

MAE 130A / SE 101A Mechanics I: Statics

Designation: Required course for ME, AE, and SE

Catalog Description:

MAE 130A/SE 101A: Mechanics I: Statics (4)

Statics of particles and rigid bodies in two and three dimensions; free body diagrams; internal forces; static analysis of trusses, frames, and machines; shear force and bending moment diagrams in beams; equilibrium problems with friction.

Prerequisites:

Grades of C- or better in Math 20C and Phys 2A.

Textbooks, Required Materials:

F.P. Beer and E.R. Johnston, Vector Mechanics for Engineers: Statics, 8th ed., McGraw-Hill (2007),

J.L. Meriam and L.G. Kraige, Engineering Mechanics: Statics, 5th ed., John Wiley & Sons (2003),

or equivalent.

Prerequisites by Topic:

Basic trigonometry, vectors (dot and cross products), linear algebra (solving system of linear algebraic equations), basic Newtonian physics.

Class/Laboratory Schedule: 4 lecture hours per week.

Course Topics:

1. Statics of particles
2. Moment of a force, couples, equivalent systems of forces
3. Equilibrium of rigid bodies in 2D and 3D
4. Distributed forces, centroids, and centers of gravity
5. Static analysis of trusses, frames, and machines
6. Internal forces in beams, shear force and bending moment diagrams
7. Equilibrium problems with friction

Course Objectives:

(Numbers in parenthesis refer to ME and AE Program Outcomes)

Objective 1: To teach students the formulation of equilibrium equations for planar and spatial rigid bodies (1a,5e).

Objective 2: To teach students the process of modeling external forces, drawing free-body diagrams, and evaluating internal forces (1a,5e).

Objective 3: To teach students how to solve equilibrium problems with friction (1a,5e).

Methods of Evaluation:

1. Homework will be regularly assigned, collected, and graded.
2. Midterms and Final exam.

Performance Criteria:

(Numbers in parentheses refer to the methods of evaluation used to assess student performance)

Objective 1

1.1 Students will learn to formulate and solve equilibrium equations for particles and rigid bodies (1, 2).

Objective 2

2.1 Students will learn to construct free-body diagrams, and to compute internal forces in statically determinate trusses, frames, and machines (1, 2).

2.2 Students will learn to construct the moment-shear diagrams for beams, and to identify critical sections subjected to maximum internal forces (1, 2).

Objective 3

3.1 Students will learn how to solve and analyze equilibrium problems with friction (1, 2).

Contribution of Course to Professional Component:

Fundamental course of engineering science for mechanical, aerospace, and structural engineers.

Syllabus Prepared By: H. Murakami, March 2000

Revised: V. Lubarda, via Teaching Work Group, April 2008