Mechanical Engineering and Mechanics

MEM 202 Engineering Mechanics - Statics

Fall 2006/07

Designation: Required

Catalog Description: Covers intermediate static mechanics, an extension of the fundamental concepts and methods of static mechanics introduced in the freshmen course tDEC 111, and tDEC 113. Includes topics such as problem formulation and solution methods; two- and three-dimensional vector representation of forces, moments and couples; static equilibrium of particles, rigid bodies, and engineering structures; analysis of external and internal forces in structures via the methods of free-body diagrams; and properties of cross-sectional areas.

Prerequisites: Sophomore standing; tDEC 111, tDEC 113

Textbook(s) and other required material:
       Required: **"Engineering Mechanics - Statics"**, by William F. Riley and Leroy D. Sturges. Second Edition, John Wiley and Sons, Inc., ISBN 0-471-05333-3

Course Objectives:
1. Analyzed and calculate the resultants of system of forces and moments acting on a body (in 2-dimensions and 3-dimensions);
2. Find the equivalent force and moment of a system of forces and couples acting on a body;
3. Calculate the centroids of lines, areas, and volumes, and determine the statically equivalent resultant force and its location of distributed loads of any function (in 2-dimensions and 3-dimensions);
4. Calculate the forces acting on members of trusses and frames in 2-dimensions and 3-dimensions using the methods of joints and sections;
5. Ability to distinguish between internal and external forces and drawing a complete free-body diagrams.

Topics:
1. Resultant of Concurrent Forces, Resolution of Forces into Components, Rectangular Components of Forces and Their Resultant Force;
2. Free Body Diagrams, Equilibrium of a Particle In Two and Three Dimensions;
3. Moments and their Vectorial Representation in Two and Three Dimensions, Couples and Resolution of a Force to a Force and a Couple, General Force and Moment Systems;
4. Center of Gravity and Center of Mass; Centroids of Lines, Areas, and Volumes, Distributed Loads on Beams;
5. Free Body Diagrams, Equilibrium of a Rigid Bodies in Two and Three Dimensions'
6. Plane Trusses, Method of Joints, and Zero-Force Members, Plane Trusses, Method of Sections, Space Trusses, Frames and Machines

Class Schedule: 2 hours/week lecture (2 credits); 2 hours of recitation/ week (1credit)

Contribution to Professional Component:
       Contributes toward the three-year of engineering topics related to structural analysis

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 an understanding of problem formulation and solution methods for two- and three-dimensional vector representation of forces, moments and couples of static structures	Homework, Weekly Class Assignments, and formal Exams
b. An ability to design and conduct experiments as well as to analyze and interpret data	0	Not Applicable	Not Applicable
c. An ability to design a system, component or process to meet desired needs	0	Not Applicable	Not Applicable
d. An ability to function on multidisciplinary teams	0	Not Applicable	Not Applicable
e. An ability to identify, formulate and solve engineering problems	2	The problems require students to identify, formulate and solve problems in structural analysis.	Homework, weekly class assignments, and formal exams.
f. An understanding of professional and ethical responsibility	0	Not Applicable	Not Applicable
g. An ability to communicate effectively	0	Not Applicable	Not Applicable
h. The broad education necessary to understand the impact of engineering solutions in a global/societal context	0	Not Applicable	Not Applicable
i. A recognition of the need for and an ability to engage in lifelong learning	0	Not Applicable	Not Applicable
j. A knowledge of contemporary issues	0	Not Applicable	Not Applicable
k. An ability to use the techniques, skills and modern engineering tools necessary for engineering practice	1	Limited use of spreadsheet programs are used	Homework

Prepared by: Dr. Jonathan Awerbuch, 15 November 2006