ENGR 0130 - STATICS

Catalog Description

Formerly known as ENGR 35
Prerequisite: Completion of PHYS 205, PHYS 205L, and MATH 31 with grades of "C" or better
Advisory: Completion of ENGR 151 with grade of "C" or better
Hours: 54 lecture
Description: A first course in engineering mechanics: properties of forces, moments, couples and resultants; two- and three-dimensional force systems acting on engineering structures in equilibrium; analysis of trusses, and beams; distributed forces, shear and bending moment diagrams, center of gravity, centroids, friction, and area and mass moments of inertia. Optional additional topics include fluid statics, cables, Mohr's circle and virtual work. (C-ID ENGR 130) (CSU, UC)

Course Student Learning Outcomes

- CSLO #1: Write and relate the concepts of engineering mechanics to model, analyze, and solve force and body systems that are in both 2D and 3D equilibrium.
- CSLO #2: Create a model and mathematically analyze free body diagrams.
- CSLO #3: Analyze and solve geometric bodies for their centroid by the methods of calculus and the methods of composite bodies.
- CSLO #4: Analyze and solve geometric bodies for their moment of inertia by the methods of calculus and the methods of composite bodies.

Effective Term

Fall 2022

Course Type

Credit - Degree-applicable

Contact Hours

54

Outside of Class Hours

108

Total Student Learning Hours

162

Course Objectives

1. Describe the basic principles of engineering mechanics.
2. Solve problems using the fundamental properties of force systems in equilibrium using vectors.
3. Draw complete free-body diagrams of whole and/or partial mechanisms in 2D and 3D.
4. Apply equations of equilibrium, Sum of Forces = 0, Sum of Moments = 0, to 2D and 3D systems.
5. Apply principles of equilibrium in the analysis of structures, both frames to support loads and machines to transmit loads.
6. Apply the friction law for dry surfaces to both flat surfaces and flat belts and determine if motion is impending.
7. Locate centroids of simple and composite bodies, using calculus and center of gravity/centroid methods.
8. Determine the moment of inertia of simple and composite bodies.
9. Determine the reasonableness (in terms of units, magnitude, direction) of solutions to problems.
10. Determine the internal forces in the members of a truss or frame.
11. Use appropriate written and oral communication skills to display knowledge of Engineering material.

General Education Information

- Approved College Associate Degree GE Applicability
- CSU GE Applicability (Recommended-requires CSU approval)
- Cal-GETC Applicability (Recommended - Requires External Approval)
- IGETC Applicability (Recommended-requires CSU/UC approval)

Articulation Information

- CSU Transferable
- UC Transferable

Methods of Evaluation

- Problem Solving Examinations
  - Example: Exams are given to evaluate the engineering concepts in the Student Learning Outcomes. These are graded to determine the proficiency gained regarding the presented material. Examples would be: 1. Given a diagram of a 3D system, determine the unknown forces on the cables or springs to maintain a known mass in equilibrium. 2. Given a distributed load on a member, determine the reaction forces of the restraints, draw the shear and moment diagrams for the member. 3. Given a diagram of a wrench, draw the free body diagram for each member of the wrench, determine the internal forces on each connection and the external force exerted on a nut. Homework sets are collected and graded to determine the students ability to perform a solution and communicate the correctness of that solution to the reader. Examples: 1. Set up and solve the necessary system of equations for unknown forces in 2D and 3D systems in static equilibrium. 2. Determine an equivalent resultant force and resultant moment for a given set of loads on a 2D or 3D body. 3. Given the loading on a beam (several forces and moments), draw the correct shear and moment diagrams.

Repeatable

No

Methods of Instruction

- Lecture/Discussion
- Distance Learning

Lecture:

1. Instructor demonstrates how to draw and then analyze 2- and 3-dimensional force-body equilibrium problems; including appropriate solution development of a free body diagram. Students will then solve 2- and 3-dimensional force-body equilibrium problems.

Distance Learning

1. Instructor illustrates via live/recorded video and posts an online discussion on the concept of moment, where it appears in the engineering discipline and its uses. Students will use this topic

and apply to force-body problems and use to solve for unknowns (typically either forces or lever arms).

Typical Out of Class Assignments
Reading Assignments

1. Read through the theory and examples regarding the solution of problems to find forces in cables while suspending bodies in equilibrium. 2. Read the textbook explanation regarding the importance of the three internal loads of a member; shear force, bending moment and normal force. 3. Read through chapter 10 in the text; the theory and procedure for determining the moment of inertia by integration.

Writing, Problem Solving or Performance

1. Complete a homework problem set from the textbook on the principles of bodies subject to forces that are in equilibrium. Create a free body diagram to declare and analyze the system (this is the model). Perform mathematical analysis to accompany the model created above and solve the system. 2. Given a body with several known forces and two unknown forces, create and use a vector diagram to solve for the unknown forces.

Other (Term projects, research papers, portfolios, etc.)
Required Materials

- Engineering Mechanics - Statics
  - Author: Russell Hibbeler
  - Publisher: Prentice Hall
  - Publication Date: 2016
  - Text Edition: 14th
  - Classic Textbook?:
  - OER Link:
  - OER:

Other materials and-or supplies required of students that contribute to the cost of the course.

Calculator, ruler, notebook