

# California Polytechnic State University, San Luis Obispo

## Construction Management Department

### CM 313 – Commercial Construction Management, Fall 2019

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<b>Office Hours:</b>	TH- 11AM-1PM; FRI by Appt
<b>Class Days/Times:</b>	M: 12:10PM-4:00PM, TWR: 1:10PM-4:00PM
<b>Classroom:</b>	186-B106
<b>Prerequisite(s):</b>	CM 214 and ARCE 212

### Course Description

Materials, methods, and techniques associated with large commercial and institutional construction operations. Topics include building systems analysis of foundations, waterproofing, structural framing, exterior cladding, and finishes. Scheduling, estimating, and construction contracts are integrated into a project based approach. 3 laboratories, 2 activities.

### Course Goals and Learning Outcomes

#### Course Goals:

As a result of this course, you should be able to:

- Understanding the types of materials used in commercial buildings
- Understanding how to read commercial building project plans and specifications
- Knowing the different types of equipment and materials used in commercial building projects
- Comprehend the design intent and constructability issues in commercial building projects
- Synthesizing the knowledge gained through class readings and exercises by participating in a construction site visit

#### Course Learning Outcomes (CLOs):

1. Identify and recall MEP fundamentals in commercial construction
2. Identify and recall Green Building Codes and LEED-NC requirements

3. Comprehend and recall typical commercial and industrial construction activity sequencing.
4. Identify standard building codes and analyze how they pertain to commercial and industrial project design and construction practices including ADA, UFC, UBC, BOCA and IBC.
5. Analyze the relationships between and the responsibilities of typical design team, owner, and subcontractors and how they affect the construction process in commercial and industrial construction practices.
6. Analyze the material procurement and submittal processes and how they affect the construction process in commercial and industrial construction practices.
7. Interpret plans and specifications to determine the intended methods and details of construction for a given commercial and/or industrial construction project.
8. Analyze the different types of deep and shallow foundations typically used for commercial construction projects and the situations that each is best suited for.
9. Comprehend and recall typical materials and installation methods for deep and shallow foundations commonly used in commercial/industrial construction projects.
10. Comprehend and recall the means and methods used for site development typically associated with large commercial and industrial construction projects.
11. Comprehend and recall the means and methods associated with structural steel construction including material procurement process, site logistics, installation, welding, etc.
12. Comprehend and recall the means and methods associated with light gauge steel framing typically used in commercial and industrial construction.
13. Comprehend and recall the means and methods associated with precast concrete building systems commonly used in commercial and industrial construction projects.
14. Analyze the differences between site-cast and pre-cast building systems and how they affect productivity and associated cost.
15. Comprehend and recall the means and methods associated with common roofing systems used in commercial and industrial construction projects.
16. Analyze the different roofing systems commonly used in commercial and industrial construction projects and the situations for which each is typically used.
17. Comprehend and recall the means and methods associated with glass and glazing systems typically used in commercial and industrial construction
18. Comprehend and recall the materials, means and methods associated with door and hardware systems typically used in commercial and industrial construction and how they are affected by fire and ADA codes.

19. Comprehend and recall the materials, means and methods associated with masonry, steel, and glass cladding systems typically used in commercial and industrial construction
20. Comprehend and recall the means and methods associated with partition wall systems typically used in commercial and industrial construction
21. Analyze the design and construction issues associated with code compliance for fire and smoke separation, egress, and accessibility for commercial and industrial projects.
22. Comprehend and recall the materials, means and methods associated with ceiling and floor systems typically used in commercial and industrial construction projects.
23. Discuss and identify the overall coordination and management issues associated with the typical commercial and industrial construction process, means, and methods.
24. Building information modeling.

### **Scheduling**

25. Acquire skill in basic analytical and networking techniques in the areas of planning, scheduling, and cost engineering as applied to the management and control of construction projects. Demonstrate that skill by taking plans and specifications for an actual construction project of moderate complexity and creating an appropriate project schedule. Steps to include scoping the work, creating the Work Breakdown Structure (WBS), identifying and defining activities using correct level of detail, and estimating activity durations.
26. Become proficient with the techniques and procedures of a scheduling computer program. Demonstrate that skill by using it to create a plot of the CPM schedule for the assigned construction project (as explained above).
27. Identify project scheduling issues such as project time acceleration and schedule compression (crashing a schedule) to optimize realization of project goals.
28. Able to explain the basics of cost control and create cost curves for a project. Understand the integration of time and cost when measuring project performance, and able to apply earned value as a management control structure.
29. To become familiar with computerized scheduling.

### **Estimating**

30. Appreciate the role of an estimator for a general contractor and the difference between quantity take-off and estimating a project.
31. To know different methodologies and when to apply those methodologies for estimating – lump-sum, negotiated maximum price, GMP, cost plus.
32. To analyze a set of working drawing and specifications to determine the type of materials needed, units of measure, and be able to determine the quantities of the various materials required by the documents.

33. To present a logical, complete and accurate listing of the materials and their quantities in a format which then could be priced and labor analysis performed on it.
34. To analyze a set of specifications and drawings to determine the basic labor, material, equipment, and subcontractor requirements.
35. To present a logical, complete and accurate estimate including pricing for a variety of cost items.
36. To become familiar with computerized estimating - advantages & disadvantages.
37. To have extensively used specification and plans for all exercises.
38. Recognize and identify indirect job cost items, main office overhead and profit in an estimate.

### **Contracts Administration**

39. Identify prime contract red flag clauses and their effect on the owner and construction contractor.
40. Explain the need for proper documentation and record keeping
41. Recognize what elements are necessary to constitute a typical commercial contract (lump sum and negotiated - AIA typical A101 and A201 Supplemental Conditions) and the different types of contractual relationships
42. Identify the parties to and different types of surety bonds, including bid bonds, performance bonds, and labor/material payment bonds
43. Recall and explain the structure and formation of joint ventures
44. Identify contract change procedures and price/time adjustments
45. Identify the types and causes of delays, suspensions and terminations
46. Recognize and identify liquidated damages, force majeure, and time extension clauses

## **Student and Program Learning Outcomes**

The American Council for Construction Education (ACCE) is the accrediting body for Cal Poly's construction management program. The ACCE requires achievement of 20 student learning outcomes (SLOs). The construction management program has identified 20 program learning outcomes (PLOs) that equal or exceed the ACCE SLOs and 5 additional idiosyncratic PLOs.

This course supports the following PLOs:

- PLO 1: Create written communications appropriate to the construction discipline.
- PLO 2: Create oral presentations appropriate to the construction discipline.
- PLO 3: Create a construction project safety plan.
- PLO 4: Create construction project cost estimates.
- PLO 5: Create construction project schedules.
- PLO 6: Analyze professional decisions based on ethical principles.
- PLO 7: Analyze construction documents for planning and management of construction processes.
- PLO 8: Analyze methods, materials, and equipment used to construct projects.

PLO 12: Understand different methods of project delivery and the roles and responsibilities of all constituencies involved in the design and construction process.

PLO 13: Understand construction risk management.

PLO 15: Understand construction quality assurance and control.

PLO 16: Understand construction project control processes.

PLO 18: Understand the basic principles of sustainable construction.

PLO 19: Understand the basic principles of structural behavior.

PLO 20: Understand the basic principles of mechanical, electrical and plumbing systems.

PLO 23: Understand the key leadership characteristics that are successful in building and strengthening construction management teams.

PLO 25: Understand the benefits of respecting the unique and diverse backgrounds individuals bring to a construction team.

### Topical Outline, Outcomes, and Method of Assessment

This course has embedded assessment instruments for the PLO(s) listed below:

PLO 5: Create construction project schedules.

PLO 7: Analyze construction documents for planning and management of construction processes.

PLO 8: Analyze methods, materials, and equipment used to construct projects.

An overview of content, course learning outcomes, program learning outcomes, instructional activities, and assessment measures, are listed in the table below.

Week	Topical Outline	CLOs	PLOs	Instructional Activities	Method of Assessment
1	Safety/Site Logistics; Team Building/Leadership; Project Team Formation/Introduction; Building Code Overview; Project Delivery Overview; Soils, Excavation, Foundations	4, 5, 8, 9, 10, 42, 43	12, 13, 23, 25	Lecture, Activity, Lab	In-Class Lab Assignments, Text Reading Assignment
2	Commercial Construction Structural Building Systems	7, 11, 13, 14, 19	7, 8, 15, 19	Lecture, Activity, Lab	In-Class Lab Assignments, Text Reading Assignment
3	Simpson Strong Frame Building Activities	13, 19	8, 15, 19	Activity	Participation in Building Activities

<b>Week</b>	<b>Topical Outline</b>	<b>CLOs</b>	<b>PLOs</b>	<b>Instructional Activities</b>	<b>Method of Assessment</b>
4	Commercial Construction Core and Shell Systems	1, 7, 12, 15, 16, 17	7, 8, 18, 20	Lecture, Activity, Lab	In-Class Lab Assignments, Text Reading Assignment
5	Commercial Construction Interiors; Risk Management; Sustainability; Ethics	2, 18, 19, 20, 21, 22	13, 15, 18	Lecture, Activity, Lab	In-Class Lab Assignments, Text Reading Assignment
6	Simpson Strong Frame Building Activities; Review of Commercial Construction Systems for Exam	13, 19	8, 15, 19	Activity	Participation in Building Activities; Exam
7	Team Project Estimating; Introduction of PLO 7 & 8 Individual Assignment	30, 31, 32, 33, 34, 35, 36, 37	4, 7, 8	Lecture, Activity, Lab	In-Class Lab Assignments; Individual Assignment
8	Team Project Scheduling; Introduction of PLO 5 Individual Assignment	3, 25, 26, 27, 28, 29	5, 7, 8	Lecture, Activity, Lab	In-Class Lab Assignments; Individual Assignment
9	Commercial Construction Procurement; Review of Construction Document Set for Exam	5, 6, 7, 8, 39, 40, 41, 44, 45, 46	4, 7, 8, 12, 13	Lecture, Activity, Lab	In-Class Lab Assignments; Exam
10	Individual Leadership Presentation; Team Proposal Development	ALL	ALL	Lab	Individual Assignment; Team Assignment

## **Required Texts/Reading**

### **Textbook**

Mehta, Scarborough, and Armpries (2016). Building Construction: Principles, Materials, and Systems – 3rd Edition. Upper Saddle River, NJ: Pearson. (ISBN 978-0-13-445417-7). Text can be obtained at the Cal Poly Book Store, Amazon, and other similar locations.

### **Other Readings**

Peurifoy (2013). Estimating Construction Costs- 6th Edition. New York, NY: McGraw Hill. (ISBN 9781259170430). Text can be obtained at the Cal Poly Book Store, Amazon, and other similar locations.

Bartholomew (2002). Construction Contracting, Business and Legal Principles- 2nd edition. Upper Saddle River, NJ: Prentice Hall. (ISBN 0130910554). Available at the University Store.

AIA Documents A101, A201, A503 (all 2007 Editions) with accompanying Guides and Commentaries. As necessary, these will be provided on-line via PolyLearn.

Students are also encouraged to keep abreast of current events, news and emerging trends/topics related to the Architecture, Engineering and Construction (AEC) industry, as we will be discussing these in class periodically.

### **Other Equipment/Material Requirements**

The department has a requirement that all students have a notebook computer. Most Construction Management classes emphasize cooperative projects/assignments, and a notebook computer provides the required mobility to facilitate collaboration. In today's construction environment, computing is an integral component with the computer being the standard tool. A notebook computer is the key to having computing capability available at all times and all locations. Financial aid may be available to cover the cost of the computer laptop. Go to the Cal Poly Financial Aid Office website <http://financialaid.calpoly.edu/> for more information. For more detailed information about laptop specifications see the CM website. (<http://www.construction.calpoly.edu/content/prospective/laptop-requirements>).

Also, have on hand at all times – writing utensils, calculator, paper, positive attitude.

### **Classroom Protocol**

As a student, you are responsible to:

- This is a LAB CLASS first and foremost. Much of your time will be devoted to working on exercises and assignments. Class sessions will also combine reading assignments with lectures and class discussions. Students are expected to have completed the assigned reading before coming to class. Students are encouraged to participate in class discussions and to bring in subjects related to the class of personal importance to them for further discussion.
- This is a senior level course; you are expected to know and be familiar with basic construction concepts and construction management tools including construction materials, basic methods, estimating, scheduling, and contracts.

- Please arrive to class on time. Do not be late or have any unexcused absences. This will result in a reduction in your grade. Excessive absences and tardiness will result in an additional decrease in your grade. If you know that you need to miss class or are going to be late, it is your responsibility to contact the instructor as soon as possible.
- Turn off cell phones and computers during lecture.
- There will be no socializing going on during lectures.
- Sleeping during class will not be tolerated.
- Do not read newspapers, books, do homework or additional class assignments during lectures. This can be distracting to the Professor as well as your fellow classmates.
- Students will be responsible to keep the classroom clean during the quarter.
- Bikes are not allowed in the classroom.

## Diversity Statement

The classroom environment supports the goals and objectives of the Cal Poly – SLO Office of Diversity and Inclusion (OUDI) by promoting the tenets of Love, Empathy and Respect. Students are required to embrace this philosophy, supporting classmates with encouragement and appreciation of others values, ethics, opinions and intellectual diversity. Respect the classroom, respect your peers, respect yourself.

## Assignments and Exams

The following assignments and their associated point values are subject to change by the instructor as needed.

Description	Points
50	Textbook Reading Homework (4 assignments – 12.5 pts ea)
100	Individual Assignments (2 – 50pts ea)
50	Leadership Presentation
100	Class attendance, participation, quizzes, in-class exercises
200	Exams (2 - 100 pts ea)
150	Final Team Project Proposal and presentation
650	Total Points Possible

## Late/Missed Work and Make-Up Policy

This course will enforce the Cal Poly Class Attendance Policy; see [www.catalog.calpoly.edu](http://www.catalog.calpoly.edu). Excessive absenteeism and continued tardiness can result in one complete grade reduction in the final course grade. The instructor reserves the right to adjust a student's final grade by up to 10%, based on class participation, attendance and contribution during class.

## Grading Policy



Listed below is the grading scale for this course.

Letter Grade	Percentage	Performance	Definition
A	93 – 100%	Excellent Work	Superior Attainment of Course Learning Outcomes
A-	90 – 92%	Mostly Excellent Work	
B+	87 – 89%	Very Good Work	Good Attainment of Course Learning Outcomes
B	83 – 86%	Good Work	
B-	80 – 82%	Mostly Good Work	
C+	77 – 79%	Very Acceptable Work	Acceptable Attainment of Course Learning Outcomes
C	73 – 76%	Acceptable Work	
C-	70 – 72%	Mostly Acceptable Work	
D+	67 – 69%	Mostly Poor Work	Poor Attainment of Course Learning Outcomes
D	63 – 66%	Poor Work	
D-	60 – 62%	Very Poor Work	
F	0 – 59%	Failing Work	Non-Attainment of Course Learning Outcomes

## University Policies

### Participation and Attendance

Insert student participation and attendance expectations here.

Students are responsible for knowing the University policy regarding class attendance. See this link on [Class Attendance Policy](#) provided on the university website.

### Add/Drop Policy

Students are responsible for knowing the University policies, procedures, and schedule for dropping or adding classes. See this link on [Add/Drop Policy](#) provided on the university website.

### Academic Integrity

Students are responsible for knowing the [Academic Honesty Policy](#).

### Students with Disabilities

If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and the Disability Resource Center, Building 124, Room 119, at (805) 756-1395, as early as possible in the term, as accommodations may take several weeks to arrange. If you are a student with a disability, please consider discussing your needs and possible accommodations with me as soon as possible, and visit the [DRC Website](#) for additional information.

## **SensusAccess**

SensusAccess is a self-service, alternate media solution made available by Kennedy Library to automatically convert files into a range of alternate media including audio books (MP3 and DAISY), e-books (EPUB, EPUB3 and Mobi) and digital Braille. The service can also be used to convert inaccessible files such as image-only PDF files, JPG pictures and Microsoft PowerPoint presentations into more accessible and less tricky formats. This service is available at no charge for all Cal Poly students, faculty, staff and alumni. For additional information, visit [SensusAccess at the Kennedy Library](#).

## **Technical Support and Contact Information**

Support is available for troubleshooting and access issues for PolyLearn. Please visit the [PolyLearn Student Support Web Site](#) for further information.

## **Campus Resources to Support Student Learning**

Cal Poly offers programs and resources that are available to assist students during your academic studies, such as the [Cal Poly Student Academic Services Web Site](#).