SACRAMENTO STATE
Construction Management

Construction Management Program

California State University, Sacramento

CM 140
Structures II – Timber and Formwork Design

Course Syllabus
Spring 2009

Instructor: Professor Mikael Anderson, PE

Lecture 1:30 – 2:45 PM Tuesday Thursday – Eureka Hall 315

Telephone: (916) 278-5990
CM Office: (916) 278-6616
Fax: (916) 278-7957
Email **(Best way to reach me)** – anderson@ecs.csus.edu

Office Hours: RVR 4019
Monday, Tuesday, Wednesday, Thursday 10:30 AM. – 11:30 AM
or by appointment

CM 140 – Structures II – Timber and Formwork Design

COURSE DESCRIPTION:
Basic design of structural timber members with emphasis on systems used in practical situations. Beams, trusses, and columns are designed using the Uniform Building Code as a reference and the results are shown on detailed drawings and sketches. Application of engineering principles to satisfy construction requirements that are not designed or shown in typical construction documents. Includes analysis and design of concrete form systems, shoring, falsework, and construction dewatering. **3 units.**

PREREQUISITES:
The prerequisite course(s) for this class, which must have been completed with a C- or better grade, include CM 130. One hundred series CM courses are limited to students whose upper division standing has been approved by the Program Coordinator, or by special permission of the course instructor and 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 81–91, pages 98–106, and pages 328-331 of the 2008-2010 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, midterm exams, and final exam. 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.

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

Homework	20%
Midterm Exam #1	25%
Midterm Exam #2	25%
Final Exam	30%

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

COURSE OBJECTIVES:

The purposes of this course are to:

- Understand the uniform building code requirements for the construction of wood-framed building structures and temporary construction structures.
- Follow the load path throughout an entire structure
- Calculate the external, internal and reaction forces on all components of a structure
- Properly size structural wood beams, columns, and braces based on the demand loads to these components and the material capacity
- Adequately design wood formwork for concrete structures to withstand the lateral loads due to concrete hydrostatic pressures.
- Determine the vertical construction loads (dead and live) applied to temporary structures, and design the wood-framed components.
- Properly design the bracing components for formwork and temporary structures to meet the OSHA safety requirements.
- Estimate and schedule economical formwork design by utilizing proper construction staging techniques.

SPECIFIC EDUCATIONAL OUTCOMES:

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

- Determine the applicable wood adjustment factors and calculate allowable wood stresses.
- Describe fundamental properties of wood framing members.
- Understand the applicable code requirements (ACI, Caltrans, OSHA) for placement, testing, and inspection of formwork and temporary structures.
- Calculate design dead, live, seismic, and wind loads on a structure.
- Determine the tributary loads to individual components of falsework structures and formwork panels.
- Analyze and design wood purlins, joists, beams, and girders for flexural, shear, and deflection criteria.
- Analyze and design columns and braces for axial loads.
- Analyze and design formwork panels for out-of-plane hydrostatic pressures
- Analyze and design connections for adequate timber fasteners - such as nails, lag screws, bolts, and framing hardware (i.e. Simpson brackets).
- Calculate anchorage bolts capacities for common wood-framed connections, such as shearwall hold-down supports.
- Calculate hydrostatic loads used for formwork design.
- Choose and estimate economical formwork and falsework design.
- Calculate shoring and bracing requirements for formwork.
- Dewatering foundation sites.
- Computer applications as assigned for any of the above objectives
- Strengthen skills for drawing shear and bending moment diagrams.
- Solve problems using fundamental principles in a logical and systematic way.
- Idealize problems using mathematical models.
- Draw free body diagrams.

TEXTBOOK:
Breyer, Fridley, Cobeen, & Pollock, *Design of Wood Structures – ASD/LRFD*, 6th Ed., McGraw-Hill, New York, 2007. **(Required)**

REFERENCES:

Robert L. Peurifoy & Garold Oberlender, *Formwork for Concrete Structures*, 3rd Ed., McGraw-Hill, New York, 1996.

American Concrete Institute (ACI), *Formwork for Concrete, SP4*, Latest Edition.

International Conference of Building Officials (ICBO), *International Building Code (IBC)*, Latest Adopted Edition.

National Forest Products Association (NFPA), *National Design Specification (NDS), Wood Construction*, Latest Edition.

National Forest Products Association (NFPA), *Design Values for Wood Construction*, Supplement to National Design Specification (NDS), Wood Construction, Latest Edition.

American Institute of Timber Construction (AITC), *Timber Construction Manual*, Latest Edition.

COURSE ORGANIZATION & EVALUATION:

Lecture Sessions

Attendance is strongly recommended.

Lecture sessions will be one hour and fifteen 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, students are expected to complete all assigned reading or other research prior to each lecture and 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.

Field Trips

At least one mandatory field trip will be scheduled during class time to observe the fabrication and/or erection of formwork at a local jobsite.

Course Web Page

A CM 140 course web page will be developed through the CSUS SacCT. 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 **"CM140" 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 1 late homework assignment 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 SacCT and should be reviewed.

Exams Policy

Two seventy-five 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 two hour final exam will be given as determined by the University Final Exam Schedule (noted on the exam schedule below). Final exams 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:

Midterm Exam #1	Thursday, March 5, 2009 (week #6)	Wood Analysis, Beams, & Columns
Midterm Exam #2	Thursday, April 23, 2009 (week #12)	Formwork & Falsework Design
Final Exam	Thursday, May 21, 2009	12:45pm – 2:45pm

Students may bring the *Class Handouts: Wood Design Tables* along with one 8.5 x 11 sheets (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.

CM 140 - Course Outline (Tentative)
Spring 2009

Week	Lecture	Topic	Reading Assignment
1	1	Introduction to Formwork & Temporary Structures	
	2	REVIEW Design Loads, Tributary Analysis	Review Chapter 2 & 3
2	3	Wood Material Properties, Allowable Stresses, Deflection Criteria	4.1 - 4.12, and 5.1 - 5.6
	4	Wood Adjustment Factors	4.13 - 4.22
3	5	Flexural Design of Wood Members	6.1 - 6.4, 6.9 – 6.12
	6	Shear & Bearing Design of Wood Members	6.5 - 6.8, 6.9- -6.12
4	7	Design of Solid Sawn Wood Beams	5.4-5.5
	8	Design of Glue Laminated (Glulam) Beams	5.7, 6.13 – 6.16
5	9	Pre-engineered Beam Selection	6.20, WebCT Handouts
	10	Columns Subjected to Pure Axial Load	7.1 – 7.9
6	11	Columns Subjected to Pure Axial Load	7.1 – 7.9
	12	**MIDTERM EXAM #1**	
7	13	Introduction to Formwork Design	WebCT Handouts
	14	Materials & Techniques	WebCT Handouts
8	15	Hydrostatic Loads and Pressures	WebCT Handouts
	16	Supported Slab Forms	WebCT Handouts
9	17	Lateral Pressure - Wall Forms	WebCT Handouts
	18	Lateral Pressure – Column Forms	WebCT Handouts
10	19	Bracing Design	WebCT Handouts
	20	Formwork for Slabs	WebCT Handouts
11	21	Formwork for Beams	WebCT Handouts
	22	Shoring and Falsework	WebCT Handouts
12	23	Field Trip: Formwork Project	WebCT Handouts
	24	**MIDTERM EXAM #2**	
13	25	Shearwall Design	Chapter 10
	26	Dewatering	WebCT Handouts
14	27	Timber Fasteners – nails, screws	Chapter 12
	28	Timber Fasteners – bolts	Chapter 13
15	29	Formwork Project – Presentations	
	30	Formwork Project – Testing	

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