

Tennessee Technological University
Department of Civil & Environmental Engineering
CEE 3120 – Mechanics of Materials Laboratory
(CEE 3120 lab or CEE 3040 lab is Required)
Fall Semester 2007, Spring Semester 2008

2007 Catalog Data: CEE 3120. Mechanics of Materials Laboratory. Lab 2. Credit 1. A series of experiments which demonstrates the theory of mechanics of materials and the most important characteristics of engineering materials. Prerequisite: CEE 3110.

Textbook: Laboratory Manual prepared by Department.

Reference: None

Coordinator: G. Ramirez, Associate Professor of Civil Engineering

Goal: The goal of CEE 3120 “Mechanics of Materials Laboratory” is to reinforce and extend the student’s understanding of the mechanical behavior of a variety of materials under different types of loading and to get hands-on experience in materials testing.

Course learning objectives:

1. The student will become acquainted with the behavior of various materials under different types of loading and will be able to compare experimental and theoretical behaviors.
2. The student will learn different test procedures to measure certain material properties needed in design.
3. The student will gain experience in writing lab reports to communicate and describe the results of testing.

Course measurable outcomes:

Students will be expected to:

1. identify the types of loads on materials and the failure pattern that is likely to result from such a load;
2. become familiar with both the procedures and equipment required for measuring the mechanical properties of materials;
3. describe the stress-strain behavior of materials in tension;
4. describe the load-deflection behavior of both short and long columns under compressive loading;
5. describe the stress-strain behavior ductile materials in torsion;
6. measure and calculate deflection and stress in a simply supported beam subjected to transverse loads;
7. measure and calculate deflection in an indeterminate beam subjected to transverse loads;
8. determine the stress distribution and the stress concentration factor near a hole for a flat plate in tension;
9. predict the fatigue life of a material by plotting stress vs. cycles of load; and
10. prepare clear engineering reports consisting of drawings and graphs coupled with written procedures, results, and conclusions.

Topics covered: (One lab per week, 2 hours each)

1. Introduction and Lab Safety (2 classes)
2. Tensile stress-strain behavior (2 classes). Report required
3. Compressive stress-strain behavior of short columns (1 class). Report required
4. Brittle and ductile torsional behavior (1 class). Report required
5. Flexural stress in simply-supported beams (1 class). Report required
6. Buckling of long columns (1 class). Report required
7. Beam deflections (1 class). Report required
8. Stress concentrations (1 class). Report required
9. Impact, hardness (1 class). Report required
10. Fatigue (1 class). Homework
11. Test (1 class)

Contribution of the course to meeting professional component:

This course is a part of the engineering topics of the curriculum, and it is 100% laboratory.

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

Engineering Science: 1.0 credit or 100%
Engineering Design: 0 credits or 0%

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 5: The graduates will have effective communication skills.
Outcome 7: The graduates will have an understanding of experimental processes.
Outcome 11: The graduates will have an understanding of the importance of fundamental and applied research in the advancement of engineering knowledge.

Relation of course to ABET Criteria:

<u>General Criteria</u>	Bloom's Level of Achievement
(3a) Knowledge of math, science, engineering	3
(3b) Design, conduct experiments; analyze and interpret data	4
(3g) Effective communication	4
(3k) Techniques, skills, modern tools for engineering practice	3

Program Criteria

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|---|---|
| 1. Apply knowledge of math and sciences | 3 |
| 2. Conduct civil engineering experiments and analyze and interpret the resulting data | 4 |

Computer usage:

- Demonstration fatigue test using computer-controlled servo-hydraulic test machines.
- Use of computer for typing reports and preparing graphs required in all reports.
- Use computer to compute deflections of statically indeterminate beam in experiment 6.

Laboratory projects:

- Laboratory reports are required as described under Topics Covered.

Prepared by: G. Ramirez

Date: October 2007