

Tennessee Technological University
Department of Civil & Environmental Engineering
CEE 3110 – Mechanics of Materials
Required
Fall Semester 2007, Spring Semester 2008

- 2007 Catalog Data: CEE 3110. Mechanics of Materials. Lecture 3. Credit 3. Stress; strain; Hooke's law, extension, torsion and bending; beam deflections, column buckling and combined stresses. Prerequisite: CEE 2110.
- Textbook: James M. Gere, *Mechanics of Materials*, Brooks/Cole, Thompson Learning, Sixth Edition, 2004.
- Reference: Russell C. Hibbeler, *Mechanics of Materials*, Third edition, Prentice-Hall Publishing Co., 1997
- Coordinator: G.R. Buchanan, Professor of Civil Engineering
- Goal: The goal of CEE 3110 "Mechanics of Materials" is to introduce the student to the behavior of deformable bodies subjected to forces, moments, and thermal change.

Course learning objectives:

1. The student is to analyze and solve problems in static equilibrium.
2. The student is to develop fundamental principles of mathematics and engineering mechanics to understand and solve problems related to internal stresses, strains, and deformations of objects.
3. The student is to be introduced to statically indeterminate structures and fundamental column behavior.

Course measurable outcomes:

Students will be expected to:

1. calculate normal and shearing stresses on specified planes of members subjected to axial loads;
2. calculate strains and deformations of members subjected to axial loads as well as to relate stresses to strains;
3. calculate torsional shearing stresses and deformations of circular shafts subjected to torques;
4. calculate bending stresses for a variety of beam cross sections and loading cases;
5. understand and calculate beam transverse shearing stresses for any location in the beam cross section;
6. combine diverse load cases and corresponding stresses to calculate maximum stress conditions;
7. solve the basic differential equation governing beam behavior and compute elementary statically indeterminate beam reactions; and
8. apply Euler's Equation to calculate column load capacity.

Topics covered: (Three lecture classes per week, 55 minutes each)

1. Axial stress and strain of tension members (4 classes)
2. Material properties (1 class)
3. Analysis and design of circular and hollow circular shafts (3 classes)
4. Shear stress and bending stress for beams (7 classes)
5. Combined stresses (4 classes)
6. Analysis and design of pressure vessels (1 class)
7. Stress transformation (3 classes)
8. Deflection of beams (6 classes)
9. Statically indeterminate structures (7 classes)
10. Analysis and design of columns (3 classes)
11. Tests (3 classes)

Contribution of the course to meeting professional component:

This course is a part of the engineering topics of the curriculum.

ABET category content as estimated by faculty member who prepared this course description:

Engineering Science: 2.5 credits or 83%

Engineering Design: 0.5 credits or 17%

Relation of course to program outcomes:

- Outcome 1: The graduates will have a broad understanding of the relevant principles of mathematics, science, and engineering.
- Outcome 2: The graduates will have a general comprehension of four technical areas appropriate to civil engineering.
- Outcome 4: The graduates will be capable of design activities and have the ability to identify, formulate, and solve engineering problems.
- Outcome 8: The graduates will have the ability to use techniques, skills, and modern engineering tools needed for engineering practice.

Relation of course to ABET Criteria:

<u>General Criteria</u>	Bloom's Level of Achievement
(3a) Knowledge of math, science, engineering	3
(3e) Identify, formulate and solve engineering problems	3
(3k) Techniques, skills, modern tools for engineering practice	3

Program Criteria

	Bloom's Level of Achievement
1. Apply knowledge of math and sciences	3
2. Apply knowledge of four technical areas appropriate to civil engineering	3

Computer usage:

1. Computer usage is not emphasized in this class.

Laboratory projects: None

Prepared by: G.R. Buchanan

Date: October 2007