Mechanics of Building Materials for Construction – BMATWT 530
Syllabus

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

Professor: Dr. Peggi Clouston, 127 Holdsworth Hall, Tel. 545–1884, clouston@forwild.umass.edu

Credits: 3

Prerequisite: MATH 104 or equivalent

Place & Time: 105 Holdsworth Hall, Lectures: Wed. & Fri. 10:10–11:00, Labs: Mon. 10:10–12:05

Course Description and Objectives
Mechanics of Building Materials for Construction introduces students of Architecture and Construction Technology to the strength–related behavior of building materials. Basic structural concepts, including statics and strength of materials, are addressed in a practical hands–on manner. Practical applications of building materials are highlighted throughout the course through in–class examples and illustrations, homework assignments and tutorial sessions. Specific course objectives include:

- a general introduction to basic principles of mechanics of materials
- calculation of stresses and strains in axial members
- calculation of bending and shear stresses in simple beams
- understanding the concept of stability with slender columns
- calculation of external and internal forces in simple, statically determinate structures

Course Components
- Lectures: Class will meet for a 50 minute session on Wednesday and Friday mornings to introduce and discuss new topics and to go through sample problems.
- Labs: Class will meet for 115 minutes on Monday mornings for a problem solving tutorial. Working in assigned groups, students will solve questions that are similar to the homework questions to be completed the following week.
- Assignments: Homework will be assigned every Monday during the lab. Due dates will be set when homework is assigned, but will generally be the following Monday. 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 two mid–term exams and one final exam. All exams will be closed book but cheat sheets and calculators will be allowed.
Grading and Evaluation
Exam #1: 20%
Exam #2: 20%
Final exam: 25%
Weekly assignments: 30%
Lecture and lab participation: 5%

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
B.Onouye and K.Kane, Statics and Strength of Materials for Architecture and Building Construction.

General Reference
• 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 both lectures and lab sessions. 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/).

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/) 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 off during class time. Any disruptive behavior will be sanctioned appropriately.
Course Outline

Week 1  Introduction to wood mechanics - what it is and why we need to know
    Vector addition and resolution  (2.2)

Week 2  Lab: textbook questions 2.6, 2.7, 2.8, 2.10, 2.12
    Statics: internal/external forces, moment  (2.3)

Week 3  Lab: vector review
    Equilibrium, free-body diagrams  (2.4, 2.5 and 3.2)

Week 4  Lab: textbook questions 2.14, 2.20, 2.28, 2.36, 2.59
    Wood trusses; method of joints  (3.3)
    Method of sections

Week 5  Lab: textbook questions 3.8, 3.16, 3.18, 3.32
    Method of sections
    Pinned Frames  (3.4)

Week 6  Lab: review for exam #1
    EXAM #1

Week 7  Lab: Definition of stress  (5.1)
    Definition of strain
    Stress/strain diagrams, Hooke’s law  (5.2 & 5.3)

Week 8  Lab: textbook questions 5.1, 5.7, handout questions 1 & 2
    Centroids & Moment of Inertia  (6.1 & 6.2)
    Parallel axis theorem  (6.3)

Week 9  Lab: Laboratory demonstration, textbook question 6.1
    Beams: Shear and Bending Moments  (7.2 & 7.3)
    Bending stress  (8.1 & 8.2)

Week 10  Lab: textbook questions 7.2, 7.3, 7.6
    Bending stress (examples)
    Section Modulus

Week 11  Lab: textbook questions 8.1, 8.6, 8.8
    EXAM #2
    Shear stress  (8.3 & 8.4)

Week 12  Lab: CANCELLED (Thursday class followed)
    Shear stress (examples)
    HOLIDAY - Thanksgiving

Week 13  Lab: textbook questions 8.11, 8.15
    Shear flow in built-up beams
    Beam deflection  (8.5)

Week 14  Lab: textbook questions 8.21, Handout question 1
    Columns  (9.1 & 9.2)
    Column design examples

Week 15  Lab: Handout questions on columns

Week 16  Final EXAM

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1 Related textbook chapters and sections – to be reviewed prior to class.