

# Creating a LEED General Associate Exam Preparation Technical Elective

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Sustainability in building design is increasing in demand within the construction industry. The Construction Management program at California Polytechnic State University currently requires classes that address sustainable building, but does not have a class that specifically prepares students for professional certification in this field. The purpose of this course is to prepare students for the LEED Green Associate exam, which if passed, will earn the student the Green Associate credential. By offering this class as a technical elective, students will be given the opportunity to build off their previous knowledge of green building and pursue a certification that will help solidify their knowledge. Given that green building is on the rise, preparing students to earn a certification in this field will contribute to a greater wealth of knowledge of green building directly out of college and will make newly graduated students more competitive when they enter the job market. This project-based paper will provide an in-depth analysis of the proposed curriculum, course content, assignments, and evaluation methods that will be used in the proposed technical elective. The technical elective will be proposed as a 2-unit course that can be taken by students who are third-year standing.

**Key Words:** LEED, Curriculum, Technical Elective, Syllabus, Sustainability

## Introduction

Leadership in energy and Environmental Design (LEED) is one of the most widely used green building rating systems that is being used in the United States. Projects that are considering LEED certification may earn points through the nine credit categories provided by LEED and have the possibility of attaining one of the following LEED certification levels: certified, silver, gold, and platinum. Buildings that have taken the steps to attain LEED certification may experience higher upfront costs but can expect lower operating costs throughout its lifecycle.

My interest in LEED certification was sparked when I took CM 317 (Sustainability and the Built Environment) here at Cal Poly. I felt that learning the basics of green building practices was a valuable tool to have before pursuing a full time position in the construction industry. Although the course taught the basics of green building, I was interested in pursuing a certification that would show

employers that I had a solid understanding of green building practices. This is how I came up with the idea of creating a LEED GA preparation course. By offering this course as a technical elective, students who are interested in pursuing LEED certification may choose to take this course for technical elective credit. The course has been designed in such a way that it guides students through the nine LEED credit categories: integrative process, location and transportation, sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality, innovation, and regional priority. Students who choose to take this course will be encouraged to take the LEED GA exam. The primary goal of this course is to increase the number of students from the construction management department here at Cal Poly who graduate with a LEED certification. Having this certification will cause students to appear more attractive to potential employers and will contribute to a greater wealth of knowledge in green building.

Below, I will outline the process I went through to create this course. The course I have created contains weekly lecture slides, assignments, and quizzes. I will discuss how each of these relates to the learning objectives associated with this class and how they will prepare students for the LEED GA exam.

## **Planning**

When creating this course, I first had to understand what content was going to be covered in the LEED GA exam. After performing research on the exam, I found that the LEED GA exam was to be separated into several knowledge domains. These knowledge domains serve as the basis for the learning objectives and module topics for this course.

### **Knowledge Domains**

Table 1

Knowledge Domain	Number of Questions on Exam
LEED Process	16
Integrative Strategies	8
Location and Transportation	7
Sustainable Sites	7
Water Efficiency	9
Energy and Atmosphere	10
Materials and Resources	9
Indoor Environmental Quality	8
Project Surroundings and Public Outreach	11

## **Course Structure**

### *Learning Objectives*

The learning objectives for this course have been constructed in a way that places emphasis on the main knowledge domains that will be found on the LEED GA exam.

### **Course Learning Objectives**

1. Understand how LEED certification works and how the LEED rating systems are structured.
2. Discuss how project team members can utilize integrative strategies to establish sustainable design practices for the project.
3. Identify the benefits of locating projects in previously developed areas.
4. Recognize the importance of site assessment and preserving the natural environment surrounding the project.
5. Be able to evaluate a building's water usage and understand how to reduce indoor and outdoor water usage.
6. Be able to evaluate a building's energy usage and understand methods of implementing energy efficient strategies.
7. Analyze the life-cycle of building materials and evaluate considerations when choosing building materials.
8. Identify the significance that indoor environmental quality has on occupant health and describe methods of improving indoor environmental quality.
9. Understand the environmental impacts of the built environment and the value of sustainable design.

### *Modules*

The modules for this course have been organized in a way that will prepare the students to achieve exceptional knowledge under each learning objective. Given that there are nine knowledge domains that will be covered on the exam and there are ten weeks in each quarter at Cal Poly the first knowledge domain “LEED Process” has been separated into two separate modules. This will provide students with time to get comfortable with the structure of the course at the beginning of the course rather than bombarding them with material the very first week. The modules have been divided into the following ten topics and will contain content that covers the following subtopics (see figure 1).

### *Course Materials*

Each week, students will be provided with lecture slides that supply a brief overview of the content to be covered for the week. The lecture slides will mention key topics and terms which will serve as a guide to the students as they make their way through the assigned reading for the week (see figure 2).

Along with the lecture slides, students will be asked to complete 1-2 reading assignments that will provide a more in depth look at the topics that are being covered (see figure 3). Reading assignments will be derived from three main texts that will be offered to students for free in pdf format. Offering free course materials increases the accessibility and provides students with more sources of information. In addition to the required reading, students will also be provided with supplemental

materials such as additional articles or informational videos that students may review if they desire to gain a deeper understanding of the coursework that is on hand.

## **Required Text**

1. Green Building Education Services. LEED Green Associate Exam Preparation Study Guide.
2. USGBC Staff. (2011). USGBC LEED Green Associate Study Guide. Prentice Hall PTR.
3. USGBC Staff. (2014). LEED Core Concepts Guide. ISBN: 9781932444322

## *Assignments*

The assignments for this course will allow students to apply LEED concepts to actual projects. At the beginning of the course, students will be asked to choose a building to work with for the quarter. Students must have access to the plans for this building or have extensive knowledge of the building specifics. Each week, students will be asked to describe how the project meets the prerequisites and credits in a given category. If the student's building does not meet the prerequisites or credits from a given category, they will be asked to come up with a plan to help the building meet the prerequisites and credits.

## **Example of Assignment Deliverables**

- Research the credit category “Sustainable Sites” under Rating System “LEED BD+C: New Construction”, version “v4.1 - LEED v4.1” and familiarize yourself with the prerequisite and credits available.
- Choose a minimum of three credits from this category that you would like to focus on for this assignment.
- Write a brief paragraph for each prerequisite and credit category.
- In your paragraph, describe the steps your project takes to satisfy the prerequisite or credit. If your project is not eligible for a prerequisite or credit, describe changes that could be made in order to satisfy the requirements.

## *Quizzes*

Weekly quizzes will be administered in this course. The purpose of each weekly quiz is to assess the student's understanding of the module and to provide the student with questions that are similar to those on the LEED GA exam. Although each category consists of varying amounts of questions, each weekly quiz will contain ten questions. I chose to format the quizzes in this manner to provide consistency throughout the course and to expose students to a greater variety of sample questions.

Quizzes will be composed of three main types of questions: recall, application, and analysis (see figure 4). Recall questions primarily serve to test the student's knowledge of concepts by asking the student to define terms, recall facts, identify processes, and group items into categories. Application questions evaluate the student's knowledge of procedures and performance and analysis questions evaluate the students reasoning and problem-solving abilities. These questions are similar to the types of questions that are to be expected on the LEED GA exam.

## *Final*

The final is a compilation of the quiz questions and will follow the question distribution laid out in the knowledge domains. The final will be given during week 10 and will take the place of the quiz from the final module. The final is made to serve as a mock LEED GA exam and will follow the same 100 question format. Each student will be given two hours to complete the test and will be expected to use a lockdown browser to ensure they are not receiving outside help. Providing the test in this manner will help students feel more comfortable with the format of the actual LEED GA exam.

### **Lessons Learned**

Over the course of this project, I had the opportunity to come up with an idea for a course that I thought would be beneficial to future Cal Poly construction management students and tailor the contents of the course in a way that would be most effective. Although I enjoyed crafting this course, I experienced difficulties along the way. The first difficulty that I experienced was figuring out how to structure the modules and come up with course content. My initial method was to divide the modules up according to the LEED credit categories and add information to the lecture slides as I learned new information. This method led to the lecture slides being unstructured and lacking a smooth flow of information. After trial and error, I discovered the LEED knowledge domains through the LEED GA cheat sheet. This resource helped me come up with specific topics that should be covered in each module. During this time, I also started gathering information from multiple resources and put the information in one google doc before placing it in the lecture slides. This helped me organize the information for the course and allowed me to create more focused lecture slides.

Another obstacle that I faced while making this course was coming up with assignments that were valuable to the course. As a student, I value assignments that seem purposeful rather than like busy work. My goal for this course was to come up with assignments that mimicked real life applications of the course material without being overly time consuming given that this course would be offered as 2 units.

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| <ol style="list-style-type: none"> <li>1. Introduction to LEED and Test Overview             <ol style="list-style-type: none"> <li>a. Course schedule and framework</li> <li>b. Fundamentals of USGBC</li> <li>c. LEED development process</li> <li>d. Project registration</li> <li>e. Other rating systems</li> <li>f. Exam details</li> </ol> </li> <li>2. LEED Process             <ol style="list-style-type: none"> <li>a. Structure and scope of LEED rating systems</li> <li>b. LEED credit categories</li> <li>c. LEED certification process</li> </ol> </li> <li>3. Integrative Strategies             <ol style="list-style-type: none"> <li>a. Integrative process</li> <li>b. Integrative project team members</li> <li>c. Standards that support LEED</li> </ol> </li> <li>4. Location and Transportation             <ol style="list-style-type: none"> <li>a. Previously developed areas</li> <li>b. Existing infrastructure</li> <li>c. Parking footprint</li> </ol> </li> <li>5. Sustainable Sites             <ol style="list-style-type: none"> <li>a. Site assessment</li> <li>b. Construction activity pollution prevention</li> <li>c. Habitat conservation and restoration</li> <li>d. Exterior open space</li> <li>e. Rainwater management</li> <li>f. Exterior lighting</li> <li>g. Heat island reduction</li> <li>h. Site management</li> </ol> </li> </ol> | <ol style="list-style-type: none"> <li>6. Introduction to LEED and Test Overview             <ol style="list-style-type: none"> <li>a. Course schedule and framework</li> <li>b. Fundamentals of USGBC</li> <li>c. LEED development process</li> <li>d. Project registration</li> <li>e. Other rating systems</li> <li>f. Exam details</li> </ol> </li> <li>7. LEED Process             <ol style="list-style-type: none"> <li>a. Structure and scope of LEED rating systems</li> <li>b. LEED credit categories</li> <li>c. LEED certification process</li> </ol> </li> <li>8. Integrative Strategies             <ol style="list-style-type: none"> <li>a. Integrative process</li> <li>b. Integrative project team members</li> <li>c. Standards that support LEED</li> </ol> </li> <li>9. Location and Transportation             <ol style="list-style-type: none"> <li>a. Previously developed areas</li> <li>b. Existing infrastructure</li> <li>c. Parking footprint</li> </ol> </li> <li>10. Sustainable Sites             <ol style="list-style-type: none"> <li>a. Site assessment</li> <li>b. Construction activity pollution prevention</li> <li>c. Habitat conservation and restoration</li> <li>d. Exterior open space</li> <li>e. Rainwater management</li> <li>f. Exterior lighting</li> <li>g. Heat island reduction</li> </ol> </li> </ol> |
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Figure 1. Course topics



# Location and Transportation

Figure 2. Lecture slide

Week	Topic	Course Material
Week 1	Introduction to LEED and Test Overview	<ul style="list-style-type: none"> <li>- Read pages 2-17 "Introduction to Green Buildings and Communities" in <i>Leed Core Concepts</i></li> <li>- Read pages 240-247 "LEED Green Associate Exam" in <i>LEED Green Associate Exam Preparation Study Guide</i></li> </ul>
Week 2	LEED Process	<ul style="list-style-type: none"> <li>- Read pages 32-50 "Sustainable Thinking at Work: New Process for Building Green" in <i>LEED Core Concepts Guide</i></li> </ul>
Week 3	Integrative Strategies	<ul style="list-style-type: none"> <li>- Read pages 30-31 "Sustainable Thinking: Integrative Process" and pages 32-49 "Sustainable Thinking at Work: New Processes for Building Green" in <i>LEED Core Concepts Guide</i></li> </ul>
Week 4	Location and Transportation	<ul style="list-style-type: none"> <li>- Read pages 52-55 "Green Building Core Concepts and Application Strategies: Location and Transportation" in <i>LEED Core Concepts Guide</i></li> <li>- Read pages 75-87 "Location and Transportation" in <i>LEED Green Associate Exam Preparation Study Guide</i></li> </ul>
Week 5	Sustainable Sites	<ul style="list-style-type: none"> <li>- Read pages 56-60, "Sustainable Sites" in <i>LEED Core Concepts Guide</i></li> <li>- Read pages 49-66 "What about Sustainable Sites" in <i>LEED Green Associate Study Guide</i></li> </ul>
Week 6	Water Efficiency	<ul style="list-style-type: none"> <li>- Read pages 61-63, "Water Efficiency" in <i>LEED Core Concepts Guide</i></li> <li>- Read pages 67-78 "What about Water Efficiency" in <i>LEED Green Associate Study Guide</i></li> </ul>
Week 7	Energy and Atmosphere	<ul style="list-style-type: none"> <li>- Read pages 64-70, "Energy and Atmosphere" in <i>LEED Core Concepts Guide</i></li> <li>- Read pages 79-96 "What about Energy and Atmosphere" in <i>LEED Green Associate Study Guide</i></li> </ul>
Week 8	Materials and Resources	<ul style="list-style-type: none"> <li>- Read pages 71-76, "Materials and Resources" in <i>LEED Core Concepts Guide</i></li> <li>- Read pages 97-109 "What about Material and Resources" in <i>LEED Green Associate Study Guide</i></li> </ul>
Week 9	Indoor Environmental Quality	<ul style="list-style-type: none"> <li>- Read pages 77-81 "Indoor Environmental Quality" in <i>LEED Core Concepts Guide</i></li> <li>- Read pages 111-126 "What about Energy and Atmosphere" in <i>LEED Green Associate Study Guide</i></li> </ul>
Week 10	Innovation in Designs and Regional Priority	<ul style="list-style-type: none"> <li>- Read page 82 "Innovation in Design" in <i>LEED Core Concepts Guide</i></li> <li>- Read Pages 127-129 "What about Innovation in Design" in <i>LEED Green Associate Study Guide</i></li> </ul>

Figure 3. Assigned reading schedule

**Question 6****1 pts**

A rapidly renewable material is defined as one that:

- Has a growth cycle of 10 years or less
- Has a very low life cycle assessment
- Can be recycled with a minimum amount of energy
- Is naturally grown material that does not require chemical fertilizers to speed the growth cycle

Figure 4. Example quiz question