1. Course Number and Name

ENME332L Solid Mechanics and Materials Laboratory

2. Credits and Contact Hours

- 3 credits
- Lecture: 4:00 – 4:50pm Tuesday, Thursday
- Laboratory: 5:00 – 8:00pm, Tuesday, Thursday

3. Instructor

Dr. Neil Rothman, nrothman@umbc.edu
If you email me, please include the course number in the subject line (ENME332L).
Office: ENGR 221
Office Hours: As posted on Blackboard and by appointment

Open Door Policy:

- If my door is open/ajar, I may be meeting with another student, so please knock softly so I know you're there. You may have to wait a few minutes.
- If my door is closed, I'm occupied. Please come back at another time.

Telephone: 410-455-5507 (UMBC campus)
Before you call or email, please check the course Blackboard site for questions on assignments, etc.

4. Teaching Assistants

Farhoud Kabirian farhoud1@umbc.edu
Hector Medina hmedina1@umbc.edu
Office Hours: as posted on Blackboard

5. Textbook

None

6. Course Description

This course is intended to reinforce the concepts learned in ENME110 Statics, ENME220 Mechanics of Materials, and ENME301 Structure and Properties of Engineering Materials through hands-on experiments. Students will learn standard methods for measuring material properties, states of stress and strain, as well as compare analytical predictions to experimentally measured states of stress and strain.

The lectures will cover materials relevant to each day's laboratory. Pre-laboratory assignments will require you to research and review material from previous courses and the laboratory procedure so you are prepared to perform each experiment. Laboratories will require varying degrees of hands-on participation. Data will be shared with the entire section for your lab report, but you will prepare laboratory reports with a partner. Guidelines for the preparation of laboratory reports are posted on Blackboard and will also be discussed in the first class.

7. Specific Course Information

The course will consist of 9 experiments, as follows:

- Lab #1 – Hardness

- Lab #2 – Tensile properties and failure
- Lab #3 – Impact strength
- Lab #4 – Torsion properties and failure
- Lab #5 – Beam bending; elastic deflection
- Lab #6 – Deformation of a cantilever beam
- Lab #7 – Strain measurement in a thin-walled pressure vessel
- Lab #8 – Stress concentration
- Lab #9 – Combined loading

Each laboratory experiment will have an associated pre-laboratory assignment that is due at the beginning of that laboratory period. Pre-laboratories should follow the same general formatting guidelines as laboratory reports, but only need to address the specific questions posed in the assignment. Laboratory reports are usually due 1 week from the date of the laboratory (see course schedule for specific dates). Laboratory reports are completed with a partner and pre-laboratory assignments are done individually.

The semester project will require students to work in teams to address a materials related design problem. Details will be posted on Blackboard. A brief report and final presentation will be given by each team to describe their project.

Prerequisites: ENME110, ENME 220, ENME 301, MATCH152, and PHYS121 (or equivalents)

8. Specific Goals for Course

After completing the course, students will:

- Understand and use the definitions of stress and strain to evaluate the mechanical properties of engineering materials under monotonic loading.
- Understand the uncertainties in the measurement of material properties
- Understand the failure behavior of engineering materials and be capable of selecting a material for a particular application based on its properties environmental conditions.
- Be able to determine the deformations of axial members, torsion members and beams under external loading.
- Understand the use of strain gages and be capable of using experimental strain measurements in a structure to determine the stress state under loading and compare it to theoretical predictions, including understanding sources of error.
- Be capable of presenting scientific information and the results of experiments through a technical report that is understandable to someone trained in Mechanical Engineering.

9. ABET Criteria

(a) Apply knowledge of mathematics, science and engineering: laboratories require students to apply their knowledge of materials science, mechanics of materials, physics, and mathematics to

the loading and deformation of engineering materials to extract material properties and/or predict behavior

(b) Design and conduct experiments, analyze and interpret data: students design and conduct experiments on different materials, interpreting their data to better understand how different materials behave under a variety of loading scenarios and conditions, including how to determine the properties of the materials from these measurements

(e) Identify, formulate, and solve engineering problems: Each laboratory requires students to complete a pre-laboratory assignment that involves identifying the fundamental concepts for the laboratory, understanding what is to be done in the laboratory, use these to predict material or structural behavior, and understand how data collected in the experiment will validate their approach; the semester project requires that they formulate a design solution to a specific engineering problem involving material selection and testing.

(g) Communicate effectively: students prepare written reports for each experiment and give oral presentations on their team projects

(k) Use the techniques, skills, and modern engineering tools necessary for engineering practice: laboratories teach the use of materials testing techniques, materials selection, methods for measuring states of stress and strain, and reinforce the theory that supports application of these tools in professional engineering practice.

10. Policies and Procedures

Work is due on time. Pre-labs are due before lecture on the day they are due. Laboratory reports are due by the start of your laboratory period on the assigned day. Not an hour late or the next day.
Everything Counts: Detailed guidelines for the preparation of laboratory reports are posted on Blackboard. Follow them. Content is most important, but grammar, spelling, format, etc. count in everything you write as a professional engineer so you need to focus on them now!
Mobile Phones: Phones/texting can be a distraction to you, me, and the rest of the class. Please be considerate and put phones away during class.

Safety: Safety is everyone's responsibility. Please obey appropriate safety guidelines. Anyone discovered willfully disregarding safety instructions will be asked to leave the lab and will receive a 0 for that lab.

11. Grading

Laboratory reports – 50%
Pre-lab Assignments – 30%
Project – 10%
Teamwork (peer evaluation) – 5%
Attendance – 5%

Weighted sum ≥ 90 = A
Weighted sum ≥ 80 = B

Weighted sum ≥ 70 = C
Weighted sum ≥ 60 = D
Weighted sum < 60 = F

12. Academic Honesty

By enrolling in ENME332L, each student assumes the responsibilities of an active participant in UMBC's scholarly community, in which everyone's academic work and behavior are held to the highest standards of honesty. Cheating, fabrication, plagiarism, and helping others to commit these acts are all forms of academic dishonesty, and they are wrong. Academic misconduct could result in disciplinary action that may include, but is not limited to, suspension or dismissal.

The full Student Academic Conduct Policy is available in the UMBC Student Handbook, the Faculty Handbook, or the UMBC Policies section of the UMBC Directory.

Students will not be required to sign a confirmation of compliance with these policies, but will be held to this standard in all effort associated with the course.

Failure to comply with the requirements of the Student Academic Conduct Policy may result in failure of ENME332L.

13. Course schedule

The course schedule is posted on Blackboard.

Neil S. Rothman, Ph.D.
July 2014