I. GENERAL COURSE INFORMATION

Subject and Number: Engineering 9
Descriptive Title: Engineering Mechanics - Statics
Course Disciplines: Engineering
Division: Mathematical Sciences

Catalog Description:
In this course, students will explore resultants and components of concurrent forces; moments of forces with respect to points and axes; equivalent systems of forces and moments; equilibria of particles and rigid bodies in two and three dimensions; distributed forces; centroids and centers of gravity; analysis of structures; forces in beams; friction moments and products of inertia; and energy methods.

Conditions of Enrollment:
Prerequisite: Physics 1A AND Mathematics 191 with a minimum grade of C

Course Length:	**X Full Term**	**Other (Specify number of weeks):**
Hours Lecture:	**3.00 hours per week**	**TBA**
Hours Laboratory:	**0 hours per week**	**TBA**
Course Units:	**3.00**	

Grading Method: Letter
Credit Status: Associate Degree Credit

Transfer CSU: X Effective Date: 1/20/1998
Transfer UC: X Effective Date: Fall 1998

General Education:
El Camino College:

CSU GE:

IGETC:

II. OUTCOMES AND OBJECTIVES

A. COURSE STUDENT LEARNING OUTCOMES (The course student learning outcomes are listed below, along with a representative assessment method for each. Student learning outcomes are not subject to review, revision or approval by the College Curriculum Committee)

Solve equilibrium problems in two and three dimensions using algebraic and trigonometric methods.

The above SLOs were the most recent available SLOs at the time of course review. For the most current SLO statements, visit the El Camino College SLO webpage at http://www.elcamino.edu/academics/slo/.

B. Course Student Learning Objectives (The major learning objective for students enrolled in this course are listed below, along with a representative assessment method for each)

1. Apply the parallelogram law in the addition and subtraction of concurrent forces.
   - **Objective Exams**
2. Solve equilibrium problems in two and three dimensions using algebraic and trigonometric methods.
   - **Objective Exams**
3. Apply the basics of vector algebra to solve equilibrium problems in two and three dimensions.
   - **Objective Exams**
4. Convert a system of forces and moments to an equivalent system at another point of a body.
   - **Objective Exams**
5. Determine the resultants of distributed forces and centers of gravity.
   - **Objective Exams**
6. Analyze forces which occur in structures and trusses where joints are held together by pins.
   - **Objective Exams**
7. Determine distributed forces, shear forces, and moments in beams; draw diagrams of distributed forces, shear forces, and moments.
   - **Objective Exams**
8. Solve statics problems involving friction.
   - **Objective Exams**
9. Solve problems using energy methods.
   - **Objective Exams**

III. OUTLINE OF SUBJECT MATTER (Topics are detailed enough to enable a qualified instructor to determine the major areas that should be covered as well as ensure consistency from instructor to instructor and semester to semester.)

Lecture or Lab	Approximate Hours	Topic Number	Major Topic
Lecture	6	I	STATICS OF PARTICLES A. Forces on a Particle. Resultant of Two Forces B. Addition of Vectors and Resultant of Several Concurrent Forces C. Resolution Forces into Components D. Equilibrium of Particles and Newton's First Law E. Forces in Space
Lecture	6	II	RIGID BODIES: EQUIVALENT SYSTEMS OF FORCES A. External and Internal Forces, Transmissibility B. Vector Products, Scalar Products, and Mixed Triple Product C. Moments of Forces and Couples D. Resolution of a Given Force into a Force and a Couple
Lecture	7	III	EQUILIBRIUM OF RIGID BODIES A. Free Body Diagrams B. Reactions at Supports and Connections for a Two-Dimensional Structure C. Equilibrium of a Rigid Body in Two Dimensions D. Statically Indeterminate Reactions E. Equilibrium of a Two-Force Body F. Equilibrium of a Three-Force Body G. Equilibrium of a Rigid Body in Three Dimensions H. Reactions at Supports and Connections for a Two-Dimensional Structure
Lecture	7	IV	DISTRIBUTED FORCES A. Center of Gravity B. Centroids of Areas and Lines C. First Moments of Areas and Lines D. Composite Plates and Wires E. Distributed Loads on Beams
Lecture	7	V	ANALYSIS OF STRUCTURES A. Definition of a Truss B. Simple Trusses C. Analysis of Trusses by the Method of Joints D. Analysis of Trusses by the Method of Sections
Lecture	7	VI	FORCES IN BEAMS A. Internal Forces in Members B. Various Types of Loading and Support C. Shear and Bending Moments in Beams D. Shear and Bending Moment Diagrams E. Relations among Load, Shear, and Bending Moment

Lecture	7	VII	FRICTION A. The Laws of Dry Friction and the Coefficient of Friction B. Angles of Friction C. Problems Involving Dry Friction
Lecture	7	VIII	MOMENTS OF INERTIA A. Moments of Inertia of Areas B. Polar Moments of Inertia C. Radius of Gyration of an Area D. Parallel-Axis Theorem
Total Lecture Hours		54	
Total Laboratory Hours		0	
Total Hours		54	

IV. PRIMARY METHOD OF EVALUATION AND SAMPLE ASSIGNMENTS

A. PRIMARY METHOD OF EVALUATION:
Problem solving demonstrations (computational or non-computational)

B. TYPICAL ASSIGNMENT USING PRIMARY METHOD OF EVALUATION:
A 160 kg utility pole is used to support at C the end of an electric wire. The tension in the wire is 540 N, and the wire forms an angle of 15° with the horizontal at C. Determine the largest and smallest allowable tensions in the guy cable BD if the magnitude of the couple at A cannot exceed 360 N-m. See the diagram. Show all of your work.

C. COLLEGE-LEVEL CRITICAL THINKING ASSIGNMENTS:
1. Three loads are applied to a beam as shown. The beam is supported by a roller at A and by a pin at B. Neglecting the weight of the beam, determine the reactions at A and B when P = 15 kips. Show all of your work.
2. Using the method of joints, determine the force in each member of the truss shown. State whether each member is in tension or compression. Show all of your work.

D. OTHER TYPICAL ASSESSMENT AND EVALUATION METHODS:
Other exams
Homework Problems

V. INSTRUCTIONAL METHODS
Discussion
Lecture

Note: In compliance with Board Policies 1600 and 3410, Title 5 California Code of Regulations, the Rehabilitation Act of 1973, and Sections 504 and 508 of the Americans with Disabilities Act, instruction delivery shall provide access, full inclusion, and effective communication for students with disabilities.

VI. WORK OUTSIDE OF CLASS

Study
Answer questions
Required reading
Problem solving activities

Estimated Independent Study Hours per Week: 6

VII. TEXTS AND MATERIALS

A. UP-TO-DATE REPRESENTATIVE TEXTBOOKS

Hibbeler, R.C.. Engineering Mechanics -- Statics. 14th ed. McGraw-Hill, 2016.

B. ALTERNATIVE TEXTBOOKS

C. REQUIRED SUPPLEMENTARY READINGS

D. OTHER REQUIRED MATERIALS

Graphing or scientific calculator

VIII. CONDITIONS OF ENROLLMENT

A. Requisites (Course and Non-Course Prerequisites and Corequisites)

Requisites	Category and Justification
Course Prerequisite Physics-1A AND	Computational/Communication Skills
Course Prerequisite Mathematics-191	Computational/Communication Skills

B. Requisite Skills

Requisite Skills
Draw basic free body diagrams. PHYS 1A - Analyze physical problems in order to draw a free-body-diagram.
Solve problems using Newton's Laws. PHYS 1A - Recognize all the physical principles required to solve the problem. PHYS 1A - Isolate and model the physical principle underlying each part of the problem.
Evaluate integrals using the method of integration by parts. MATH 191 - Evaluate integrals using integration techniques including: integration by parts; trigonometric substitutions; partial fraction decomposition and tables of integrals.

C. Recommended Preparations (Course and Non-Course)

Recommended Preparation	Category and Justification

D. Recommended Skills

Recommended Skills

E. Enrollment Limitations

Enrollment Limitations and Category	Enrollment Limitations Impact

Course created by Thomas Thorsen on 01/01/1974.

BOARD APPROVAL DATE:

LAST BOARD APPROVAL DATE: 01/22/2019

Last Reviewed and/or Revised by: Milan Georgevich and Jill Evensizer **Date:** 9/26/2018

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