

# Design of Wood Structures – BMATWT 540

## Syllabus: Spring 2005

University of Massachusetts, Amherst  
Department of Natural Resources Conservation  
Building Materials and Wood Technology Program

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**Professor:** Dr. Peggi Clouston, 127 Holdsworth Hall, Tel. 545-1884, [clouston@forwild.umass.edu](mailto:clouston@forwild.umass.edu)

**Credits:** 3

**Prerequisite:** BMATWT 390S, CEE 241 or instructor's consent

**Place & Time:** 105 Holdsworth Hall, Tuesday and Thursday 11:15-12:30

### Course Description and Objectives:

*Design of Wood Structures* provides students with a fundamental understanding of structural engineering wood design principles. Focus is placed on design procedures and their underlying assumptions for wood members in residential, commercial and industrial applications. Students will learn design techniques for individual wood components, including beams, columns, trusses, wood/steel connections, and diaphragms, using both conventional lumber products as well as state-of-the-art engineered wood products.

### Course Components

- **Lectures:** Class will meet for 75 minute sessions on Tuesday and Thursday mornings to introduce and discuss new topics and to go through sample designs.
- **Assignments:** Homework will be assigned approximately every second week. Due dates will be set when homework is assigned. *Assignments must be submitted on time.* Late submittal (without prior Professor approval) will result in a 5% penalty for each day that it is late (including weekends). No assignments will be accepted after homework solutions have been handed out.
- **Exams:** There will be one mid-term exam and one final exam.
- **Quizzes:** There will be four quizzes spread throughout the term.
- **Connection project:** Students will design, build and experimentally test a timber bending connection. Groups will formally present their design and results to the rest of the class. Groups will be randomly assigned and encouraged to work together as teams for all aspects of the project. All members of the same team will receive the same grade.

### Grading and Evaluation

Mid-term exam: 20%

Final exam: 25%

Quizzes – total 4: 20%

Assignments – total 4: 20%

Connection project: 15%

Letter grades will be assigned as follows: A (>92), A- (90.0-91.9), B+ (87.0-89.9), B (83.0-86.9), B- (80.0-82.9), C+ (77.0-79.9), C (73.0-76.9), C- (70.0-72.9), D+ (67.0-69.9), D (60.0-66.9), F < 60

### Required Text

J.J.Stalnakar and E.C. Harris, *Structural Design in Wood*. Kluwer Academic Publishers, Boston, 2<sup>nd</sup> ed., 1997

## General Reference

- D.E.Breyer, *Design of Wood Structures*. New York, McGraw-Hill, Inc., 5<sup>th</sup> ed., 2003
- J.Ambrose and H. Parker, *Simplified Design of Wood Structures*. John Wiley & Sons, Inc., New York, 5<sup>th</sup> ed., 1994
- B.Onouye and K.Kane, *Statics and Strength of Materials for Architecture and Building Construction*. Upper Saddle River, New Jersey, Prentice Hall, 2<sup>nd</sup> ed., 1999
- American Institute of Timber Construction, *Timber Construction Manual*. New York, New York, Wiley & Sons, Inc., 4<sup>th</sup> ed., 1994 • 1997 NDS, *National Design Specification for Wood Construction*, and the *NDS Supplement, Design Values for Wood Construction*, American Forest & Paper Association
- Forest Products Laboratory. 1999. *Wood handbook--Wood as an engineering material*. Madison, WI: U.S. Department of Agriculture, Forest Service, Forest Products Laboratory. 463 p. Available on the web: <http://www.fpl.fs.fed.us/documnts/FPLGTR/fplgtr113/fplgtr113.htm>

## Attendance and Absences

Students are expected to attend and participate in lectures. Unavoidable absences should be discussed directly with the Professor prior to class. Students are responsible for obtaining missed course material and should first attempt to copy another student's notes before contacting the Professor. If you must miss an exam or assignment due to extenuating personal circumstances (per university-accepted reasons), contact the Professor before the event (if possible) to arrange for a solution. Other than for accepted reasons, make-up exams, assignments or projects will *not* be given. Students should arrive to class on time.

## Grievance Procedure

If you have an academic grievance, you may dispute it by submitting a written explanation together with the material in question to the Professor within two weeks of the occurrence of the grievance. If an agreeable solution can not be found, the University Grievance Procedure will be followed (found in the Undergraduate Rights and Responsibilities (at [http://www.umass.edu/dean\\_students/rights/](http://www.umass.edu/dean_students/rights/))).

## Special Needs

All reasonable efforts will be made to meet the individual needs of the student. If you have a learning disability or need special accommodation please make an appointment with the Professor to discuss your needs. All discussions will be kept strictly confidential.

## Academic Honesty

The University Academic Honesty Policy applies. This policy can be found in the Undergraduate Rights and Responsibilities (at [http://www.umass.edu/dean\\_students/rights/](http://www.umass.edu/dean_students/rights/)) and covers plagiarism, cheating, fabrication, and facilitating dishonesty. Original, handwritten assignments are required by each student.

## Classroom Behavior

As per building policy, it is not permitted to consume food in the classroom. Smoking is also prohibited. Students are strongly encouraged to turn all cell-phones or other electronic communications devices off during class time. Any disruptive behavior will be sanctioned appropriately.

## Course Outline

Week 1	<b>(Jan. 27)</b>	General introduction: Wood as an engineering material ( <i>Chapter 1.0</i> )
Week 2		Wood structure and properties; implications on design ( <i>Chapter 2.0</i> ) Lumber products and manufacturing ( <i>Chapter 3.0 and 8.1-8.4</i> )
Week 3	<b>QUIZ 1</b>	Design loads: dead, live, snow ( <i>Sections 4.2 &amp; 4.3</i> ) Design loads: wind, seismic, load combinations ( <i>Sections 4.4 – 4.7</i> ) <b>Assignment # 1 – handout</b>
Week 4		Load tracing: roof and floor systems ( <i>Section 4.1; Onouye &amp; Kane, Chapter 4</i> )
Week 5	<b>QUIZ 2</b>	Design methods: ASD vs. LRFD ( <i>Section 4.8 – 4.12</i> ) WoodWorks® design software: connections <b>Assignment #2 - handout</b>
Week 6		Connections: Z values, nail design ( <i>Sections 5.1-5.3</i> ) Connections: lag screws & bolts ( <i>Sections 5.5-5.7</i> )
Week 7	<b>(Mar.10)</b>	Connection detailing <b>MID-TERM EXAM</b>
Week 8	<b>(Mar.15 &amp; 17)</b>	<b>Spring Recess</b>
Week 9		Beam design: bending, lateral stability ( <i>Sections 6.1-6.3</i> ) Beam design: shear, deflection, bearing ( <i>Sections 6.5-6.10</i> )
Week 10	<b>QUIZ 3</b>	Beam design: Examples and Span tables (lumber, I-joists, PSL, LVL) WoodWorks® design software: joists, beams & columns <b>Assignment #3 – handout</b>
Week 11		Compression members, Column behavior & design ( <i>Sections 7.1, 7.2</i> ) Walls, Beam-columns and eccentricities ( <i>Sections 7.6</i> )
Week 12	<b>QUIZ 4</b>	Tension members, combined bending and tension ( <i>Sections 7.8-7.9</i> ) WoodWorks® design software: concept mode <b>Assignment #4 – handout</b>
Week 13		Plywood, OSB sheathing design ( <i>Sections 11.1-11.8</i> ) <b>Holiday (Patriot's day)</b>
Week 14		Sheathing design Lateral loads and stability ( <i>Section 12.1; Onouye &amp; Kane, Chapter 4</i> )
Week 15		Wood preservatives Connection project: Laboratory testing
Week 16	<b>(May 10)</b>	Class presentations
Week 17	<b>(May 16-May 20)</b>	<b>Final EXAM</b>