

# ENGR 35: STATICS

## Foothill College Course Outline of Record

Heading	Value
Effective Term:	Spring 2025
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:

1. Solve systems acting on particles and rigid bodies for resultant and component forces
2. Solve for unknown forces in two and three dimensions in equilibrium conditions
3. Analyze situations which include distributed forces and moments of inertia
4. Analyze trusses, frames, beams, and cables for unknown forces
5. Analyze situations including friction as a consideration
6. Analyze virtual work using the potential energy equation

## Course Content

1. Force systems acting on particles and on rigid bodies
  - a. Forces in a plane
    - i. Vectors
    - ii. Resultant vectors
    - iii. Resolution into components
  - b. Forces in space
    - i. Addition
    - ii. Components
2. Equilibrium of particles and rigid bodies in two and three dimensions
  - a. External and internal forces
  - b. Vector product

- c. Moment of a force about a point
  - d. Scalar product
  - e. Moment of a force about an axis
  - f. Moment of a couple
  - g. Addition of couples
  - h. Reduction of a system to one force and one couple
    - i. Equivalent systems
    - j. Equilibrium of a rigid body in two and three dimensions
    - k. Equilibrium of a two-force body
      - l. Equilibrium of a three-force body
  - m. Reactions at supports and connections
3. Distributed forces
    - a. Center of gravity of a two-dimensional body
    - b. Centroids of areas and lines
    - c. Determination of centroids by integration
    - d. Distributed loads on beams
    - e. Center of gravity of a three-dimensional body
    - f. Determination of centroids by integration
    - g. Moments of inertia of areas
    - h. Moments of inertia of a mass
  4. Analysis of structures
    - a. Trusses
      - i. Simple trusses
      - ii. Analysis by method of joints
      - iii. Analysis by method of sections
    - b. Frames
      - i. Analysis of a frame
      - ii. Machines
    - c. Beams
      - i. Types of loading
      - ii. Shear and bending moment in a beam
      - iii. Shear and bending moment diagrams
    - d. Cables
      - i. Cables with concentrated loads
      - ii. Cables with distributed loads
  5. Friction
    - a. Dry friction and coefficient of friction
    - b. Angles of friction
    - c. Wedges
  6. Virtual work and stability of equilibrium
    - a. Principle of virtual work
    - b. Real machines
    - c. Potential energy
    - d. Stability of equilibrium

## Lab Content

Not applicable.

## Special Facilities and/or Equipment

1. Scientific calculator
2. Overhead projector
3. When taught online, on-going access to computer with email software and hardware; email address

## Method(s) of Evaluation

Methods of Evaluation may include but are not limited to the following:

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

## Method(s) of Instruction

Methods of Instruction may include but are not limited to the following:

Lecture  
Discussion  
Group work

## Representative Text(s) and Other Materials

Beer, Johnston, and Mazurek. Vector Mechanics for Engineers: Statics. 2019.

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

1. Homework assignments: Problem sets require application of concepts and equations from class
2. Text: Careful reading and rereading of the text and lecture notes. Approximately 60 pages of reading per week

## Discipline(s)

Engineering