.S., University of Maryland, 1966; M.S., 1973; Ph.D., Syracuse University, 1976. Assistant Professor.
Experience: Elementary school teacher, teaching assistant, research assistant, lecturer, Syracuse University; program associate and consultant, Early Childhood Education programs.

LL.B., National Taiwan University, Republic of China, 1950; LL.M., Southern Methodist University, Dallas, Texas, 1957; B.S., Illinois Institute of Technology, Chicago, Illinois, 1964; M.S., 1966. Associate Professor.
Experience: Judge, Taitung and Taichung District Courts; secretary and section chief, Justice Department, Republic of China; teaching assistant, Illinois Institute of Technology; test engineer, Northern Indiana Public Service Corporation, Hammond, Indiana; research and development engineer, Research and Development Division, Advance Ross Electronics Corporation, Addison, Illinois; assistant professor, Purdue University Calumet Campus, Hammond. "VALPEY, ROBERT G. (1972) .......... Dean, School of Engineering and Technology
B.S., United States Military Academy, 1945; B.M.E., Cornell University, 1950; M.S., University of Colorado, 1958; Ph.D., University of Illinois, 1962.
Experience: Officer, U.S. Air Force; instructor, U.S. Military Academy, West Point; instructor, U.S. Air Force Academy; chief, Turbo-machinery Section, Wright Air Development Center Equipment Laboratory; director, Launch Vehicle Section and Advanced Programs Section, Space Systems Division, U.S. Air Force; dean, School of Engineering, California State College, Fullerton. Registered professional engineer, Ohio.

VANCE, ROBERT D. (1972) ............................................. Food Industries
B.S., Brigham Young University, 1966; M.S., Ohio State University, 1968; Ph.D., 1971. Associate Professor.
Experience: Animal Science Department, Brigham Young; Canadian Department of Agriculture; teaching assistant, Ohio State; research associate, Ohio Agriculture Research and Development Center.

VAN De VANTER, GORDON L. (1960–66) (1968) ......................... Crop Science
B.S., California State Polytechnic College, 1953; M.A., 1963; additional graduate study, University of California, Davis.
Experience: Commercial vegetable grower, owner-manager. Contract logging and excavation operation. Aerographer, USNR.

VAN EPHS, JOHN (1974) ............................................. Mathematics
B.A., University of California, Berkeley, 1965; Ph.D., 1969. Associate Professor.
Experience: Instructor, John Hopkins University; assistant professor, California State, Hayward.
VAN WYNGAARDEN, WILLEM L. (1965) ......................................................... Physics
B.S., McMaster University, 1961; M.S., University of Manitoba, 1964; Ph.D., Louisiana State University and A. & M. College, 1975. Associate Professor.
Experience: Instructor, Methodist College.

VARNEY, ALVIN DAVID (1969) ................................................................. Engineering Technology
B.S., Le Tourneau College, Longview, Texas, 1964. Associate Professor.
Experience: Machinist, Krause Corporation, Hutchinson, Kansas; LeTourneau College, Longview, Texas and U.S. Industries, Longview; trainee, Field Enterprises, Longview; product engineer, John Deere Company, Des Moines, Iowa, and Vernon, California.

VARTAN, ROBERT P. (1967) ........................................................................ Accounting
B.A., University of Michigan, 1936; M.B.A., 1937; J.D., University of Toledo, 1955, Associate Professor.
Experience: Supervising senior, Price Waterhouse & Company; chief of audit section, financial analyst, adviser to Renegotiation Board, Detroit Ordnance District; instructor, University of Detroit; controller and assistant treasurer, Greer Hydraulics, Inc.; controller for Plymouth Body Plant, divisional controller for Airtemp Division, Chrysler Corporation; vice president-finance, assistant treasurer, assistant secretary, Dot Records, Inc.; vice president-finance, Ranwood Records, Inc.; controller, secretary and treasurer of ICC Van Nuys Skyways, Inc. and Golden West Airlines, Inc.; independent consultant service; C.P.A.

VENERABLE, GRANT D., II (1972) ................................................................. Chemistry
B.A., University of California, Los Angeles, 1965; M.S., University of Chicago, 1967; Ph.D., 1970. Associate Professor.
Experience: Teaching assistant, research assistant, University of California, Los Angeles, and The University of Chicago; Argonne pre-doctoral fellow, The University of Chicago, U.S. Atomic Energy Commission; postdoctoral fellow radiobiology, University of California, Los Angeles; lecturer, California State College, Los Angeles; teacher, Duarte High School, Los Angeles. Danforth Associate.

VINANDERE, ROGER A. (1976) ................................................................. Soil Science
B.S., Michigan State University, 1967; M.S., 1969; Ph.D., University of Illinois, 1976. Assistant Professor.
Experience: Research assistant, Michigan State University; research and teaching assignment, University of Illinois; computer terminal operator, University of Illinois; U.S. Air Force.

VOELTZ, HERMAN C. (1965) ................................................................. History
Experience: Instructor, 83 Div I and E School, Bad Ischl, Austria; assistant librarian, Civil Service, War Department, Austria; instructor and associate professor, Division of Continuing Education, University of Oregon; assistant professor, Oregon State University; associate professor, Western New Mexico University; U.S. Army.

VORHIES, RALPH M. (1946) ................................................................. Crop Science
B.S., University of Missouri, 1938; M.A., 1941; Ed.D., 1964. Professor.
Experience: Agriculture instructor at Belton and Couch High Schools, Missouri; instructor, Southeast State Teachers College, Cape Girardeau, Missouri; horticulture adviser, USAID Guatemala; officer, U.S. Navy.

VOSS, LARRY R. (1968) ................................................................. Executive Assistant to the President
B.A., Sacramento State College, 1956; graduate study, Sacramento State College and California State College at Los Angeles.
Experience: Placement supervisor, Sacramento State College; assistant personnel officer, California State Department of Education, senior personnel analyst, Chancellor's Office, Trustees of the California State Colleges, assistant director, U.S. Office of Education project; "Improvement of Personnel Administration in State Education Agencies", director of personnel relations, California Polytechnic State University, San Luis Obispo.
WADDELL, JOSEPH JAMES (1976) ........................................................................................................ Library
Experience: Engineering and surveying technician for various employers; clerk, Illinois State Geological Survey; research technician, Portland Cement Association; x-ray diffractionist, laboratory technician, American Cement Corporation; librarian, Severy, Inc., Santa Monica; assistant librarian, University of California, Los Angeles.

WADLINGTON, FAYE (1973) ........................................................................................................ Graduate Nurse
R.N., Wichita St. Joseph School of Nursing, Wichita, Kansas, 1947; additional study, Los Angeles City College, Los Angeles, California, University of California, Los Angeles, California.
Experience: Psychiatric nurse, Winter V.A. Hospital, Topeka, Kansas; Charity Hospital, New Orleans; scrub nurse, Physicians and Surgeons Hospital, Shreveport, Louisiana; senior nurse, Mt. Sinai Hospital, New York; May Company Department Stores; Longview Fibre Company; Los Angeles Industrial Nursing; Visiting Nurses Association, Los Angeles.

WAHL, WILLIAM B. (1966-71) (1973) ......................................................................................... English
A.B., San Francisco State College, 1953; M.A., 1954; Ph.D., University of Salzburg, Austria, 1973. Associate Professor.
Experience: Teacher, College of San Mateo; Sequoia High School.

WAHL, WILLIAM B. (1966-71) (1973) ......................................................................................... English
A.B., San Francisco State College, 1953; M.A., 1954; Ph.D., University of Salzburg, Austria, 1973. Associate Professor.
Experience: Teacher, College of San Mateo; Sequoia High School.

WAI, ANGLI (1967) ......................................................................................................................... Child Development
Experience: Instructor, Berea College, Berea, Kentucky; teacher, State University of Iowa and Randolph Woman's College.

WALKER, HOWARD D. (1957) ....................................................................................................... Chemistry
Experience: U.S. Public Health Service, postdoctorate fellow, American Meat Institute Foundation, University of Chicago; group leader, Veterans Hospital, Downey, Illinois; instructor, Northwestern University.

WALKER, ISAAC N. (1967) ............................................................................................................ English
B.S., Northwestern University, 1953; M.A., University of Texas, 1955; Ph.D., 1965. Associate Professor.
Experience: Teaching assistant, special instructor, University of Texas; instructor, Southwest Texas State College; instructor, Del Mar College, Corpus Christi; assistant professor, North Texas State University.

WALKER, KENDRICK W. (1973) ................................................................................................. Philosophy
B.A., University of Southern California, 1965; M.A. 1969; Ph.D., 1974. Associate Professor.
Experience: Teaching assistant and lecturer, University of Southern California; lecturer, Mt. St. Mary's College.

WALL, LEONARD W. (1969) ........................................................................................................ Physics
B.S., Louisiana Polytechnic Institute, 1963; Ph.D., Iowa State University, 1969. Professor.
Experience: Physical science aide, U.S. Waterways Experiment Station; laboratory assistant, Louisiana Polytechnic Institute; graduate teaching assistant and research assistant, Iowa State University; assistant professor, University of Kansas.

WALLACE, WILLIAM CARL (1970) ................................................. Director, Educational Opportunity Program
B.S., California Polytechnic State University, San Luis Obispo, 1967; M.A., 1973; additional graduate study, University of California, Santa Barbara.
Experience: Senior youth counselor and classification counselor, California Youth Authority, the Paso Robles School for Boys; consultant, California Student Aid Commission; consultant Ethnic Heritage Program, New Haven, Connecticut.

WALTER, VIRGINIA R. (1974) ................................................................................................ Ornamental Horticulture
B.S., Ohio State University, 1970; M.S., 1972. Assistant Professor.
Experience: Greenhouse superintendent and technical assistant, Ohio State University.
WALTERS, DIRK R. (1969) ................................................................. Biological Sciences
B.S., Western Illinois University, 1965; M.A., Indiana University, 1966; Ph.D., 1969. Associate Professor.
Experience: Teaching associate, Indiana University; instructor, Orange County (New York) Community College.

WALTERS ROBERT W. (1970) ........................................................ Program Counselor
Experience: Activities advisor, University of Washington; director of student activities, athletics, foreign student affairs, Seattle Community College; director of student development, SCOPE Corporation, Stenner Glen.

WANG, MARY Y. (1973) ................................................................. Food Industries
B.S., California Polytechnic State University, 1969; M.S., University of California, Davis, 1972. Associate Professor.
Experience: Chemist, Tri/Valley Growers; quality control supervisor, Tillie Lewis Foods; research assistant, University of California, Davis.

WARD, EDWARD JOHN (1970) ................................................... Architecture and Environmental Design
B.S., University of Massachusetts, 1962; M.U.P., Michigan State University, 1964. Associate Professor.

WARD, WESLEY S. (1954) ............................................................. Architecture and Environmental Design
B. of Arch., University of Southern California, 1953; graduate study, Spain. Professor.
Experience: Officer, flight instructor, air installations, U.S. Air Force; draftsman-designer, Everett E. Parks, Architect; design responsibility, Benedict Beckler and Kochler, Architects and Engineers; architectural practice, design and research consultation, California, Madrid, Spain; Registered Architect, California.

WARFIELD, DAVID L. (1975) .......................................................... Crop Science
B.S., University of California, Davis, 1966; M.S., 1968; Ph.D., Washington State University, 1973. Assistant Professor.
Experience: Research assistant, University of California Davis; teaching assistant, research assistant, lab technician, Washington State University.

WARTEN, RALPH M. (1968) ......................................................... Mathematics
B.S., Brooklyn College, 1957; M.S., Purdue University, 1959; Ph.D., 1961. Professor.
Experience: Research and teaching assistant, Purdue University; instructor, advisory mathematician, I.B.M. Corporation, Federal Systems Division; mathematician, I.B.M. Corporation, Scientific Center.

WATERBURY, ARCHIE M. (1973) ..................................................... Biological Sciences
A.B., San Jose State College, 1966; M.A., 1968; Ph.D., University of California, Davis, 1972. Associate Professor.
Experience: Teaching assistant, lecturer, University of California, Davis.

WATSON, E. EDGAR (1973) ......................................................... Audio-Visual Production Coordinator
B.S., Rochester Institute of Technology, 1956; graduate study, California Polytechnic State University.

WATSON, HAROLD J. (1964) ......................................................... Acting Head, Chemistry Department
A.B., Princeton University, 1944; A.M., University of Illinois, 1948; Ph.D., 1950. Professor.
Experience: Assistant, University of Illinois; chemist, Texaco, Inc.; group leader, Dan River Mills, Inc., Chemical Consultant, Danville, Va.

WEATHERBY, JOSEPH N., JR. (1968) ........................................ Political Science
Experience: International operations, Ford Motor Company; assistant professor, Bay de Noc College; summer, Fulbright, American University, Cairo, Egypt.

WEBB, JAMES L. (1969) .................................................. Physical Education
Experience: Instructor-coach, Grand Forks Public Schools, Grand Forks, North Dakota, Staples Public Schools, Staples, Minnesota; assistant baseball coach, University of North Dakota; teaching assistant, University of Oregon.

WEBER, BARBARA P. (1966) ........................................ Home Economics
B.S., University of Nevada, 1951; M.A., California Polytechnic State University 1968; additional graduate study, University of Nevada, California Polytechnic State University, Oregon State University. Associate Professor.
Experience: Instructor, Allan Hancock College, Evening Division.

B.S., Louisiana State University, 1960; A.M., Harvard University, 1968; additional graduate study, Columbia University, University of Munich. Associate Professor.
Experience: Assistant mathematician, Brookhaven National Laboratory; computer systems analyst, Columbia University; computing systems consultant, Max Planck Institute; applied mathematician, ABT Associates, Inc.

WEBSTER, JAMES P., JR. (1964) ............................................ Agricultural Engineering
B.S., California State Polytechnic College, 1953; graduate study, Cal Poly, Oregon State University. Associate Professor.

WEINSTEIN, STEPHEN T. (1969) ........................................ Mathematics
B.A., University of Southern California, 1960; M.A., 1965; Ph.D., 1972. Associate Professor.
Experience: Engineering planner and program analyst, North American Aviation, Space & Information Systems Division; teacher, Bell High School; instructor, East Los Angeles City College; teaching and research assistant, University of Southern California.

WEISENBERGER, GARY L. (1975) ..................................... Agricultural Engineering
B.S., California Polytechnic State University, 1973; M.S., 1976. Assistant Professor.
Experience: Research technician, California Polytechnic State University, San Luis Obispo.

WENZL, MICHAEL J. (1969) ............................................ English
Experience: Instructor, Arizona State College, University of New Mexico.

WESSELS, HENRY (1970) .............................................. Art
B.S., Northern Illinois University, 1957; M.F.A., University of Southern California, 1970. Associate Professor.
Experience: Teacher, Rockford, Illinois and La Mirada, California high schools; instructor, Orange Coast College, Cerritos College; owner, Studio-Gallery, Huntington Beach.

WEST, HOWARD (1959) ............................................. Associate Executive Vice President
Experience: Apprentice reporter, Los Angeles Examiner; journalism instructor and acting director of public relations, Pepperdine College; editor, America's Builders; publications consultant, Southland Press; assistant to President, director, International Education, Associate Dean, Resources and Planning.

WEST, JOHN W. (1968) .......... Associate Dean, School of Agriculture and Natural Resources
B.S.A., University of Tennessee, 1947; M.S., 1948; Ph.D., Purdue University, 1951. Professor.
Experience: U.S. Army; assistant director of research, Security Mills, Knoxville, Tennessee; associate professor of Poultry Science, Mississippi State University; professor and head, Department of Poultry Science, Oklahoma State University.
WESTOVER, JAMES D. (1971) ................................................................. Chemistry
Associate Professor.
Experience: Analyst, research assistant, Arizona State College; research and teaching assistant, Brigham Young University; research chemist, E. I. Dupont de Nemours & Company, Kinston, North Carolina; lecturer, California State Polytechnic College, San Luis Obispo; teacher, Paso Robles High School.

WHALEY, GLENN V. (1963) .............................................................................. Library
Experience: Reference librarian, Drake University; librarian, Milwaukee Public Library.

WHALLS, MARVIN J. (1968) ............................................................... Head, Natural Resources Management Department
B.S., Michigan State University, 1951; M.S., University of Michigan, 1957; Ph.D., 1970. Professor.
Experience: Fishery research biologist, Hunt Creek Trout Research Station and research fellow, Institute for Fisheries Research, Michigan Department of Conservation; fishery biologist in charge of fisheries management and development, southern California, California Department of Fish and Game.

WHEATLEY, PATRICK O. (1970) ........................................................................ Mathematics
B.A., St. Mary's Seminary, 1956; M.S., The University of Chicago, 1963; Ph.D., University of Houston, 1970. Associate Professor.
Experience: Aerospace Engineer, NASA, MSC, Houston, Texas; teaching assistant, University of Houston; teacher, Strake Jesuit Preparatory School, Houston, Texas.

WHEELER, ERNEST J., JR. (1969) ...................................................... Coach, Physical Education
B.A., University of Washington, 1961; M.S., University of Southern California, 1966.
Experience: Teacher and assistant basketball coach, Compton Junior College; high school coach and teacher, Anaheim.

WHELEN, ROBERT R. (1961) ........................................................................ Animal Science
B.S., Colorado State University, 1952; M.S., 1955, Ph.D., Oregon State University, 1962. Professor.
Experience: Irrigated farming; ranching; graduate assistant and graduate fellow in animal nutrition, Oregon State University; junior animal husbandman, Oregon Agricultural Experiment Station.

WHITE, MARY LOU (1961) ........................................................................... Physical Education
Experience: St. Helens, Oregon, High School instructor; physical education instructor, Clark College, Vancouver, Washington.

WHITFIELD, JOHNIE-MARIE (1975) ........................................................... Chemistry
B.S., Millsaps College, 1965; Ph.D., Louisiana State University, 1973. Assistant Professor.
Experience: Research associate, University of Mississippi; teaching assistant, Millsaps College; Vanderbilt University, Louisiana State University; instructor, Alabama College, Millsaps College, Louisiana State University, University of Alabama; visiting assistant professor, Millsaps College.

WIGHT, HEWITT G. (1952) ........................................................................ Chemistry
B.S., University of Utah, 1943; Ph.D., University of California, 1955. Professor.
Experience: Teaching assistant, University of Utah, St. Martin's College, and the University of California; officer, U.S. Army.

WILEY, J. BARRON (1956) ........................................................................ Education
B.S., University of Denver, 1940; M.B.A., 1948; Ed.D., Indiana University, 1956. Professor.
Experience: Accounting and business administration, various firms; head, department of business education, Colorado Woman's College; assistant professor of air science, Indiana University; U.S. Air Force.
WILEY, RICHARD C. (1946) ......................... Head, Metallurgical Engineering Department
Special engineering courses, Stanford University; industrial arts training, San Jose State
College and University of California. Professor.
Experience: Master mechanic and welder, Utah Construction Company; welding instructor,
Sacramento Junior College; Palo Alto, San Francisco, and San Jose school systems; senior
welding engineer, Joshua Hendy Iron Works; field engineer, Bechtel Corporation; welding
metallurgy consultant, Westinghouse Corporation; X-ray Engineering International; Linde
Company, New York; registered professional engineer, California.

WILK, EDWARD A. (1966) ................................ Library
B.A., Western Michigan University, 1965; M.S.L., 1966. Senior Assistant Librarian.
Experience: I.B.M. operator, Allstate Insurance Company; salesman, Arts International,
Detroit, Michigan.

WILKS, MAURICE L. (1966) ................................. Architecture and Environmental Design
M.Arch., Yale University, 1952; postdoctoral scholar, University of California, Los Angeles,
1974. Professor.
Experience: Private practice; consulting architect; coordinating architect and senior de-
signer, Victor Gruen Associates; consulting architect, Robert Kliegman, A.I.A.; Charles O.
Matcham, FAIA; senior designer, P. J. Ellerbroek, FAIA; assistant professor, University of
Kansas; associate professor, University of Utah; visiting associate research psychologist, Uni-
versity of California, Los Angeles. Registered architect, California, Ohio, Utah.

WILLIAMS, GRAYDON J. (1970) ......................... Music
B.M., New England Conservatory of Music, 1957; M.M., 1959; additional study: Eastman
School of Music; Peabody Conservatory of Music. Associate Professor.
Experience: Associate professor, The College of the Ozarks.

WILLIAMS, ROBERT F. (1971) ...................... Management
B.S.M.E., Rice Institute, 1939; graduate study, University of Cincinnati, University of Cali-
fornia at Los Angeles. Associate Professor.
Experience: Lecturer, University of California, Los Angeles; lecturer, Los Angeles State
College; lecturer, Royal Technical University, Stockholm; lecturer, Gothernberg Graduate
School of Business, Sweden; lecturer, Copenhagen University of Commerce; president, Par-
sons & Williams, Inc., Management Consultants; chief industrial engineer, Crosley Division,
Avco, Cincinnati, Ohio.

WILLIAMSON, DANIEL P. (1970) ......................... Economics
B.A., University of California, Santa Barbara, 1966; Ph.D., University of California, San
Diego, 1973. Associate Professor.
Experience: Associate in economics, University of California, San Diego; teaching assistant,
University of California, San Diego; research assistant, University of California, San Diego.

WILLIAMSON, DAVID G. (1968) ......................... Chemistry
B.A., University of Colorado, 1963; Ph.D., University of California at Los Angeles, 1966;
pastdoctoral fellow, National Research Council of Canada. Professor.
Experience: Research assistant, University of California; chemist, National Bureau of Stan-
ards, Boulder, Colorado.

WILLS, MAX THOMAS (1967) ......................... Chemistry
Experience: Chemist, Oil and Refining Co.; laboratory technician, General Mills Inc.; teach-
er and research assistant, University of Washington; research chemist, Shell Development Co.

WILSON, JACK D. (1976) ..................... Head, Agricultural Engineering Department
B.S., Michigan State University, 1956; M.S., 1958; Ph.D., 1968. Professor.
Experience: Design and experimental engineer, The Oliver Corp., South Bend, Indiana;
graduate research assistant, graduate teaching assistant and instructor, Agricultural Engineer-
ing Department, Michigan State University; dairy farming, Michigan; associate professor,
Agricultural Engineering Department, University of Georgia; U.S. Army; registered profes-
sional engineer.
WILSON, MALCOLM W. (1968) ........................................ Associate Dean, Graduate Studies
Experience: Elementary school teacher, Colorado; teacher, Shenandoah Junior High, Florida; teacher, Miami-Dade Junior College, Florida; department head, Canyon Del Oro School, Tucson, Arizona; graduate assistant, University of Arizona; Director of Short Courses for primary school headmasters, University of Botswana, Lesotho, and Swaziland; U.S. Aid/Cal Poly Project, Gaborone, Botswana, Africa.

WILSON, WALTER D. (1969) ...................................................................................Physics
B.S., University of California, Berkeley, 1957; Ph.D., 1966. Associate Professor.
Experience: Researcher, University of California, Berkeley; member of technical staff, Aerospace Corporation, San Bernardino, and Aerojet General Nucleonics, San Ramon, California.

WILVERT, CALVIN H. (1973) ...............................................................................Social Sciences
B.A., University of California, Los Angeles, 1963; M.A., University of California, Berkeley, 1967; Ph.D., 1971. Associate Professor.
Experience: Assistant professor, University of Vermont; Officer, U.S. Army.

WINGER, DONLEY J. (1963) ............................................. Electronic and Electrical Engineering
B.S.E.E., University of North Dakota, 1960; M.S.E.E., 1963; Ph.D., Iowa State University, 1971. Professor.
Experience: Graduate assistant and instructor, University of North Dakota; design engineer consultant, Dow-Key Co.; research associate, Iowa State University; visiting professor, NASA, Edwards, California.

WINNINGHOFF, PHILIP FRANCIS (1972) .................................................. Architecture and Environmental Design
B.Arch., Montana State College, 1962; M.S., Montana State University, 1972. Associate Professor.
Experience: Draftsman, H. E. & J. W. Kirkemo, Missoula, Montana; draftsman, Winston & Winston, San Jose, California; modelmaker, Scale Models Unlimited, Palo Alto; draftsman, Welton Becket & Associates, San Francisco; research assistant, Department of Computer Sciences, Montana State University; instructor, School of Architecture, Montana State University.

WINSLOW, CARLETON MONROE, JR. (1969) ........................................ Architecture and Environmental Design
Experience: Private practice, California and Hawaii; associate professor of architecture, University of Southern California; Commissioner, San Luis Obispo Architectural Review Commission. Registered architect, California.

WOLCOTT, VICTOR F. (1962) ....................................................................... Business Administration
B.S., Stanford University, 1947; M.B.A., 1949. Associate Professor.

WOLF, FREDERICK E. (1971) ............................................................... Coordinator, Special Programs
B.A., Pomona College, 1962; M.A., California State College, Los Angeles, 1968; additional graduate study, California Polytechnic State University.
Experience: Technician, Garrison Theater, Claremont College; technician, Drama Department, California State College, Los Angeles; instructor, Drama Department; College Union director, activities coordinator, California Lutheran College; interpreter, purchasing agent, U.S. Army.

WOLF, LAWRENCE J. (1970) ......................................................... Director, Financial Aids
B.A., University of Southern California, 1957; LL.B., La Salle University, 1967; M.A., California Polytechnic State University, 1973.
Experience: Coordinator of Student Discipline, Financial Aid Counselor, California Polytechnic State University; executive assistant, supervisor-Manufacturing Controls, Space Division, North American Rockwell Corp., Downey; district manager, Chrysler-Plymouth Division, Chrysler Motors Corp.; zone manager, Ford Division, Ford Motor Company.
WOLF, ROBERT S. (1975) .................................................. Mathematics
B.S., Massachusetts Institute of Technology, 1966; M.S., Stanford University, 1967; Ph.D.,
1974. Assistant Professor.
Experience: Computer programmer, Computer Research Corp; instructor, University of
California, Santa Cruz; teaching assistant, Stanford University and State University of Oregon.

WOLFF, PAUL (1971) .................................................. Architecture and Environmental Design
B. Arch., University of California at Berkeley; graduate study, Academy of Art and Architec-
ture, Munich, Germany; M.S., Environmental Psychology, University of Surrey, England,
1975. Associate Professor.
Experience: Principal, Paul M. Wolff, A.I.A., Architect, Palo Alto; principal, “Play Struc-
tures,” Palo Alto; partner, Arutunian, Kinney, Wolff Assoc., Landscape Architecture and
Recreational Designers, Palo Alto; project architect, Nobler & Chen, A.I.A., Redwood City,
Keller & Daseking, A.I.A., Palo Alto; Janssen, Daseking & Keller, A.I.A., Menlo Park; architec-
tural designer, Hawley & Peterson, A.I.A., Palo Alto; Clark, Stromquist, Potter & Ehrlich,
A.I.A., Palo Alto; draftsman and designer, Richard J. Neutra, FAIA, Los Angeles; U.S. Army;
architectural designer, Jönsson & Jönsson, Stockholm. Registered architect, California.

WOOD, THOMAS M. (1974) .................................................. Coach, Physical Education
A.B., University of California at Davis, 1971; M.S., California Polytechnic State University,
San Luis Obispo, 1974.
Experience: Assistant basketball coach, University of California at Davis; elementary physi-
cal education specialist, Woodland; graduate assistant, California Polytechnic State University.

WORDEMAN, JOHN B. (1973) ................................. Head, Graphic Communications Department
Experience: Associate professor and staff chairman, Management Division, School of Print-
ing, Rochester Institute of Technology; customer service representative and production super-
visor, Herbick and Held Printing Company; production planner, William G. Johnston
Company; typographer, layout and design artist, Metropolitan Life Insurance Company; offic-
er, U.S. Naval Reserve.

WORK, LLOYD J. (1958) .................................................. Physics
B.S., California State Polytechnic College, 1954; M.E., Harvard University, 1967; M.S.,
University of Kansas, 1970. Associate Professor.
Experience: Metallurgical and ore dressing research, mill superintendent, International
Metallurgical Chrome Corporation, San Luis Obispo; manager, Castro Mining Company, San
Luis Obispo; U.S. Navy.

WRIGHT, JOYCE H. (1969) .................................................. Speech Communication
B.A., San Diego State University, 1965; M.A., 1968; C.C.C., Speech Pathology, American
Speech and Hearing Association. Associate Professor.
Experience: Speech pathology graduate traineeship, Bureau of Neurological and Sensory
Diseases, U.S. Department of Health; speech pathologist, Edgemoire Hospital, San Diego;
audiologist, private ENT practice, San Diego; speech director, Kern County Crippled Chil-
dren’s Society; speech pathologist, San Luis Obispo County Schools Summer Clinics; private
practice, San Luis Obispo, licensed speech pathologist, State of California.

WRIGHT, MARSHALL S., JR. (1960) .................................................. Chemistry
B.A., Reed College, 1946, 1952; M.A., University of Oregon, 1949; additional graduate study,
American Speech and Hearing Association. Associate Professor.
Experience: Teaching fellow, University of Portland, University of Oregon; research and
teaching assistant, University of California, and Institute for Metabolic Research; instructor,
Orange Coast College, visiting lecturer, Chapman College.

WU, SING-CHOU (1969) .................................................. Computer Science & Statistics
B.A., National Taiwan University, 1959; M.S., Utah State University, 1966; Ph.D., Colorado
State University, 1970. Professor.
Experience: Teacher, Hwaliang Commercial School, Taiwan, China; teller, Bank of China;
laboratory instructor and programmer, Utah State University; teaching assistant, Colorado
State University.

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WYSOCK, RAYMOND ANTHONY (1970) ........................................... Industrial Technology
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