ENGR A280: STATICS

Item	Value
Curriculum Committee Approval Date	12/08/2021
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

Vector mechanics, covering force diagrams, moment of forces and couples, two- and three-dimensional force systems, analysis of engineering structures at equilibrium (e.g. trusses and beams), distributed force, centroids and center of gravity, shear and bending moment diagrams, friction, are and mass moments of inertia. PREREQUISITE: MATH A185 or MATH A185H or MATH A182H; and PHYS A185 or PHYS A185H. Transfer Credit: CSU; UC. C-ID: ENGR 130.**C-ID:** ENGR 130.

Course Level Student Learning Outcome(s)

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

Course Objectives

- 1. Determine the resultant of a two- and three-dimensional force system applied to a rigid body.
- 2. Use a free body diagram to evaluate the reaction forces at the rigid body constraints, which are being used to maintain equilibrium.
- 3. Perform vector analysis methods addressing forces acting on rigid bodies, trusses, frames, and machines.
- 4. Determine internal forces in individual members of trusses, frames, and machines.
- 5. Locate the centroid and center of gravity of regularly shaped lines, areas, and volumes.
- 6. Determine external and internal force reactions on beams.
- 7. Draw shear-force and bending-moment diagrams for beams.
- 8. Determine friction forces in simple shapes.
- 9. Evaluate area and mass moments of inertia.

Lecture Content

REVIEW OF BASIC CONCEPTS Units of Measurement Review of Newtons law of motion DESCRIPTION OF VECTOR FORCES Components of Vector Forces Combining Two- and Three-dimensional Vector Forces MOMENTS AND COUPLES Resultants of Forces and Moments on Rigid Bodies Equivalent Systems of Forces EQUILIBRIUM OF RIGID BODIES IN 2-D and 3-D Free body diagrams Effects of Various Constraints on Rigid Bodies Conditions for Equilibrium of Rigid Bodies EQUILIBRIUM OF STRUCTURES 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 Centroids of Lines, Areas, and Volumes Centers of Gravity of Lines, 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 Drawing Shear-Force and Bending-Moment Diagrams TYPES OF FRICTION Normal and Friction Forces Coefficient of Dry Friction Angles of Static Friction Friction in Wedges and Screws MOMENTS OF INERTIA Area and Mass Moments of Inertia Radius of Gyration Parallel-Axis Theorem Composite Areas and Bodies Mohrs Circle (Optional)

Method(s) of Instruction

- Lecture (02)
- DE Live Online Lecture (02S)
- DE Online Lecture (02X)

Instructional Techniques

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

Reading Assignments

.75 hrs./week of textbook reading.

Writing Assignments

1 hr./week of problem solving exercises.

Out-of-class Assignments

5 hrs./week of practice problems.

Demonstration of Critical Thinking

Homework Assignments, Quizzes, and Exams. Critical thinking is an integral part of an engineering course. Assigned exercises will test the ability of students to apply engineering concepts and make critical decisions.

Required Writing, Problem Solving, Skills Demonstration

Homework Assignments, Quizzes, and Exams. Open-ended questions and problem-solving exercises are systematically present on exams, quizzes, and homework assignments, and require a written response.

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

Textbooks Resources

1. Required Beer, F.P., Johnston, R., Mazurek, D.F., Cornwell, P.J., Self, B.P.. Vector Mechanics for Engineers, 12th ed. McGraw Hill, 2019 Rationale: rationale 2. Required Meriam, J.L., Kraige, L.G., Bolton, J.N.. Engineering Mechanics: Statics, 9th ed. Wiley, 2018 Rationale: rationale 3. Required Hibbeler, R.C.. Engineering Mechanics: Statics, 14th ed. Pearson, 2016 4.

Required Bedford, A.M., Fowler, W.. Engineering Mechanics: Statics, 5th ed. Pearson, 2008 Rationale: Optional