

An Update on College and University Programs in Air Pollution Control

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A survey of academic programs in air pollution control was made. Results from the 127 schools reporting are tabulated by state. Faculty involved in air pollution instruction are identified. Some conclusions and recommendations are presented.

This paper outlines the results of a recent survey which attempted to document who is carrying out academic air pollution control training. A questionnaire directed at faculty associated with these programs was published in the June 1981 issue of *JAPCA*. This was followed by letters to all non-responding schools who had reported programs in previous studies.² A letter with an abbreviated set of questions was sent as a follow-up to these initial requests for information.

Of the 127 schools responding, 62 answered the detailed questionnaire. A breakdown of the 127 schools indicates: 104 four-year or graduate programs, 12 community college programs, and 10 programs outside the U.S. The complete listing of schools is given in Appendix I. Most of the major air pollution programs available in the U.S. are included.

University Programs

Air pollution training is an important part of modern engineering education. This is demonstrated in Table I by the wide range of departments in which the training is centered. Other departments reporting training activities not indi-

cated in the table are identified in Appendix I.

Over 50% of the universities responding indicated their programs were accredited by ABET. Several indicated accreditation by other professional organizations. Faculty involved with air pollution training at the time the survey was completed are listed in Appendix I. An average of 4 faculty members per established program was found.

Table I. Academic departments responsible for air pollution control training.

Civil Engineering	37
Chemical Engineering	21
Environmental Engineering	17
Environmental Science	15
Mechanical Engineering	11
Environmental Health Science	7
Meteorology	3
Chemistry	2

Curriculum

The typical curriculum pattern remains one introductory course in air pollution at the undergraduate or graduate level. The schools offering more extensive air pollution training programs are limited. Figure 1 and Table II summarize these results. The more specialized courses are usually offered at the graduate level. Schools offering more extensive air pollution training programs are limited in number.

Water pollution control course work is also an integral part of the curriculum

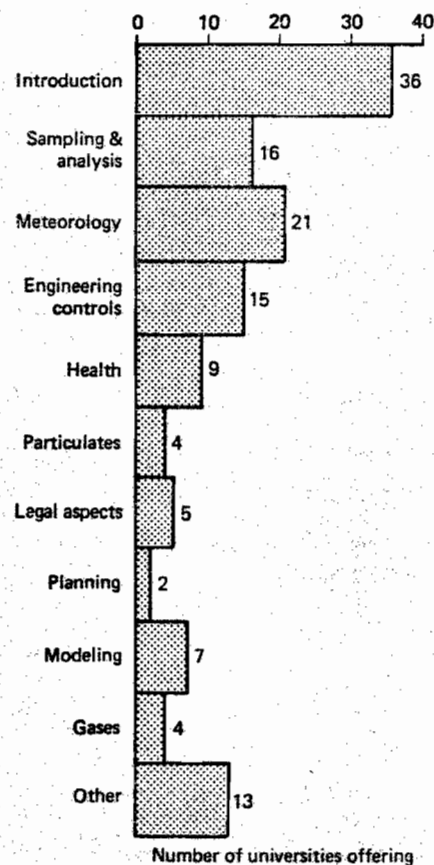


Figure 1. Air pollution course work available (62 universities responding).

of the schools surveyed. Other related specialized course work available included solid waste management, water resources, radiation and noise. This is

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Table II. Number of schools offering related courses (127 universities reporting).

Water Pollution	101
Solid Waste Management	31
Water Resources	52
Radiation	19
Noise	21
Other	25

illustrated in Table II. In addition to the typical academic course work, 18 universities are involved in giving short courses in air pollution control.

Students

Enrollment of students in programs that qualified them to work in air pollution control are shown in Table III. Students graduating in these programs in 1980 included 398 at the B.S. level, 222 at the M.S. level, and 24 with Ph.D.

Faculty were asked to estimate where their students who work in some area of air pollution control find employment. Results were averaged and are summarized in Table IV. This represented the employment picture in 1981.

Financial Support

Universities were asked to evaluate their air pollution training efforts between 1981 and 1984. More than half (33/62) expected their program to re-

Table III. Number of students enrolled qualified to work in air pollution control (62 universities reporting).

Degree	1980	1981
B.S.	1105	1254
M.S.	576	518
Ph.D.	96	116

main unchanged, 10 expected their program to become larger, 8 expected their program to get smaller, while the remaining 11 predicted only some change.

Table IV. Percent employment by sector.

Sector	%
Industry (pollution source)	34
Control equipment	3
Instrument manufacture	1
Large consulting firm	14
Small consulting firm	6
Local agency	8
State agency	14
Federal agency	12
University	6
Other	3

Financial support is vital for any academic program. This is especially true at the graduate level. It was interesting to determine where the support will need to come from to maintain programs at the current size. Table V summarizes the results.

Conclusions

The commitment of universities around the U.S. and in other countries continues with respect to air pollution control. The challenge to achieve acceptable environmental conditions with economic growth requires universities to offer air pollution training to both the specialist and the nonspecialist. To effectively carry this out requires both students and experienced faculty.

Students in all disciplines need to be reminded how their professional decisions affect the environment. Several schools use an introductory air pollution course this way. Students need to be encouraged by faculty in their major department to take the appropriate

courses. Student chapters, national paper competitions, APCA Section and Chapter recognitions and scholarships will help motivate outstanding students in all disciplines to take coursework required to understand air pollution control.

In order for faculty to be able to effectively teach both the general and specialized courses, they must have the opportunity for professional development. Too often this is not considered adequately in the schedules and budgets of universities. Consulting and research are certainly important, but so is participation in professional societies like APCA. Funds for continuing professional development, as well as facilities, are vital and should be considered by industry and government as part of their stake in the future. The reader is encouraged to contact one of the air pollution programs reported in this survey to learn more about it and its special needs.

Recognizing the incompleteness and the uncertainties that exist in the present study, it is believed that the basic data reported should be useful. Additions, corrections, and comments will be appreciated.

Table V. Source of funds required to continue programs

Source	%
State	58
Federal	29
Research grants	45
Industry	16
University	8
Pays for itself	11

Reference

1. A. T. Rossano, H. M. Cota, "University programs in air pollution control: review and outlook," *JAPCA* 28: 1106 (1978).

Appendix I. Colleges offering air pollution coursework in the U.S. and Canada—1982.

State	College or University	No. of Air Pollution Courses ^a	No. of Water Pollution Courses ^a	Program In	Degrees	Name
ALABAMA	U. of Alabama	1 (1)	7 (4)	CE	MS, PhD	G. P. Whittle
ALASKA	U. of Alaska	1	2	Env Q Engr	MS	Oscar Dickson
ARIZONA	Arizona State U.	1	8 (5)	CE		J. W. Klock, T. E. Higgins
CALIFORNIA	Calif. Inst. of Technology	5	17	EnvE Sci	BS, MS, PhD	R. C. Flagan
	Cal. State U.—Sacramento	1 (1)	2 (3)	CE	BS, MS	A. Ranzieri, K. Kerri
	Cal. State U.—San Jose	2 (3)		Met	BS, MS	R. Bornstein, K. MacKay
	Cal. Poly. State U.—San Luis Obispo	(7)	(5)	CE, EnvE, ME	BS, ME	H. M. Cota, R. G. Keif, D. M. Misic, W. E. Holtz, W. E. Clark
	Humboldt State U.	(2)	(4)	EnvRE	BS, MS	C. M. Anderson
	Stanford University	1 (1)	0	ME	BS, MS, PhD	C. H. Kruger
	U. of Calif.—Berkeley	10 (2)	15 (4)	PH, ChE, CE, ME, Ch	MS, PhD	D. H. Thomas
	U. of Calif.—Davis	2 (9)	13 (9)	CE	BS, MS, PhD	D. P. Chang
	U. of Calif.—Irvine	3 (3)	4 (3)	ME	BS, MS, PhD	G. Samuelson
	U. of Calif.—Los Angeles	2 (4)	3 (3)	Ap Sci, Engr	BS, MS, PhD	R. L. Perrine
	U. of Calif.—Riverside	(6)	(8)	EnvSci	AB, MS	P. H. Diage

State	College or University	No. of Air Pollution Courses ^a	No. of Water Pollution Courses ^a	Program In	Degrees	Name
COLORADO	Colorado State U.	5	7 (5)	EE, EnvE, ME	BS, MS, PhD	R. Pearson, Atm Sci; E. Reiter, Atm Sci; D. Hendricks, P. Sinclair, Atm Sci; C. Turner, H. Edwards, ME; T. Sanders
CONNECTICUT	U. of Hartford	(1)	(8)	CE	BS	R. Dalphin, C. Hemond, ME
WASHINGTON, DC	Howard University	3 (1)	11 (4)	CE	BS, MS	J. H. Johnson, R. C. Chawla, ChE; H. Cole, Ecology
DELAWARE	U. of Delaware	1 (1)	5 (3)	CE, ChE	BS, MS, PhD	L. Spielman
FLORIDA	Florida Int'l. U.	4 (1)	6 (4)	CE, EnvE	BS, MS	J. T. Viliate
	Florida Tech. U.	4		EnvE	BSE, MSE, MS	J. Hartman
	U. of Central Florida	3 (3)	6 (4)	CE, EnvS.	BSE, MSE, MS	Dr. Wanulista, D. Cooper
	U. of Florida	5 (1)	10 (7)	EnvSci	BS, MS, PhD	D. Lundgren, E. Allen
HAWAII	U. of Hawaii	3	(1)	Met		Wan-Cheng Chiu
IDAHO	U. of Idaho	1 (2)		Chem	BS, MS, PhD	S. Farwell, D. Adams, C. Wai, D. Brown
ILLINOIS	DePaul U.	(1)	(3)	Chem	BS	F. Breitbeil
	Governors State U.	6 (11)	3 (8)	EnvSci	BA, MS	E. Cehelnik, H. Sievering
	Ill. Inst. of Technology	7 (1)	10 (2)	EnvE	MS, PhD	R. Edgar
	Northwestern U.	1	7 (2)	CE	BS, MS, PhD	H. Cember
	So. Illinois U.-Edwardsville	9 (9)	2 (5)	CE, EnvSt	BS, MS	G. Arnold, P. Kokoropoulos, C. Thornton, D. McCabe, H. Kircher, L. McAneny, S. Hall, D. Myer, D. Rands, R. Kohn
	S. Illinois U.-Carbondale	2 (2)	6 (2)	Th, EnvE	BS, MS	H. Hesketh, T. Squire, W. O'Brien, S. Rajaa, T. Petires, J. Chen
	U. of Illinois-Urbana	8 (8)	12	CE	MS, PhD	J. Stukel, P. K. Hoppe
	U. of Illinois-Chicago	4 (13)	3	EnvHealth Sc	MPH, MS, DrPH, PhD	R. Wadden, R. Allen, L. Babcock, E. Hermanos, W. Hallenbeck, J. Holden, W. Clark, B. Brenniman
INDIANA	Midwest College of Engr.	3	(3)	CE, ChE	BS, MS	W. Koch
	Purdue University	3 (1)	4 (2)	CE, ME	BS, MS, PhD	R. B. Jacko, C. Warner
	Rose-Hulman Inst. of Technology	0	0	ChE, CE		M. Thomas
IOWA	U. of Iowa	2 (2)	14 (9)	EnvE, CE	MS, PhD	R. R. Dague
KANSAS	U. of Kansas	6 (1)	12 (5)	CE	MS, PhD	D. Lane, R. McKinney, C. Burkhead
KENTUCKY	U. of Kentucky	2	4	ChE	MS, PhD	L. Peters, D. Bhattacharyya, R. Peck-ME
	U. of Louisville	1 (1)	(5)	ChE, EnvE	ME, MS, PhD	Martin, Fleishman
	E. Kentucky U.	(1)	(3)	EnvH Sci	BS	J. H. McLean
	W. Kentucky U.	(3)	(7)	EnvE T	BS	D. Rowe
LOUISIANA	McNeese State U.	2 (2)	2 (5)	EnvSci	BS, MS	V. Monsour, D. Cassorly, L. Stevenson, G. Fister, S. Chang
MARYLAND	Johns Hopkins U.	21 (0)	8 (0)	EnvH Sci	MHS, ScM, ScD, PhD	C. Billings
	U. of Maryland	5 (3)	3 (1)	Met	BS, MS, PhD	H. Landsberg, J. Gentry, G. Gordon, W. Zoller
MASSACHUSETTS	Harvard U.	8	3	PH, EnvH Sci	MS, ScD	W. Burgess, D. Cooper, M. Ellenbecker, M. First, W. Hinds, D. Leith, D. Moeller, T. Smith, J. Spencer, D. Leith
MICHIGAN	Ferris State College	(2)	(3)	EnvQ	BS	J. Fleming
	Michigan State U.	4 (1)	6 (4)	CE, San.E	MS, PhD	M. Davis, J. Eastman, R. Boumeester, D. Wiggers
	U. of Michigan	5	2	PH, EnvE	MS, PhD	T. Armstrong, L. Fine, M. Hilbert, R. Smith, L. Whitehead
	Wayne State U.	7	18 (10)	ChE, Oc EnvH	MS, PhD	R. Kummeler, R. Mickelson, P. Wagner, T. L. Singh-ME
MINNESOTA	U. of Minnesota	5	5	EnvEH, ME, CE	MS, MPH, PhD	D. Barber, M. Gallagner
MISSOURI	St. Louis U.	1 (1)		E. Atm. Sci	BS, MS, PhD	J. Moore
	Washington U.	2 (2)	0	ME	MS, DSc	R. Husar, W. White
	U. of Missouri-Rolla	2	4 (2)	CE	BS, MS, PhD	C. Billings, Dr. Parish, K. Terkonda
MONTANA	Montana State	1 (1)	11 (2)	CE		H. Peavy, A. Amirtharajah, W. Characklis, R. Sauks
NEBRASKA	U. of Nebraska	1		ChE	BS, MS	L. C. Tao

State	College or University	No. of Air Pollution Courses ^a	No. of Water Pollution Courses ^a	Program In	Degrees	Name
NEW JERSEY	Cook College-Rutgers U.	6 (5)	3 (5)	EnvSci	BS, MS, PhD	R. Manganelli, J. Hunter, R. Hague, S. Glanti, J. Lipoti, N. Reiss, A. Kaplovsky, I. Leone
NEW YORK	New Jersey Inst. of Tech.	9 (10)	25 (12)	CE, EnvE	BS, MS, PhD	R. Cheremisinoff
	Cornell University	2	5 (2)	CE, ChE		P. Harriott
	Cooper Union-Adv. of Sci. & Art	(9)	7 (4)	Engr		J. Bore
	Manhattan College	2 (1)	4 (7)	ChE	BS, MS	L. Theodore, J. Reynolds, F. Zeni
	NYU Inst. of Env. Medicine	12		EnvH Sci	MS, PhD	M. Lippmann, P. Lioy, T. Kneip, M. Eisenbud, J. Daisey, R. Jaeger, R. Schlesinger, E. Palmes
	Rensselaer Poly. Inst.	3 (1)	3 (3)	ChE, EnvE	BS, MS, PhD	W. Shuster, E. Altwickler, A. Johannes
NORTH CAROLINA	Duke University	1 (1)	6 (2)	CE, EnvE	BSE, MS, PhD	P. Vesilind
	E. Carolina U.	1 (1)	1 (5)	EnvH	BS, MS	Y. J. Loa
	N. Carolina	7 (1)	6 (2)	Air Cons	MS, PhD	D. B. Marsland
	U. of NC-Chapel Hill	16	16	EnvSci-Eng	MSEE, MSPH, PhD	P. Reist, D. Fox
OHIO	U. of NC-Charlotte	0	3 (20)	CET, UEE	AA, BSE	R. C. Chen
	Miami U.	4 (1)	7 (2)	EnvSci	MS	G. E. Willeke
	Ohio University	2 (1)	4 (4)	ChE	MSES	W. Baasel, R. Savage
	U. of Cincinnati	35 (3)	24 (4)	EnvH, CE-EnvE, ChE	AA, MS, PhD	W. Licht, K. Keener, B. Saltzman, K. Willeke, M. Ruby, S. Hee, J. Rickabaugh, D. Durbin, M. Radike
	U. of Toledo	8 (6)	5 (8)	CE, EngrSci	BS, MS	A. Kumar, C. Ardis, D. Colony, D. Anglebeck, G. Bennett, E. Weaver, J. Gupta
OKLAHOMA	E. Central Okla. State U.	2 (2)	2 (2)	EnvSci	BS	M. L. Rowe
OREGON	Oregon State	6 (6)	5 (6)	ME	BS, MS, PhD	R. W. Boubel, D. Junge
	Portland State U.	1 (2)	1 (2)	Engr, ME	BS, MS	F. Terraglio
PENNSYLVANIA	Carnegie-Mellon U.	1 (2)	5 (3)	CE		D. Lincoln, M. Morgan, C. Davidson, S. Rubin, McMichael
	Drexel U.	8	7	EnvSci	MS, PhD	P. Purdom, L. Levin
	Lafayette College	(5)	(2)	CE, ME, ChE	BS, MS, PhD	L. McGeady
	Penn. State U.	5 (7)	11 (13)	EnvE-CE, ME, ChE, Chem	BS, MS, PhD	J. B. Nesbitt, J. W. Davis, J. Hecklen
	Villanova U.	2	2	ChE	BS, MS	R. Sweeney
SO. CAROLINA	Clemson U.	3 (1)	16 (3)	Env SE	MS, PhD	T. Overcamp, R. Fjeld, A. Elzerman
TENNESSEE	East Tenn. State U.	2 (1)	4 (1)	Env. H	BSEH, MSEH	M. Mogan, P. Chachman, A. Iglar
	Tenn. Technological U.	2 (2)		ChE	BS, MS	C. Kerr
	U. of Tenn.-Chattanooga	1 (1)	1 (1)	ChE, EnvE	BS, MSE	J. Henry
	U. of Tenn.-Knoxville	9 (1)	23 (9)	CE, EnvE	MS, ME, PhD	W. Davis, E. Houglund
	Vanderbilt U.	3 (2)	10 (6)	CE, EnvE	MS, PhD	E. Thackston
TEXAS	Lamar U.	(2)	(2)	EnvSci	BS	E. Eads
	Sam Houston State U.	(1)	1 (3)	Env Sci	BS	J. DeShaw
	Texas Tech. U.	8 (5)	6 (5)	ChE	MS	R. Bethea, L. Urban, R. Ramsey, R. Peterson, W. Smith, D. Haragan, D. Potter, J. Hayes, A. Way
	U. of Texas-Arlington	3 (1)	8 (3)	CE	BS, MS, PhD	S. Qasim, V. Argento
	U. of Texas-Austin	9 (2)	14 (1)	CE	BS, MS, PhD	J. Ledbeter, H. Cooper, R. Miksad
	U. of Texas-Dallas	7	6	EnvSci	MS, PhD	J. Crowder, W. Glaze
	U. of Texas-El Paso	4 (5)	6 (4)	CE	BS, MS	P. Hassler, H. Applegate
	U. of Texas-Houston	2 (1)		ChE	BS, MS, PhD	F. Worley
UTAH	Brigham Young U.	1 (1)	2 (2)	ChE		D. Barker, C. Bartholomew
	U. of Utah	(3)		Bio, Met, ChE, CE	BS	N. DeNevers, A. Hill
VERMONT	Norwich U.	(6)	(7)	EnvE	BS	W. Kelleher, E. Sevi, G. Wight
	U. of Vermont	4	2 (3)	CE	BS, MS	R. Kapuseinski, R. Downer, D. Hemenway
VIRGINIA	Virginia Poly. Inst. & St. U.	4 (2)	14 (8)	CE	MS, PhD	N. T. Stephens
	U. of Virginia	3 (2)	7 (5)	ME, CE, EnvSc	BS, MS	J. Beard, C. Barker, W. Reed

State	College or University	No. of Air Pollution Courses ^a	No. of Water Pollution Courses ^a	Program In	Degrees	Name
WASHINGTON	Washington State U.	7 (3)	(7)	ChE	MS, PhD	E. Robinson, D. Cronn, H. Westberg, R. Koppe, M. Pack, B. Lamb, M. Cambell, W. Thomson
	U. of Washington	10 (3)		CE	DSc, BSCE, MS, PhD	M. Pilat
WEST VIRGINIA	W. Virginia Coll. of Grad. Studies	6	5	ChE, EnvSt	MS, ChE	F. Kroesser
WISCONSIN	Marquette U.	(2)	9 (6)	CE	MS, BSCE	A. Zanoni
	U. of Wisconsin-Milwaukee	2 (2)	3 (3)	CE, ME	BS, MS	K. Tsao, Miller, Bayer, Ballentine, Hsu, Skider
CANADA	Universite de Sherbrooke	1 (1)	2 (1)	ChE	BS, MS	M. Beerh, M. Boulos, J. Jones, M. deBroissia, E. Chornet
	U. of Calgary	1 (1)	1	ChE	MSc	M. Montari
	U. of Windsor	2 (1)	4 (4)	HortSci, ChE	BS, MS, PhD	A. Gnyp, C. St. Pierre
	U. of Toronto	8 (2)	8 (2)	CE, Chem, ME	MS, PhD	J. G. Henry, J. W. Smith
	U. of Sherbrooke	(1)	(1)	ChE		
SPAIN	Escuela	3	1	CE	MS	J. Garcia-Heras, J. Hernando, J. Frigany

Community Colleges

MASSACHUSETTS	Springfield Tech. Comm. Coll.	(1)	(8)	EnvTech	AS	W. Gaitenby
MINNESOTA	916 Area Voc. Tech. School	(1)	(1)	Tech Lab	VocTech	M. Gallagher
NEW JERSEY	Middlesex County College	1	3	EnvSci	AS	D. Trainor
OHIO	Hocking Tech. College	4	2	EnvH Tech	AA	D. Mingus
	Muskingum Area Tech. Coll.	5	5	EngrSci	AA	D. Hehr
	U. of Toledo Comm. & Tech. Coll.	6	3	TechSci-Math	AA	R. Stein
OKLAHOMA	Oscar Rose Junior Coll.	6	8 (19)	EngSci-EnvSc	AS	W. Roach
PENNSYLVANIA	Northampton County CC	2	2	EnvSt	AA	J. Huber
	Pittsburgh Tech. Inst.	8		EnvSc & Tech	AA	C. Kirstatter
NORTH CAROLINA	Pitt Comm. Coll.	6	3	AWRTech	AA	D. Painter
TENNESSEE	Chattanooga St. Tech. CC	2		EnvSci	AS	J. Giesemann
CANADA	Mount Royal College	9	3	EnvQ Con	AA	D. Leask

^a Quantities in parentheses reflect undergraduate courses; other quantities reflect graduate courses.

Abbreviations Used

A & S	Arts and Sciences	EnvQ Con	Environmental Quality Control
Air Cons	Air Conservation	EnvR E	Environmental Resources Engineering
Air Env St	Air Environmental Studies	Env S	Environmental Service
Air R	Air Resources	Env Sci	Environmental Science
An & D Sc	Animal and Dairy Science	EnvSE	Environmental Systems Engineering
Ap H	Applied Health	EnvSt	Environmental Studies
Ap Sci	Applied Science	EnvTech	Environmental Technology
Atm Sci	Atmospheric Science	Erth Sci	Earth Science
AWR Tech	Air and Water Resource Technology	H Sci	Health Science
CE	Civil Engineering	Hort Sci	Horticultural Science
ChE	Chemical Engineering	ME	Mechanical Engineering
ChE Sci	Chemical Engineering Science	Med	Medicine
Chem	Chemistry	Met	Meteorology
DSc	Doctor of Science	OcEnv H	Occupational & Environmental Health
Engr	Engineering	PH	Public Health
EnvE	Environmental Engineering	PS	Public Service
EnvH Tech	Environmental Health Technology	Sci	Science
EnvInd H	Environmental & Industrial Health	ThE	Thermal Engineering
EnvSci Tech	Environmental Science & Technology	Ubn E	Urban Engineering
EnvE Sci	Environmental Engineering & Sciences	WRE	Water Resources Engineering
EnvH	Environmental Health	WRM	Water Resources Management
EnvH Sci	Environmental Health Science	ThFS	Thermal Fluid Systems
Env Mag	Environmental Management	Ubn-EnvE	Urban and Environmental Engineering
Env Oc	Environmental Occupations		