University of Idaho, College of Engineering
ENGR 350 Mechanics of Materials
Fall Semester, 2014

Objective:

To provide an introduction to the principles and methods of mechanics of materials, and to familiarize the undergraduate student with the techniques for solving a wide range of problems dealing with the determination of stress, strain and displacement fields in mechanically and thermally loaded components.

Class hours: M W F 1:30 pm - 2:20 pm, EP 122

Instructor: Dr. Gabriel Potirniche
324Q Engineering-Physics Building
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Office hours: Mon. 3:00pm-4:30 pm
Tue. 2:00 pm-4:00 pm
Thurs. 2:00 pm- 4:00 pm

Textbook: Mechanics of Materials: An Integrated Learning System, Timothy A. Philpot, 3e Edition, John Wiley & Sons, 2013

Webpage: http://www.webpages.uidaho.edu/~gabrielp/ENGR350/ENGR350.html

Grading:

Homework	25%
Exams (3)	45%
Final Exam (comprehensive)	30%

A: 90-100 B: 80-89 C: 70-79 D: 60-69 F: 0-59

Homework: It will be assigned on weekly basis, and will be collected one week later, unless otherwise specified. No late homework allowed. Late homework will not be graded.

Learning outcomes:

1. **Stress and strain.** Identification and computation of the simple loading cases in design, i.e. tension, compression and shear loading. Students will learn how to compute stresses and strains in given components and structures under various applied loads.
2. **Mechanical properties of materials.** Students will learn how to compute and draw uniaxial stress-strain diagrams. They will also learn the main elastic and plastic constants, as defined from a uniaxial stress-strain diagram, and will learn about the relations between the three main elastic constants. Elastic constants will be used to compute dimensional changes of components subjected to different loads.
3. **Design concepts.** Types of loads and the calculation of safety factors for each loading case will be introduced.
4. **Axially loaded members.** The governing equation for the deformation of bars under uniaxial loading will be clarified. Students will also learn the techniques needed to compute internal forces and stresses in statically determinate and statically inderminate configurations.
5. **Torsion of circular bars.** Learning of the torsion equation for strain will be done be analyzing the geometry of deformation, and the relation between the shear strain and the angle of twist will be clarified. Students will derive the relationship between the external

applied torque and shear strain. Students will also learn the design equations for torsion of shafts with rectangular cross-sections or arbitrary hollow cross-sections.

6. **Shear forces and bending moments in beams.** Students will review their knowledge accumulated in the Statics course on how to compute reaction forces at supports, and draw internal force and moment diagrams for beams with different supports and various applied loading.
7. **Stresses in beams.** Students will learn how to compute internal bending stresses and shear stresses in beams, given shear force and bending moment diagrams.
8. **Deflection in beams.** Students will learn about the moment-curvature relation for a beam and how to calculate deflections in beams using the integration of moment equation method and the method or superposition.
9. **Analysis of stress and strain.** Students will learn about the two dimensional stress state, and stress transformation. Students will also learn how to compute two-dimensional and three-dimensional stress states in various mechanical components given complex applied loading. Generalized equations between stress and strain will be introduced for linear elasticity cases.
10. **Plane stress problems.** Students will learn how to perform stress transformation in two-dimensions using both analytical formulas and a graphical method known as the Mohr's circle. Stresses and strains in thin-walled pressure vessels will be studied.
11. **Combined loadings.** Computation of the stress state under general three-dimensional conditions will be studied, and various failure theories will be applied to estimate the safety of such stress states.
12. **Columns.** Students will learn the main governing equation for the bucking of long slender columns under various types of end-conditions.

Disability Support Services Reasonable Accommodations Statement:

Reasonable accommodations are available for students who have documented temporary or permanent disabilities. All accommodations must be approved through Disability Support Services located in the Idaho Commons Building, Room 306 in order to notify your instructor(s) as soon as possible regarding accommodation(s) needed for the course.

- *885-6307*
- *email at <dss@uidaho.edu>*
- *website at www.uidaho.edu/dss*

University of Idaho Classroom Learning Civility Clause:

In any environment in which people gather to learn, it is essential that all members feel as free and safe as possible in their participation. To this end, it is expected that everyone in this course will be treated with mutual respect and civility, with an understanding that all of us (students, instructors, professors, guests, and teaching assistants) will be respectful and civil to one another in discussion, in action, in teaching, and in learning.

Should you feel our classroom interactions do not reflect an environment of civility and respect, you are encouraged to meet with your instructor during office hours to discuss your concern. Additional resources for expression of concern or requesting support include the Dean of Students office and staff (5-6757), the UI Counseling & Testing Center's confidential services (5-6716), or the UI Office of Human Rights, Access, & Inclusion (5-4285).

University of Idaho Student Code of Conduct, Article II, Section 1:

Cheating on classroom or outside assignments, examinations, or tests is a violation of this code. Plagiarism, falsification of academic records, and the acquisition or use of test materials without faculty authorization are considered forms of academic dishonesty and, as such, are violations of this code. Because academic honesty and integrity are core values at a university, the faculty finds that even one incident of academic dishonesty seriously and critically endangers the essential operation of the university and may merit expulsion.