California Polytechnic State University, San Luis Obispo

Construction Management Department

CM314-01/02: HEAVY CIVIL CONSTRUCTION MANAGEMENT – FALL 2020

Instructor:	Ed Boucher: BEng., MSEM, MBA, PMP
Office Location:	21-103A
Telephone:	805-756-6129 (office direct w/ voice mail) 805-756-1323 (department messages) 805-471-0717 (direct line cell)
Email:	embouche@calpoly.edu
Office Hours:	T/TH 9:00 AM-12:00 PM; (or by virtual appointment) IF NOT IN OFFICE CALL OR TEXT 805-471-0717
Class Days/Times:	MON 12:10 PM-4:00 PM ; TUES/WED/THURS 12:10 PM - 3:00 PM
Classroom:	**186-A112**
Prerequisite(s):	**CM 313**

Course Description

Materials, methods, and techniques associated with civil engineering projects and heavy construction operations. Topics include tunnel, bridge, dam, and road construction; equipment selection; and temporary structures. 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:

(i) Understand the heavy construction sector of the industry including various heavy civil construction methods, contract documents, scoping and quantifying operations.

(ii) Estimate construction times, cost and scheduling to co-ordinate operations, and setting up project control parameters.

(iii) With reference to (i) and (ii) use appropriate information sources to select suitable mechanical equipment and other resources to achieve cost effectiveness solutions.

Course Learning Outcomes (CLOs):

General

1. Recognize the types of projects, project phases or operations considered as heavy construction.
2. Identify some of the methods used in excavation, construction, bridge construction, road construction, pile driving and other heavy construction projects and structural steel erection.
3. Work typical problems associated with equipment selection and heavy construction method.
4. Read and interpret project drawings and specifications related to heavy construction projects
5. Understand terms and concepts pertinent to rigging and heavy load handling.
6. Select equipment for major earthmoving projects, estimate and schedule activities.

7. Complete a method analysis for different phases of an earthwork and/or civil engineering project.
8. Identify safety issues and regulations associated with equipment and heavy construction operations.
9. Comprehend the environmental impact of heavy construction.
10. Understand terms and concepts pertinent to erection and estimating of structural steel.
11. Collaborate satisfactorily with other students in an integrated team.
12. Demonstrate capability to read and understand complex crane load charts
13. Incorporate findings into reports and presentation as required by the instructor.
14. Deliver assessment packages to a timetable of dates.

Temporary Structures

15. Comprehend and recall common nomenclature associated with the design and construction of temporary structures.
16. Comprehend and recall common materials used for construction of temporary structures.
17. Comprehend the design methodologies, materials, and installation associated with cofferdams, sheeting and bracing for temporary earth retaining structures.

Estimating Scheduling and Control

18. Analyze contract documents 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.
19. 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.
20. Analyze contract documents to determine work packages, labor, material, equipment, and subcontractor requirements.
21. Complete a full unit price bid for a relevant and current heavy civil project.
22. Understand the concept of balancing a fleet of equipment and crew selection for heavy construction projects.

Construction Contracts Administration

23. Comprehend typical Cal Trans specification clauses and contract conditions.
24. Understand the bid and proposal process, including bidding statues, bid irregularities, bid protests, and mistakes in bids

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 4: Create construction project cost estimates.
PLO 11: Apply basic surveying techniques for construction layout and control.

Topical Outline, Outcomes, and Method of Assessment

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

PLO 01: Written Communication
PLO 03: Oral Presentations
PLO 04: Create Construction Project Cost Estimates
PLO 05: Construction Schedules
PLO 06: Construction Documents
PLO 08: Materials Methods & Equipment
PLO 11: Apply basic surveying techniques for construction layout and control.
PLO 12: Project Delivery Methods
PLO 13: Risk Management
PLO 18: Sustainability

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

Choose Unit Type	Topical Outline	CLOs	PLOs	Instructional Activities	Method of Assessment
WK #1	Rigging Equipment, Equipment Economics, Cal Trans Specs	1, 2, 5, 6, 23	4, 6	Lecture, Reading, Lab	Quiz
WK #2	Cut & Fill, Take-off Quantities, Estimating, Rigging, Structural Steel	3, 4, 6, 7, 8, 10	4	Lecture, Reading, Lab	Quiz
WK #3	Construction Methods, Slings, Mobile Equipment, Excavation Safety	3, 5, 9,	4, 13	Lecture, Reading, Lab	Quiz
WK #4	Mobile Equipment, Fleet Selection, Structural Steel, Estimating, Contracts	3, 10, 23, 24	4	Lecture, Reading, Lab	Quiz Individual Assessment Rubric
WK #5	Heavy Civil Estimating, Concrete	11, 13	4	Lecture, Reading, Lab	Exam
WK #6	Estimating, Temporary Structures, Surveying, Structural Steel, Pile Driving	3, 7, 15-17	1, 4, 8, 12	Lecture, Reading, Lab	Quiz
WK #7	Scaffolding, Asphalt, Paving, Tilt-up Construction	11, 3, 13, 14	1, 3, 4, 6	Lecture, Reading, Lab, Team Presentation	Team Presentation, Quiz
WK #8	Cranes, Crane Charts	3, 4, 12 13	1, 3, 4, 5, 11	Lecture, Reading, Lab	Individual Assessment Rubric, Quiz
WK #9	Heavy Load Transport, Tower Cranes	5, 12, 13	4, 18	Lecture, Reading, Lab	
WK#10	Estimating, Scheduling, WBS, Presentations	13, 14, 18-24	1,4, 5	Team Presentation	Rubric, Exam

Required Texts/Reading

Textbook

- General Heavy Equipment: Construction Planning Equipment, and Methods" 9th Edition or Special edition, Peurifoy, R and C. Schexnayder. ISBN- 9781259170430 ISBN- 9781121559431

Other Readings

- Means 'Heavy Construction" Any year
- Formwork For Concrete Structures by R. Peurifoy , G. Oberlender 3rd Ed pub: McGraw Hill Construction
- Formwork for Concrete," 6th (or newer) edition (SP-4) Author: Hurd, M.K. American Concrete Institute (ACI)
- Handbook of Temporary Structures in Construction, 2nd Edition Author: Ratay, Robert T. McGraw-Hill, Inc. (ISBN 0-07-051261-2)
- The Caterpillar Performance Handbook – Edition 31 and online.
- CalTrans web site.
- CalTrans (State of California, Dept. of Transportation) Standard Spec.
- Cal Trans Plans
- Manual of Traffic Controls 1996 (revision 1) – CalTrans.

Other Equipment/Material Requirements

Students are strongly advised to read journals related to the subject including the ASCE monthly journal and the weekly ENR (Engineering News Record).

- Fairly recent Mac or PC (not more than three years old) with a current operating system.
- Current browser (Firefox or Chrome are preferable)

Netiquette

In our class, we may conduct several online discussions. In order to ensure a positive, dynamic, comfortable and collegial environment, please review the online etiquette ("Netiquette") sites below.

Netiquette Rules for Electronic Communications (Links to an external site.).
The Core Rules of Netiquette (Albion - the original!) (Links to an external site.).
Cal Poly strives to maintain our campus as a place of work and study for faculty, staff, and students that is free of all forms of prohibited discrimination and harassment based upon race, ethnicity, sex (including sexual assault), pregnancy, color, religion, national origin, physical or mental disability, age, marital status, sexual orientation, gender identity, genetic information, or status as a U.S. veteran. Any student who has concerns about such behavior should contact his/her instructor, Office of the Dean of StudentsLinks to an external site. at (805) 756-2472 or at deanofstudents@calpoly.edu, or the Office of Equal OpportunityLinks to an external site. at (805) 756-6770 or at equalopportunity@calpoly.edu.

The University is committed to maintaining a safe and healthy living and learning environment for students, faculty, and staff. Each member of the campus community should choose behaviors that contribute toward this end. Students are expected to be good citizens and to engage in responsible behaviors that reflect well upon their university, to be civil to one another and to others in the campus community, and contribute positively to student and university life.

It is the discretion of the instructor to make any changes he deems necessary to the class schedule, syllabus, lectures, assignments, quizzes and exams.

Please ask questions if you do not understand a concept in class. During the quarter, if you feel that you are becoming behind in your studies, and having difficulties keeping up with the assignments or concepts in the class, and are concerned about your grade, please make an appointment with me to discuss ways we can turn things around in your favor. Your education and grades here at Cal Poly are your responsibility, but as your instructor I am here to support you in a co-creative learning environment so please reach out and ask for help.

Assignments and Exams

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

Description	Points
Assessment 1 – Heavy Civil Project Estimating (Team)	**100 (TEAM)**
Assessment 2 – In-class Quizzes and Exercises, Lessons	**730**
Assessment 3 - Equipment Presentation (Team)	**100 (TEAM)**
Assessment 4 – Environmental Impact/Green Research Paper	**50**
Assessment 5 – Homework	**80**
Assessment 6 – CM Curriculum Assessments	**150**
Assessment 7 - Mid-term and Final Exam	**900**
Total Points Possible	**2110**
Assessment 8 – Heavy Civil Construction Knowledge – Extra Credit	**100**

Late/Missed Work and Make-Up Policy

Submission late less 10% /day up to 3day cut off.

Grading Policy

Failure to attend a scheduled exam or in class assignment will result in a grade of 0. Make up quizzes and exams will not be given unless you notify the instructor of a documented, excusable absence in advance. Exam make-ups will be given only under special circumstances. You must make your arrangements with your instructor prior to the exam date.

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	

Letter Grade	Percentage	Performance	Definition
B	83 – 86%	Good Work	Good Attainment of Course Learning Outcomes
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

Students are expected to attend all class sessions. The instructor is to be contacted prior to a missed class.

Students are responsible for knowing the University policy regarding class attendance. See this link on Class Attendance Policy: https://academicprograms.calpoly.edu/academicpolicies/class-attendance 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: https://registrar.calpoly.edu/drops-withdraws-and-leaves provided on the university website.

Academic Integrity

Students are responsible for knowing the Academic Honesty Policy: https://osrr.calpoly.edu/academic-integrity .

Accessibility & Support Resources

It is my intent that everything in this class shall be accessible for all participants. Cal Poly is committed to serving our students, and has stated this goal in the Accessibility Statement: http://www.accessibility.calpoly.edu/Links to an external site.

If you have any questions or concerns about alternate media, accessible technology or other assistive measures, and you would prefer to speak directly with a campus representative, I encourage you to visit the Disability Resource Center website: https://drc.calpoly.edu/ which has current hours and contact information for the helpful staff there.

Persons who wish to request disability-related accommodations should contact the Disability Resource Center https://drc.calpoly.edu/ in Building 124. Phone: (805) 756-1395. Some accommodations may take up to 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.

In addition to DRC resources, Cal Poly offers the following services that you may use if needed:

- https://sas.calpoly.edu .- Please visit site for the scope of services offered
- https://tech.calpoly.edu/services/ - Contact the service desk for help with your Portal (my.calpoly.edu) account, email and calendar, wireless issues, or other services.
- Robert E. Kennedy Library: https://lib.calpoly.edu/.
- New Student Orientation Programs: https://orientation.calpoly.edu/
- Writing and Learning Center: https://writingandlearning.calpoly.edu/center.
- Registration: https://registrar.calpoly.edu/.
- Advising: https://advising.calpoly.edu/ .
- Counseling Services: https://hcs.calpoly.edu/counseling.

Cal Poly uses Canvas & Poly Learn, which are fully accessible as a learning platform (read more about accessibility within Canvas: https://canvassupport.calpoly.edu/accessibilty.

I recognize there are many ways to learn, and many paths to the same destination. If there is a way I can help accommodate your path, or offer an alternative, please discuss this with me as soon as possible. If you'd like to learn more about your own preferred learning style, the VARK Questionnaire https://vark-learn.com/the-vark-questionnaire/.) is a fun quiz that will show you how you're most comfortable learning (although all of us, unless otherwise enabled, learn in all of the ways presented). Please let me know if I can better help you learn on your journey!

Technical Requirements

- Fairly recent Mac or PC (not more than three years old) with a current operating system.
- Current browser (Firefox or Chrome are preferable)

Technical Support and Contact Information

Support is available for troubleshooting and access issues for PolyLearn. Please visit the https://canvassupport.calpoly.edu/ 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 https://sas.calpoly.edu/.