Oregon State University  
Department of Wood Science and Engineering  
WSE 458/558 - Wood Design (Winter 2010)

Lecture: Tuesday / Thursday, 10:00 – 11:20 am, Owen 106

Lab: Tuesday, 4 – 6 pm, Owen 103

Instructor: Arijit Sinha, 152 Richardson Hall  
Phone: 737-8475, email: Arijit.sinha@oregonstate.edu

Office Hours: Tuesday 1-2 (Kearney 101A) and Wednesday 9-10 (RH 152)

Textbooks:  
(1) Design of Wood Structures - ASD (Sixth Edition) by Donald E. Breyer,  
Kenneth J. Fridley, David G. Pollock, Jr. and Kelly E. Cobeen

(2) NDS: National Design Specification (NDS) for Wood Construction,  
NDS Supplement: Design Values for Wood Construction, NDS Commentary and Supplements.  AF&PA - AWC

Prerequisites: CE381 and CE382

Grading Policy: The student must pass all grading elements to receive a passing grade.

WSE 458
Exam 20% If NO EXAM
Project 40% Project: 50% (40% grp rpt + 10% ind rpt)
Homework 40% Homework: 50%

WSE 558
Exam 15% If NO EXAM
Project 35% Project: 50% (40% grp rpt + 10% ind rpt)
Homework 40% Homework: 40%
Presentation 10% Presentation 10%

NO EXAM: If total deflection a criterion of the timber bridge is met as per the competition guidelines.  
(http://southwest.msrcd.org/timberbridge/)

Homework Policy: The student must do the homework problems and read the assigned materials in order to learn the material. Homework problems will be assigned each week in lecture and is expected from every student one week later in class. All homework will be done in neat, well-organized, professional manner as follows:
1. Pencil and engineering paper shall be used.
2. All work shall be printed or legibly written.
3. Only one side of the paper shall be used.
4. Problem sets shall be stapled in the upper left-hand corner of the page.
5. Student name, date, and course number shall be shown at the top of first sheet.
6. Page number/total pages shall be placed in the upper right-hand corner of each sheet.
7. Problem number and problem statement shall appear before the solution to the problem.
8. A figure shall be included with the problem statement if appropriate.
9. The problem solution shall be presented in logical, orderly fashion including fundamental equations and brief written statement to explain the solution or procedure.
10. Answers shall be underlined or boxed, must include correct units, and show concern for significant digits.

Late Homework Policy: 10% per day will be deducted of for late submission up to one week. No homework will be collected after that.

Course Description: Study of basic wood properties and design considerations. Design and behavior of wood connectors, beams, columns and beam columns. Introduction to plywood and glue laminated members. Analysis and design of structural diaphragms and shear walls.

Course Objectives: The objective of the course is to provide the student with an understanding of the behavior of wood as a structural material and to develop student's ability to analyze and design a variety of wood structural elements and systems.

Course Learning Objectives:

1) Understand wood as a structural material and be able to determine allowable stress for common types of wood (for common loading conditions) using NDS.

2) Understand the behavior of members in flexure and be able to design beams using NDS.

3) Be able to design columns and beam-columns using NDS.

4) Be able to design diaphragms and shear walls.

5) Understand connection behavior and be able to design basic wood connections.

6) Develop a better understanding of structural engineering as a profession and practical application of wood in buildings and bridges through a group project.

PROJECT: NATIONAL TIMBER BRIDGE DESIGN COMPETITION

The National Timber Bridge Design Competition is the focus of this year’s project. The effort will be led by all the students registered for the class. Available consultants are Dr. Rakesh Gupta (RH 114) and Arijit Sinha.

The overall quality of the project report and presentation will be evaluated. Individual student
grades on the project will be assigned based on input and criteria from the student leaders for the project and a report by each student. The criteria for this individual evaluation should be decided by the student project leaders. The report will include your experiences while working on the project and a brief discussion on *what is the most important thing you learnt while working on the project*?
**Tentative Class Schedule:** This is a tentative schedule for class subject and reading assignments. The schedule is subject to change.

<table>
<thead>
<tr>
<th>Week and Date</th>
<th>Topics</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>administrivia, wood buildings, wood as an engineering material, environmental issues Loads, load combinations</td>
<td>Chapter 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chapter 2 &amp; 3</td>
</tr>
<tr>
<td>Week 2 &amp; 3</td>
<td>wood properties/grades, glulam, panels</td>
<td>Chapters 4, 5 &amp; 8</td>
</tr>
<tr>
<td>Week 4</td>
<td>Beam Design</td>
<td>Chapter 6</td>
</tr>
<tr>
<td>Week 5</td>
<td>Design for Axial Forces</td>
<td>Chapter 7</td>
</tr>
<tr>
<td>Week 6</td>
<td>Design for combined loading</td>
<td>Chapter 7</td>
</tr>
<tr>
<td>Week 7</td>
<td>Horizontal Diaphragms</td>
<td>Chapter 9</td>
</tr>
<tr>
<td>Week 8</td>
<td>Shearwalls</td>
<td>Chapter 10</td>
</tr>
<tr>
<td>Week 9</td>
<td>Connections</td>
<td>Chapter 11</td>
</tr>
<tr>
<td>Week 10</td>
<td>Connections</td>
<td>Chapter 12 &amp; 13</td>
</tr>
</tbody>
</table>

**Note:** Students are responsible for all the assigned reading and should come to class having read the material. The lectures will not cover all of the material needed to do the homework or exams. The lectures will highlights basic concepts and illustrate these with examples. Additional details/information may be needed to perform the required calculations in the course, just as in actual design practice.
WSE558 Requirement:

Students enrolled in WSE558 would be required to select a special topic related to design of wood structures not covered in the course. Students will prepare a brief lecture and teach the material to rest of the class at the end of the term. Submit your lecture notes plus any presentation material (e.g., power point slides, overhead transparencies, etc.) to the instructor.

Submit (by noon on Friday of the week) the following to the instructor as follows:
- Week 1 - Decide on a topic
- Week 3 - Progress Report
- Week 5 - Preliminary Report
- Week 7 - Progress Report
- Week 9 - Preliminary draft of your lecture notes
- Week 10 - Teach (Tuesday, March 9th, 2010, 4PM, 103 Owen) and submit final draft of the lecture plus presentation material to the instructor.

Topics for WSE558

Students can pick a topic from the list given below or can choose a topic of their liking with approval from the instructor.

1. Analyze a wood frame house for flexible and rigid diaphragm
2. Wind load analysis on eves and edges of residential buildings
3. Glulam arches
4. Fire design
5. Shear walls with openings
6. Diaphragm with openings
7. Columns with eccentricity plus side loads
8. Built up / spaced columns
9. Tapered Columns
10. Poles and Piles
11. Biaxial Bending + Compression with eccentricity
12. Connections (Rivets)
13. Other specialized connections
14. Design Structural Insulated Panels
15. Designing for durability
16. Case Studies (from literature)
17. Designing with Wood Composites (I-joist, LVL, LSL, PSL, etc.)
18. Wood as a green building material
19. Other topics