

Civil Engineering 201: Statics

Course Description: 3 cr. U. Principles of mechanics force systems, equilibrium structures, distributed forces, centroids and friction. Prereq: Math 232(P)

Textbook: Beer and Johnston, *Vector Mechanics For Engineers, Statics*, Sixth Edition, 1997

Prerequisites by Topics:

- Solving simultaneous linear and quadratic equations
- Trigonometry and analytic geometry
- Differentiation and integration of single variable polynomials

Course Objectives:

Broad Objectives

- To develop the thought process and discipline of the students to enable them to systematically solve problems regardless of difficulty.
- Students should be able to develop confidence and competence in solving Statics problems.

Learning Outcomes

- Students gain knowledge of Vector Mechanics, representation of physical quantities by a vector notation. Grasp the meaning of magnitude and direction of a vector; understand the definition of a unit vector. Master the mechanics of Vector Algebra.
- Students are able to understand the physical meaning of a force and a moment equilibrium. Master the balance of forces and moments to ensure equilibrium for 2D and 3D structures.
- Students acquire the skill to draw a correct and complete Free Body Diagram of forces and moments for a structure.
- Students learn the method of joints and the method of sections for the analysis of trusses. They also should be able to identify the zero-force members of a truss by inspection.
- Students are able to understand the concept of friction on surfaces and calculate friction forces, and be able to draw the proper FBD showing friction forces. Understand the difference between static and dynamic friction.
- Students understand the internal forces in structures, and learn how to draw shear and moment diagrams for beams.
- Students learn how to calculate the Centroid and the Moment of Inertia of lines, areas, and composite objects.

Topics Covered:

- Statics of Particles
- Rigid Bodies; Equivalent Systems of Forces
- Equilibrium of Rigid Bodies
- Distributed Forces; Centroids and Centers of Gravity
- Analysis of Structures
- Introduction in Beams and Cables
- Friction
- Distributed Forces; Moments of Inertia

Class/Laboratory Schedule: Three 50-minute lectures per week.

Contribution of Course to Meeting the Professional Component:

This course will lay the foundation of Newtonian mechanics for students to attain the basic fundamental engineering science that serves as the building blocks for further courses in analysis and design and contribute to the success of students as practicing engineers after graduation.

Relationship to Program Objectives:

- 1b This course utilizes the equations of mechanics to be applied to the general engineering sciences, including solid, fluid mechanics, and materials.
- 1d This course teaches students the mechanism of problem solving by identifying the given information, drawing the free body diagrams, formulating the assumptions, choosing the proper equations and performing the solutions.
- 2f This is the first engineering course that teaches students the basic Newtonian mechanics that are used in subsequent analysis and design courses throughout the engineering program and later as practicing engineers.

Prepared By: Adeeb Rahman, September 10, 2001

Methods of Assessment:

- Course evaluation by students
- Prerequisite Exams
- Instructional judgment
- FE exam
- IAC Review

Resources Commonly Available:

- Instructor
- Teaching Assistant, 1/3 appointment
- Tutorial help provided by the College of Engineering
- Interactive multimedia solutions of problems

Desirable Student Competencies:

- Ability to visualize 3D solids and 2D plane projections
- Knowledge of the Windows operating system
- Ability to prepare homework assignments
- Knowledge of units (SI, U.S.)