



**Construction Management Program**  
California State University, Sacramento

**CM 124**  
**Engineering Construction**

Course Syllabus  
Fall 2008

Class Instructor: Andy Mantell, PE, Granite Construction  
Lecture 9:00 a.m. – 9:50 a.m. M, W  
ARC 1007

Lab Section 01: 8:00 a.m. – 10:50 a.m. F (Professor Mikael Anderson, PE)  
ALP 147 (or Jobsites, location TBA)

Lab Section 02: 8:00 a.m. – 10:50 a.m. F (Instructor Gareth Figgess)  
ALP 205 (or Jobsites, location TBA)

Instructor Andy Mantell Contact:  
[Andy.Mantell@gcinc.com](mailto:Andy.Mantell@gcinc.com)  
No Office Hours (see below)  
Email: andy.mantell@gcinc.com

Professor Mikael Anderson Contact:  
Telephone: (916) 278-5990  
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Email (**Best way to reach me**) – [anderson@ecs.csus.edu](mailto:anderson@ecs.csus.edu)  
Office Hours: RVR 4019

M, W 10:00 a.m. – 11:00 a.m.  
or by appointment

## CM 124: Engineering Construction

### COURSE DESCRIPTION:

A study of engineering construction projects with emphasis on equipment-paced operations including safety aspects. Engineering fundamentals and other factors that affect equipment selection and production. Amplification of recording and analysis techniques. Unit price contracts. **3 units.**

### PREREQUISITES:

The prerequisite course(s) for this class, which must have been completed with a C- or better grade, include CM 125 & CM 135. One hundred series CM courses are limited to students whose changes of major to the upper division have been approved by the Program Coordinator.

### ACADEMIC HONESTY & GRADING SYSTEM:

All students are subject to the policies described in the University Catalogue. In particular, students should be familiar with policies described on pages 104 – 112 and page 339 of the 2004-2006 CSUS Catalogue.

Giving aid to a student during an exam or taking information from another student or student's exam constitutes academic dishonesty. Students caught cheating during an exam will receive a failing grade in the course and can be dismissed from the university. Students are encouraged to work together to solve homework problems, but **copying is obviously prohibited.**

Grades will be assigned based on the student's performance as measured by the assigned homework, field reports, midterm exams, presentation, and unit price bid. Grading shall be in accordance with the University's grading policy as outlined in the section entitled "Grading System" in the current copy of the University catalog.

Homework	20%
Field Reports	15%
Presentation (oral/written)	15%
Midterm Exam #1	20%
Midterm Exam #2	20%
Unit Price Bid	10%

### Grade Scale:

A: 90-100, B: 80-89, C: 70-79, D: 60-69, F: <60

\*Students achieving overall percentages as shown above are guaranteed grades as indicated. Actual cutoffs may be lower.

## **COURSE OBJECTIVES:**

Using engineering construction projects for examples and application, the purposes of this course are:

- Further develop the analytical and managerial concepts and techniques introduced in CM 120 and CM 121.
- Focus the application of these concepts and techniques on the analysis and management of equipment-paced operations.
- Expand on the technical aspects of equipment utilization and management.
- Continue to emphasize the importance of safety as an integral part of each construction operation and project.
- Introduce unit price bids and contracts, and to explore their unique characteristics and requirements.
- Continue the development of oral and written communication skills.
- Become proficient in using the CAT handbook.
- Familiarize yourself with all types of heavy civil construction equipment.
- Solve problems using fundamental principles in a logical and systematic way.
- Idealize problems using mathematical models.

## **SPECIFIC EDUCATIONAL OUTCOMES:**

At the conclusion of the class, students should be able to:

- List the common earth types and explain how they affect the productivity of equipment
- List the common operations involved in grading, excavation, and structural earthwork
- Identify several methods for treating earth so that it can perform its intended role, as well as the types of equipment used in those methods
- Calculate rim pull, rolling resistance, bucket capacity, and the effects of altitude on a variety of equipment used on construction projects
- Determine operator efficiency and production rates for a variety of equipment
- Determine the proper spread for several common equipment-intensive operations
- Identify the controlling operation for a variety of equipment-paced operations
- Select an appropriate crane to perform hoisting operations in a variety of project types
- Identify the causes of accidents for a variety of equipment and project types and prepare a plan to avoid them
- Develop a safety plan for an earthwork contractor
- Name the key participants in the typical union-oriented general engineering company, and identify the elements of cost for equipment operators and supervisory personnel
- List and explain the differences between unit-priced contracts and the typical building construction contract and the logic underlying them
- Explain the differences between front-loading and unbalancing, and the key opportunities that a unit-priced contract presents

## **TEXTBOOKS:**

Peurifoy, Schexnayder, & Shapira *Construction Planning, Equipment, and Methods*, 7<sup>th</sup> Ed., McGraw Hill, New York, 2006. Sold in the CSUS bookstore. **(Required)**

Capachi, *Excavation & Grading Handbook, Revised*, June 2005, Craftsman Book Company. Sold in the CSUS bookstore. **(Required)**

*Caterpillar Performance Handbook*, October 1998. Available thru CSUS Construction Management library reserve for current semester only. **(Required)**

## **REFERENCES:**

O'Brien, Havers, & Stubbs, *Standard Handbook of Heavy Construction*, 3<sup>rd</sup> Ed., McGraw Hill, New York, 1996.

Nunnally, *Managing Construction Equipment*, 2<sup>nd</sup> Ed., Prentice Hall, New Jersey, 2000.

## **COURSE ORGANIZATION & EVALUATION:**

### **Lecture & Lab Sessions**

Attendance is strongly recommended.

Lecture sessions will be fifty minutes in length, and held two times per week. Classes will be devoted to the presentation of lecture topics, a brief review of the assignments, administering exams, and addressing individual questions as time allows. To maximize learning, you are encouraged to participate actively in lecture. You will also have the opportunity to work in small groups to solve problems in/out of the classroom.

Laboratory periods will focus on field trips to engineering projects under construction. Students must provide their own transportation to the project site. A written report is required the following Monday lecture session after each trip. You should be able to find at least one operation at each job site which can be improved upon. Written reports will not be accepted for those students that fail to physically attend the construction project jobsite.

In addition, students in teams are to conduct an independent study of a construction operation. Some lab time is specifically allocated to this activity; however, it is expected that additional time will be required outside of class. Based on the study, a written report is to be submitted by each team, and an oral presentation is to be made by each team.

### **Course Web Page**

A CM 124 course web page will be developed through the CSUS Web CT. It is **important** for you to have a SacLink account to utilize the tools of this course web page. You will be expected to check your Saclink email and the course web page regularly (i.e., daily) for important class announcements, homework assignments & solutions, and other information. You must send all email to me during the semester with **“CM124”** **somewhere in the “subject line”**. Email without this designation will not be recognized or responded to (i.e., I will assume that it has not been submitted).

### *Classroom Interruptions*

The lecture sessions should be treated in a professional manner, as you would behave during a meeting with a client/contractor. All cellular phones and pagers to be turned off prior to entering lecture sessions and exams. Use of classroom computers during the lecture will also not be allowed. Any violation of these warnings will result in dismissal of the student from that day's lecture.

### *Homework Policy*

Homework problems will be assigned regularly. Assignments must be turned in at the **beginning** of class on the due date, typically two periods after they have been assigned. A maximum of 2 late homeworks will be accepted at the beginning of the next class period, with a **20% penalty**. No homework may be submitted after an assignment is returned or after solutions are provided.

Homework must be neat and organized, and completed using a straight edge and engineering paper (front side only). Final answers must be boxed or underlined for clarity and **engineering units must be used in solving problems and shown on final answer to receive credit**. Homework sheets must be stapled, with name at the top of each page.

Homework will be reviewed for completion of all assigned problems, but not all of the assigned problems will necessarily be graded. However, solutions of all problems will be posted on Web CT and should be reviewed.

### *Field Reports Policy*

Field reports will be due the first Wednesday lecture period following the field trip to the construction project jobsite. Requirements for the content of these field reports are listed at the end of this syllabus.

Attendance to the field trips is mandatory to receive credit for that particular field report. No late field reports will be accepted by the instructor. Students that choose to not attend the field trip will be allowed 1 make-up field trip to be scheduled by the instructor.

### *Exams Policy*

Two fifty minute midterm exams will be given as noted on the exam schedule below. These midterm exams will be returned for review in class, but will be collected and remained on file in the instructor's office for a minimum period of one year. Any appeal on the scoring of an exam must be made at the first lecture period following return of the midterm exam.

A 30-minute presentation and 2-hour unit price bid will be performed by all groups as noted on the exam schedule below. Unit price bids will not be returned, but will remain on file in the instructor's office for a minimum period of one year. During this time, the student may schedule an appointment with the instructor to review his/her final exam.

**Exam Dates (tentative)**

Midterm Exam #1	Wednesday, Oct 22, 2008	(Week 8)
Midterm Exam #2	Wednesday, Dec 3, 2008	(Week 14)
Oral Presentations	Friday Dec 5 <b>and</b> 12, 2008	(Weeks 14 & 15)

Students may bring the CAT handbook along with one 8.5 x 11 sheet (both sides) to the first exam, and an additional sheet for each subsequent exam. These sheets must be your own hand written notes. The instructor will collect and review these sheets. Makeup exams will be given only if *prior permission* is granted for extreme situations such as valid medical reasons.

**Evaluations**

Students are encouraged to provide constructive feedback to the instructor during the semester through “student representatives” and will also formally evaluate the instructor during the last week of class using the standard evaluation form.

**Course Binders**

All students are required to submit a neatly compiled three-ring binder, with divider tabs, all course notes, assignments, handouts, quizzes, exams, and other course work. Binders will be returned to the students following the ACCE accreditation visit in Spring 2009. Failure to produce and submit this binder will result in a failing grade in the class.

**CM 124 – LECTURE SCHEDULE (Tentative)  
Fall 2008**

<b>Week</b>	<b>Lecture</b>	<b>Topic</b>	<b>Reference</b>
1	1	Introduction	Chapter 1 & 2
2	2	Planning – quantities & mass diagrams	Chapter 3
	3	Planning – quantities & mass diagrams	Chapter 3
3	4	Soil – classification, volume changes	Chapter 4
	5	Compaction & Soil Stabilization	Chapter 4
4	6	Machine Power	Chapter 5
	7	Dozers – clear & grub	Chapter 6
5	8	Dozers – ripping rock	Chapter 6
	9	Rock Excavation – shoot & drill, blasting	Chapters 12 & 13
6	10	Scrapers	Chapter 7
	11	Excavators – backhoes, loaders	Chapter 8
7	12	Finishing Equipment – motor graders	Chapter 9
	13	Excavators – draglines, clamshells	Chapter 18
8	14	REVIEW	
	15	<b>Midterm #1 (tentative date)</b>	
9	16	Pile Driving Equipment	Chapter 19
	17	Dewatering	Chapter 20
10	18	Hauling Equipment – Trucks & Wagons	Chapter 10
	19	AC Paving	Chapter 15
11	20	Concrete Finishing	Chapter 16
	21	Equipment Economics	Chapter 3
12	22	Cranes	Chapter 17
	23	Cranes	Chapter 17
13	24	Computer Applications	
	25	Unit Price Bidding	
14	26	Unit Price Bidding	
	27	<b>Midterm #2 (tentative date)</b>	
15	28	Unit Price Bidding	
	29	Unit Price Bidding	

**DISCLAIMER:**

The instructor reserves the right to adjust the scope of the course, including number and timing of exams, as necessary.

**CM 124 – LABORATORY SCHEDULE (Tentative)  
Fall 2008**

<b>Week</b>	<b>Laboratory</b>
1	Field Trip #1: Shrink/Swell Exercise
2	Field Trip #2: Location TBA
3	Field Trip #3: Location TBA
4	Independent Study – Group Progress Reports <b>DUE</b>
5	Field Trip #4: Location TBA
6	Field Trip #5: Location TBA
7	Field Trip #6: Location TBA
8	Independent Study – Group Projects
9	Field Trip #7: Location TBA
10	Field Trip #8: Location TBA
11	Field Trip #9: Location TBA
12	Independent Study – Group Projects
13	Field Trip #10: Location TBA
14	Group Presentations
15	Group Presentations

**DISCLAIMER:**

The instructor reserves the right to adjust the laboratory schedule, as will be necessary pending weather conditions and jobsite availabilities on the scheduled field trips shown above. The adjustments to this schedule will be announced during the lecture prior to the field trip, and/or posted on the course website.

**FIELD/INDEPENDENT STUDY REPORTS:**

In this course, field trips report and independent study reports are to be submitted in memorandum format. The body of the reports should be single spaced on 8-1/2" x 11". Printed hand written reports in ink will also be accepted.

State the facts using complete sentence structure. Brief outlined format will not be accepted. Each paragraph should have a topic sentence which is further developed in the body of the paragraph. Be as specific as possible.

Sample:

“A large crane was hoisting structural steel beams.” - **UNACCEPTABLE**

“A 250 ton crawler crane with 180 ft of boom and 20 ft jib was hoisting structural steel beams.” - **BETTER**

Cost should be clearly defined as to what is included. If necessary for clarification, state what is not included: “The cost of move in and move out is not included.” State your source for cost and the period of time for which it is applicable.