

Mechanical Engineering and Mechanics

MEM 230 Mechanics of Materials I

Fall, 2006-2007

Designation: Required

Catalog Description: MEM 230: Covers definitions of stress and strain, uniaxial loading, torsion, bending moments and shear forces in beams, bending stresses and shear stress in beams, and stress transformation.

Prerequisites: Statics MEM 202

Textbook and other required material:

Required: Mechanics of Materials, James M. Gere, 6th edition, Brooks/Cole, ISBN 0-534-41793-0

Course Objectives:

1. Draw Free Body Diagrams including applied forces, reaction forces, and internal forces.
2. Determine the forces, stresses, and strains in structural components subjected to tension, compression, torsion, and bending.
3. Determine stresses acting on any arbitrary plane and determine the principal stresses and angles.
4. Determine internal loading of structures that are subjected to mechanical and thermal loads.
5. Determine the shear-moment diagram of a beam and find the maximum moment/shear and their locations.
6. Determine the stresses and deformation of a torsional bar.
7. Determine the stresses and deformation of a bar due to axial loading.
8. Determine the dimensions of beam cross sections to support a variety of loading configurations.

Topics:

1. Stress and strain, material behavior, and design concepts.
2. Stresses and deformation of axially loaded members.
3. Stresses and deformation of bars under torsion.
4. Shear and moment equations and diagrams.
5. Bending stresses in beams.
6. Shearing stresses in beams.
7. Combined stresses – axial, shear, torsion, and bending.
8. Stress and strain transformation.

Class Schedule: 3 hours / week lecture (3 credits); 1 hour of recitation / week (1 credit)

Contribution to Professional Component:

Contributes toward 1 ½ year of engineering topics appropriate to developing the ability to work in the mechanics of materials area. Prepares students for advanced classes in mechanics of materials.

Relationship to Program Outcomes:

Outcomes a - k	Content	Explanation	Evidence
a. An ability to apply knowledge of mathematics, science and engineering	2	This course requires the students to develop a general understanding of mechanics of materials. The students learn how to apply and synthesize their knowledge of mathematics, science, and engineering.	Homework, quizzes, exams, and lecture notes.
b. An ability to design and conduct experiments as well as to analyze and interpret data	0	NA	NA
c. An ability to design a system, component or process to meet desired needs	2	All of the problems assigned in this course involve either the analysis of given structures under certain loading conditions or the design of new structures and machine parts to fulfill given loading characteristics.	Homework problems, exams, and lectures.
d. An ability to function on multidisciplinary teams	0	NA	NA
e. An ability to identify, formulate and solve engineering problems	2	Design problems train the students to formulate and solve engineering problems.	Homework problems, exams, and lectures.
f. An understanding of professional and ethical responsibility	0	This is emphasized as part of the engineer's overall responsibility.	'Conversations' with students during lecture.
g. An ability to communicate effectively	0	All homework assignments are submitted in writing.	Homework problems.
h. The broad education necessary to understand the impact of engineering solutions in a global/societal context	1	The impact of the topics addressed by this course (related to mechanics and structures) are conveyed during the lectures.	'Conversations' with students during lecture time on a variety of societal needs.
i. A recognition of the need for and an ability to engage in lifelong learning	1	The appropriate learning process, critical thinking, analytical thinking, and the requirement for continuous learning is repeatedly stressed by the instructor.	'Conversations' with students during lecture time on the approach and process in solving engineering problems.
j. A knowledge of contemporary issues	0	NA	
k. An ability to use the techniques, skills and modern engineering tools necessary for engineering practice	0	NA	

Prepared by: Dr. Franco M. Capaldi, 15 November 2006