ENGR G280: STATICS

Item	Value
Curriculum Committee Approval Date	09/17/2019
Top Code	090100 - Engineering, General (requires Calculus) (Transfer)
Units	3 Total Units
Hours	54 Total Hours (Lecture Hours 54)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	No
Basic Skills	Not Basic Skills (N)
Repeatable	No
Grading Policy	Standard Letter (S)

Course 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. PREREQUISITE: MATH G185 and PHYS G185. Transfer Credit: CSU; UC. C-ID: ENGR 130.**C-ID:** ENGR 130.

Course Level Student Learning Outcome(s)

1. Course Outcomes
2. Develop analysis methods to examine force systems acting on an engineering structure in static equilibrium.
3. Evaluate the constraining reactions needed to maintain static equilibrium on two-dimensional and three-dimensional rigid bodies acted on by the force systems.
4. Analyze the internal distribution of bending and shear forces acting on members of a beam or structure.

Course Objectives

- 1. Use a free body diagram to evaluate the reaction forces at the rigid body constraints, which are being used to maintain equilibrium.
- 2. Determine internal forces in individual members of trusses, frames, and machines.
- 3. Locate the centroid and center of gravity of regularly shaped lines, areas, and volumes.
- 4. Draw shear-force and bending-moment diagrams for beams.
- 5. Determine friction forces in simple shapes.
- 6. Evaluate area and mass moments of inertia.
- 7. Demonstrate a significant introduction to the formulation and solution of engineering problems.
- 8. Communicate effectively legible problem solutions to be understood by engineers in and out of their specific discipline.
- 9. Determine the forces that act on rigid bodies including external forces, weight, normal, distributed loads, friction and reactions at supports.
- 10. Calculate internal forces in members and create shear and bending moment diagrams for beams.
- 11. Analyze two-dimensional and three-dimensional force systems on rigid bodies in static equilibrium.

Lecture Content

Review of Basic Concepts Units of Measurement Review of Newtons Law of Motion Description of Vector Forces and Vector Operations Components of Vector Forces Combining Two-dimensional and Three-dimensional Vector Forces Concurrent Two-dimensional and Three-dimensional Force Systems Moments and Couples Resultants of Forces and Moments on Rigid Bodies Equivalent Force System Equilibrium of Rigid Bodies in Two-dimensional and Three-dimensional Free Body Diagrams Effects of Various Constraints on Rigid Bodies Conditions for Equilibrium of Rigid Bodies Equilibrium of Structures Trusses, Frames, and Machines Beams Analysis of Trusses by Method of Joints and Sections Analysis of Frames Analysis of Machines Distributed Forces, Centroids and Centers of Gravity Analysis of Equilibrium in Presence of Distributed Forces Distributed Force Systems Centroids of Lines, Areas, and Volumes Center of Gravity Center of Mass Centers of Gravity of Lines, Areas, and Volumes Centroids of Areas and Volumes Centroids and Centers of Gravity of Composite Bodies Fluid Statics (Optional) Forces in Beams Calculating Shear-Force and Bending-Moment in Beams Shear and Bending Moment Diagrams Drawing Shear-Force and Bending-Moment Diagrams Types and Principles of Friction Normal and Friction Forces Coefficient of Dry Friction Angles of Static Friction Friction in Wedges and Screws Friction in Machines Moments of Inertia Area and Mass Moments of Inertia Radius of Gyration Parallel-Axis Theorem Composite Areas and Bodies Mohrs Circle (Optional) Cables (Optional) Virtual Work (Optional)

Method(s) of Instruction

- Lecture (02)

Instructional Techniques

The primary mode of instruction is the lecture/demonstration method. There may be some use of graphing calculators and computers.

Reading Assignments

Reading and exercises from the text.

Writing Assignments

Problem solving exercises commonly appear on exams, quizzes, and homework assignments, and require written responses.

Out-of-class Assignments

Reading and problem solving exercises from the text and programming assignments.

Demonstration of Critical Thinking

Students will demonstrate critical thinking and problem solving skills by using logic to solve and interpret a variety of engineering applications. Demonstrations will be shown by completing assignments, participating in discussions, and completing required exams and projects.

Required Writing, Problem Solving, Skills Demonstration

Students will demonstrate problem solving skills when they write their own solutions to regular homework problems, quiz problems, individual and group projects, and exam problems.

Eligible Disciplines

Engineering: Masters degree in any field of engineering OR bachelors degree in any of the above AND masters degree in mathematics, physics, computer science, chemistry, or geology OR the equivalent. (NOTE: A bachelors degree in any field of engineering with a professional engineers license is an alternative qualification for this discipline.) Masters degree required. Title 5, section 53410.1 Engineering technology: Masters degree in any field of engineering technology or engineering OR bachelors degree in either of the above AND masters degree in physics, mathematics, computer science, biological science, or chemistry, OR bachelors degree in industrial technology, engineering technology or engineering AND a professional engineers license OR the equivalent. Masters degree required.

Textbooks Resources

1. Required Beer, F.. Vector Mechanics for Engineers, 12 ed. Mc Graw Hill, 2019 2. Required Meriam, J.L., Kraige, L.G., Bolton, J.N.. Engineering Mechanics: Statics, 9 ed. Wiley, 2018 3. Required Hibbeler, R.C.. Engineering Mechanics: Statics, 14 ed. Pearson, 2016