Montgomery County Community College
EGR 203
Engineering Statics
3-2-2

COURSE DESCRIPTION:
This course describes the mechanical behavior of materials and systems in equilibrium using Newton's laws of motion. Students will learn the principles of force and moment equilibrium, construction and analysis of free-body diagrams, understanding distributed forces, friction, and structural response. This course is subject to a course fee. Refer to http://mc3.edu/adm-fin-aid/paying/tuition/course-fees for current rates.

REQUISITES:
Previous Course Requirements
- EGR 111 Engineering Computations
- EGR 115 Engineering Graphics
- MAT 190 Calculus I
- PHY 151 Principles of Physics I

Concurrent Course Requirements
None

LEARNING OUTCOMES Upon successful completion of this course, the student will be able to:	LEARNING ACTIVITIES	EVALUATION METHODS
1. Examine the standard procedures for performing numerical calculations. Propose and apply a general method for solving problems.	Lecture Problem Solving Assignments Design of Experiments	Section Examination Design of Experiments Review

LEARNING OUTCOMES	LEARNING ACTIVITIES	EVALUATION METHODS
2. Demonstrate an ability to add forces and resolve them into components using the Parallelogram Law, to express force and position in Cartesian vector form, to determine a vector's magnitude and direction, and to use the dot product in order to determine angle between two vectors or the projection of one vector onto another vector.	Lecture Problem-Solving Assignments Design of Experiments	Section Examination Design of Experiments Review
3. Apply the concept of a free-body diagram for a particle and solve particle equilibrium problems using the concepts and equations of static equilibrium.	Lecture Problem-Solving Assignments Design of Experiments	Section Examination Design of Experiments Review
4. Compute the moment for a force in two and three dimensions about a specified axis, the moment of a couple, the resultant of nonconcurrent force systems, and the reduction of a simple force distributed loading to a resultant force having a specified location.	Lecture Problem-Solving Assignments Design of Experiments	Section Examination Design of Experiments Review
5. Apply the equations of equilibrium for a rigid body to solve rigid-body equilibrium problems using the equations of equilibrium and free-body diagrams.	Lecture Problem-Solving Assignments Design of Experiments	Section Examination Design of Experiments Review

LEARNING OUTCOMES	LEARNING ACTIVITIES	EVALUATION METHODS
6. Determine the forces in members of a truss using the method of joints and the method of sections and analyze the forces acting on the members and machines composed of pin-connected members.	Lecture Problem-Solving Assignments Design of Experiments	Section Examination Design of Experiments Review
7. Describe the concept of center of gravity, center of mass, and the centroid. Determine the location of the center of gravity and centroid for a system of discrete particles and a body of an arbitrary shape.	Lecture Problem-Solving Assignments Design of Experiments	Section Examination Design of Experiments Review
8. Apply the method of sections for determining the external loadings of a beam and formulate equations that can be plotted so that they describe the internal shear and moment throughout a member.	Lecture Problem-Solving Assignments Design of Experiments	Section Examination Design of Experiments Review
9. Explain the concept of friction and analyze the equilibrium of rigid bodies subjected to a force.	Lecture Problem-Solving Assignments Design of Experiments	Section Examination Design of Experiments Review

At the conclusion of each semester/session, assessment of the learning outcomes will be completed by course faculty using the listed evaluation method(s). Aggregated results will be submitted to the Associate Vice President of Academic Affairs. The benchmark for each learning outcome is that *70% of students will meet or exceed outcome criteria*.

SEQUENCE OF TOPICS:

1. Introduction
- a. What is Mechanics
- b. Fundamental Concepts and Principles
- c. System of Units
- d. Converting between Two Systems of Units
- e. Method of Solving Problems
- f. Numerical Accuracy

2. Statics of Particles
- a. Addition of Planar Forces
- b. Adding Forces by Components
- c. Forces and Equilibrium in a Plane
- d. Adding Forces in Space
- e. Forces and Equilibrium in Space

3. Rigid Bodies: Equivalent Systems of Forces
- a. Forces and Moments
- b. Moment of a Force about an Axis
- c. Couples and Force-Couple Systems
- d. Simplifying Systems of Forces

4. Equilibrium of Ridge Bodies
- a. Equilibrium in Two Dimensions
- b. Two Special Cases
- c. Equilibrium in Three Dimensions

5. Analysis of Structures
- a. Analysis of Trusses
- b. Other Truss Analysis
- c. Frames
- d. Machines

6. Distributed Forces: Centroids and Centers of Gravity
- a. Planar Centers of Gravity and Centroids
- b. Further Considerations of Centroids
- c. Additional Applications of Centroids
- d. Centers of Gravity and Centroids of Volumes

7. **Internal Forces and Moments**
- a. Internal Forces in Members
- b. Beams
- c. Relations Among Load, Shear, and Bending Moment

8. Friction
- a. The Laws of Dry Friction
- b. Wedges and Screws
- c. Belt Friction

LEARNING MATERIALS:
Present selected text:
Beer, F.P., Johnston, E.R. Jr., Mazurek, D.F., Eisenberg, E.R. (2010). *Vector Mechanics for Engineers: Statics and Dynamics* (9th Ed.). McGraw-Hill.

Other learning materials may be required and made available directly to the student and/or via the College's Libraries and/or course management system.

COURSE APPROVAL:

Prepared by:	William Brownlowe	Date: 3/1/2004
VPAA/Provost Compliance Verification:	Dr. John C. Flynn, Jr.	Date: 6/9/2004
Revised by:	Dr. David Brookstein, Dean for STEM	Date: 3/9/2013
VPAA/Provost or designee Compliance Verification:	Victoria L. Bastecki-Perez, Ed.D.	Date: 4/16/2013
Revised by:	Chengyang Wang, Ph.D.	Date: 12/21/2017
VPAA/Provost or designee Compliance Verification:		Date: 1/10/2018

This course is consistent with Montgomery County Community College's mission. It was developed, approved and will be delivered in full compliance with the policies and procedures established by the College.