ENGR 34 Course Outline as of Fall 2020

CATALOG INFORMATION

Dept and Nbr: ENGR 34 Title: STATICS
Full Title: Engineering Mechanics: Statics
Last Reviewed: 2/24/2020

Units		Course Hours per Week		Nbr of Weeks	Course Hours Total	
Maximum	3.00	Lecture Scheduled	3.00	17.5	Lecture Scheduled	52.50
Minimum	3.00	Lab Scheduled	0	6	Lab Scheduled	0
		Contact DHR	0		Contact DHR	0
		Contact Total	3.00		Contact Total	52.50
		Non-contact DHR	0		Non-contact DHR	0

Total Out of Class Hours: 105.00 Total Student Learning Hours: 157.50

Title 5 Category:	AA Degree Applicable
Grading:	Grade Only
Repeatability:	00 - Two Repeats if Grade was D, F, NC, or NP
Also Listed As:	
Formerly:	

Catalog Description:
A vectorial treatment of the principles of statics with application to engineering problems and an emphasis on common engineering computational tools. Students are required to have a symbolic calculator (such as TI-89, TI-Nspire CAS, or HP 50g).

Prerequisites/Corequisites:
Course Completion of PHYS 40 and Completion of MATH 1B or higher (MATH)

Recommended Preparation:

Limits on Enrollment:

Schedule of Classes Information:
Description: A vectorial treatment of the principles of statics with application to engineering problems and an emphasis on common engineering computational tools. Students are required to have a symbolic calculator (such as TI-89, TI-Nspire CAS, or HP 50g). (Grade Only)
Prerequisites/Corequisites: Course Completion of PHYS 40 and Completion of MATH 1B or higher (MATH)
Recommended:

Limits on Enrollment:
Transfer Credit: CSU;UC.
Repeatability: Two Repeats if Grade was D, F, NC, or NP

ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:

AS Degree:	**Area**	Effective:	Inactive:
CSU GE:	**Transfer Area**	Effective:	Inactive:
IGETC:	**Transfer Area**	Effective:	Inactive:

CSU Transfer:	Transferable	Effective:	Fall 1981	Inactive:
UC Transfer:	Transferable	Effective:	Fall 1981	Inactive:

CID:

Certificate/Major Applicable:
Major Applicable Course

COURSE CONTENT

Student Learning Outcomes:
At the conclusion of this course, the student should be able to:
1. Apply Newton's 1st and 3rd laws to the force analysis of rigid bodies in static equilibrium.
2. Use scientific calculators to perform vector operations and solve systems of equations.
3. Use spreadsheets to analyze statics problems and display results to the standards of an engineering analysis report.

Objectives:
Students will be able to:
1. Apply a systematic algorithm to the analysis of statics problems.
2. Convert between force and position vectors and between Cartesian and spherical coordinate systems using a scientific calculator.
3. Apply both two and three dimensional vector equations for point equilibrium to solve for the tension or compression in supporting structures.
4. Compute the moment of a force about a point or an axis using cross product, dot product, and mixed triple product.
5. Apply moments and couples to determine equivalent force/moment systems on rigid bodies.
6. Develop vector equations of rigid body equilibrium and solve for the unknown reactions in both two and three dimensions.
7. Analyze trusses, frames, and machines using the principles of Newton's 1st and 3rd laws.
8. Construct shear and bending diagrams given load diagrams to describe the internal forces in beams.
9. Prepare engineering analysis reports with charts, tables, graphics, and proper documentation using spreadsheets.
10. Apply statics principles to the analysis of dry friction statics problems.
11. Compute the center of mass, centroid, and moment of inertia for areas, volumes, and masses.

Topics and Scope:

I. General Principles
- A. Newton's Laws
- B. Units of Measurement
- C. Numerical Calculations and Homework Standards
- D. Basic Statics Analysis Algorithms

II. Vectors
- A. Vector Addition and Vector Components
- B. Force Vectors
- C. Position Vectors
- D. Unit Vectors
- E. Dot Product
- F. Vector Operations on Symbolic Calculators

III. Concurrent Force Systems
- A. Free Body Diagrams
- B. Two Dimensional Point Equilibrium
- C. Springs, Pulleys, Maximum-Minimum Relationships
- D. Three Dimensional Point Equilibrium
- E. Solution of Systems on Symbolic Calculators
- F. Independent Variable Solutions using Spreadsheets
- G. Documentation Standards for Engineering Analysis Reports

IV. Force System Resultants
- A. Moment of a Force at a Point in Two and Three Dimensions
- B. Moment of a Force about an Axis
- C. Cross Product and Mixed Triple Product on Symbolic Calculators
- D. Couples
- E. Equivalent Systems
- F. Reduction of Equivalent Systems
- G. Distributed Force Systems

V. Equilibrium of a Rigid Body
- A. Standard Reaction Constraints in Two and Three Dimensions
- B. Free Body Diagrams for Rigid Bodies in Two and Three Dimensions
- C. Equilibrium Equations for Rigid Bodies in Two and Three Dimensions
- D. Equilibrium Special Cases: Two and three Force Bodies

VI. Analysis of Common Engineering Structures
- A. Method of Joints Solutions of Trusses
- B. Method of Sections Solutions of Trusses
- C. Three Dimensional Space Trusses
- D. Frames and Machines

VII. Internal Forces
- A. Section Method for Determining Internal Forces in Two and Three Dimensions
- B. Axial Force and Torque Diagram Construction
- C. Shear and Bending Moment Diagram Construction

VIII. Friction
- A. Characteristics of Dry Friction
- B. Friction Problems

IX. Centroids and Center of Mass
- A. Centroids of Areas and Volumes using Integration and Composite Body Approach
- B. Center of Mass for a System of Particles
- C. Center of Mass of a Body using Integration and Composite Body Approach

X. Moments of Inertia
- A. Moments of Inertia for Areas
- B. Parallel Axis Theorem

C. Integration and Composite Body Approaches
D. Moments of Inertia for Masses

Optional Topics:
XI. Cables
XII. Mohr's Circle
XIII. Virtual Work
XIV. Fluid Statics

Assignment:

1. Homework problems (Approximately 100 per semester)
2. Group Assignment(s) (0-2)
3. Quiz(zes) (0-10)
4. Midterm exams focused on problem solving (2-4)
5. Project (0-1)
6. Final exam focused on solving problems

Methods of Evaluation/Basis of Grade:

Writing: Assessment tools that demonstrate writing skills and/or require students to select, organize and explain ideas in writing.

None, This is a degree applicable course but assessment tools based on writing are not included because problem solving assessments are more appropriate for this course.	Writing 0 - 0%

Problem Solving: Assessment tools, other than exams, that demonstrate competence in computational or non-computational problem solving skills.

Homework problems, quiz(zes)	Problem solving 10 - 30%

Skill Demonstrations: All skill-based and physical demonstrations used for assessment purposes including skill performance exams.

None	Skill Demonstrations 0 - 0%

Exams: All forms of formal testing, other than skill performance exams.

Midterms, final	Exams 65 - 85%

Other: Includes any assessment tools that do not logically fit into the above categories.

Project, group assignment(s)	Other Category 0 - 15%

Representative Textbooks and Materials:
Engineering Mechanics Statics.14th ed. Hibbeler, Russell. Prentice Hall. 2016

Engineering Mechanics, Statics. 9th ed. Meriam, James and Kraige, L.G. and Bolton, J.N. Wiley. 2018