ENG ME 305 Mechanics of Materials

2008 - 2009 Catalog Data:
ENG ME 305 Mechanics of Materials Prereq: ENG EK 301. Introduction to stress and strain. Axial and shear loading. Torsion of shafts and thin-walled tubes. Bending of beams. Virtual work. Combined loadings. Stress and strain transformations. Column buckling. Includes lab and design project. 4 cr.

Class/Lab Schedule: 4 lecture hour per week, Four 2 hour labs per semester

Status in the Curriculum: Required

Textbook(s) and/or Other Required Material:
J.M. Gere, Mechanics of Materials, 7th edition, Brooks &Cole, 2009

Coordinator: Elise Morgan, Assistant Professor, Mechanical Engineering

Prerequisites by Topic:
1. Basic calculus and differential equations
2. Fundamentals of statics (equilibrium, FBD, moments, vector treatment of rigid bodies)

Goals:
This course introduces junior-level engineering students to the concepts of stress and strain with applications to design and analysis of structures. The goals include:
1. Development of problem solving ability with respect to modeling and analysis of simple structure subject to axial, torsional, and bending loads. This includes a clear understanding of the assumptions and methods, as well as the development of some physical intuition of realistic outcomes
2. Hands-on experience with testing and familiarity with standard test methods for the mechanical properties of a range of materials.

Course Learning Outcomes:
As an outcome of completing this course, students will:

i. Understand the concepts of stress and strain. The students are taught linearized strain measures, Cauchy stress, principal directions, maximum stress and strain, and material failure theories. (A, E)

ii. Learn material behaviors of classical engineering materials. Tension and other classical tests of metals and other materials. (A, E)

iii. Be able to solve problems involving simple stress analysis. Lectures, homework and in-class quizzes and/or examinations give students practice in problem solving. (E)

iv. Be able to carry out a long-term design project. (C, G, N)

v. The design project requires the use of a computer program to determine the mechanical behavior of a flexible structure. (E, I, K, L)

vi. Learn to conduct and interpret experiments in solid mechanics. Students perform several labs throughout the semester. These require lab reports and "pre-lab" assignments, which discuss the phenomena of interest and the design of the experiment. (B, E, G, N)

Course Learning Outcomes mapped to Program Outcomes:
(For Program Outcomes, please see attached page or Department Web Site)

Program:	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Course:	i, ii	vi	iv	-	i-iii, v, vi		iv, vi	i, ii	v	-	v, vi	iii, v	-	i, ii, iii, iv
Emphasis:	5	3	3	1	5	1	3	2	2	1	3	3	1	3

Topics (time spent in weeks):
1. Introduction to stress, strain, and material behavior (1.5)
2. Axial loads (1.5)
3. Torsion (1.5)
4. Shear and bending stresses in beams (2)
5. Beam deflection (1)
6. Buckling of columns (1)
7. 2 + 3-D states of stress. Mohr's circle, principal stresses, failure theories (3.5)
8. Review and tests (1.5)

Contribution of Course to Meeting the Professional Component:
Engineering Topics: 100%

Status of Continuous Improvement Review of this Course:
Date: May 8, 2008 **Reviewed by**: Structures-Dynamics Committee
Prepared by: Elise Morgan **Date**: February 5, 2009