ENGR 35: STATICS

Foothill College Course Outline of Record

Heading	Value
Units:	5
Hours:	5 lecture per week (60 total per quarter)
Prerequisite:	MATH 1B or 1BH; PHYS 4A.
Degree & Credit Status:	Degree-Applicable Credit Course
Foothill GE:	Non-GE
Transferable:	CSU/UC
Grade Type:	Letter Grade (Request for Pass/No Pass)
Repeatability:	Not Repeatable

Student Learning Outcomes

- The student will be able to analyze the forces, centroid and moments of inertia on structures, such as:- Trusses- Frames- Beams- Cables
- The student be able to determine the equilibrium of particles and rigid bodies in two and three dimensions

Description

Principles of statics as applied to particles and rigid bodies in two and three dimensions under concentrated and distributed force systems. Equilibrium conditions in structures, machines, beams and cables. Determination of centroids and moments of inertia. Dry friction and methods of virtual work.

Course Objectives

The student will be able to:
A. Solve systems acting on particles and rigid bodies for resultant and component forces
B. Solve for unknown forces in two and three dimensions in equilibrium conditions
C. Analyze situations which include distributed forces and moments of inertia
D. Analyze trusses, frames, beams, and cables for unknown forces
E. Analyze situations including friction as a consideration
F. Analyze virtual work using the potential energy equation

Course Content

A. Force systems acting on particles and on rigid bodies
1. Forces in a plane
a. Vectors
b. Resultant vectors
c. Resolution into components
2. Forces in space
a. Addition
b. Components
B. Equilibrium of particles and rigid bodies in two and three dimensions
1. External and internal forces
2. Vector product
3. Moment of a force about a point
4. Scalar product
5. Moment of a force about an axis
6. Moment of a couple
7. Addition of couples
8. Reduction of a system to one force and one couple
9. Equivalent systems
10. Equilibrium of a rigid body in two and three dimensions
11. Equilibrium of a two-force body
12. Equilibrium of a three-force body
13. Reactions at supports and connections
C. Distributed forces
1. Center of gravity of a two-dimensional body
2. Centroids of areas and lines
3. Determination of centroids by integration
4. Distributed loads on beams
5. Center of gravity of a three-dimensional body
6. Determination of centroids by integration
7. Moments of inertia of areas
8. Moments of inertia of a mass
D. Analysis of structures
1. Trusses
a. Simple trusses
b. Analysis by method of joints
c. Analysis by method of sections
2. Frames
a. Analysis of a frame
b. Machines
3. Beams
a. Types of loading
b. Shear and bending moment in a beam
c. Shear and bending moment diagrams
4. Cables
a. Cables with concentrated loads
b. Cables with distributed loads
E. Friction
1. Dry friction and coefficient of friction
2. Angles of friction
3. Wedges
F. Virtual work and stability of equilibrium
1. Principle of virtual work
2. Real machines
3. Potential energy
4. Stability of equilibrium

Lab Content

Not applicable.

Special Facilities and/or Equipment

A. Scientific calculator
B. Overhead projector
C. When taught online, on-going access to computer with email software and hardware; email address

Method(s) of Evaluation

A. Homework assignments, such as problem sets and projects
B. Might include unannounced short quizzes
C. Two or more examinations during the quarter
D. Comprehensive final examination

Method(s) of Instruction

Lecture, discussion, group work.

Representative Text(s) and Other Materials

Beer, Johnson, and Mazurek. Vector Mechanics for Engineers, Statics. 12th ed. McGraw Hill, 2018.

Types and/or Examples of Required Reading, Writing, and Outside of Class Assignments

A. Homework assignments: Problem sets require application of concepts and equations from class.

B. Text: Careful reading and rereading of the text and lecture notes. Approximately 60 pages of reading per week.

Discipline(s)

Engineering