

*ABET Course Syllabus***Course Information, Textbook and Supplementary Materials**

Course Description: Students will learn the mathematical tools and physics concepts necessary to solve problems involving dynamical motion, including kinematics and kinetics of particles, systems of particles and rigid bodies; impulse and momentum relations; energy methods. Students will understand the application of vector algebra and calculus in dynamics and transformation of coordinates to analyze and solve various dynamics problems.

Required for: BSCE, BSCE Structural, BSCE Building Science, and BSCE Environmental

Prerequisite: CE 205 Statics

Co-Requisite: None

Required Textbook: Engineering Mechanical Dynamics (Vol.13), by R. C. Hibbeler, Prentice Hall/Pearson

Reference: Dynamics, Eleventh Edition by R. C. Hibbeler

Topics Covered	Learning Outcomes
Application of Vector Algebra and Vector Calculus in dynamics and transformation of coordinates	Students will understand the topic elements and will be able to analyze, compute and apply the results of the following: <ol style="list-style-type: none"> Express force and position vectors in Cartesian and polar vector form, determine unit vectors, vector operations, scalar and cross products. Express transformations of coordinates as orthogonal matrices and perform such transformations. Determine the first and second time derivatives of vectors.
Kinematics: Rectilinear and Cartesian Coordinates Curvilinear Sec Coordinates	<u>Analyze the:</u> <ol style="list-style-type: none"> Rectilinear and general curvilinear motion in Rectangular coordinate. Motion of a projectile Curvilinear motion in normal, tangential and cylindrical coordinates
Kinetics: Equation of Motion System of Particles	<ol style="list-style-type: none"> Equations of motion in rectangular, normal-tangential and cylindrical coordinates and the equations of a system of particles
Work and Energy Impulse and Momentum	<ol style="list-style-type: none"> Principle of Work and Energy of one and a system of particles Conservative forces, Potential Energy and Conservation of Energy Principle of Linear Impulse and Momentum of one and a system of particles. Conservation of Linear Momentum for system of Particles. Moment and Angular Impulse and Momentum Principles.

Plane Rigid Body Kinematics Kinematics of Rigid Bodies in Plane Motion Kinetics of Rigid Bodies in Plane Motion Work and Energy of Plane Rigid Bodies Impulse and Momentum of Plane Rigid Bodies 3-D Kinematics of Rigid Bodies 3-D Kinetics of Rigid Bodies	<u>Analyze the:</u> 13. Translation, Fixed-Axis Rotation and General Plane Motion of a Rigid Body 14. Instantaneous center of Zero Velocity. 15. Plane Kinetic Equations of Motion. 16. 3-D Equation of Motion and Fixed Axis Rotation of a Rigid Body 17. Gyroscopic Motion of a Rigid Body. 18. Use computational tools for matrix computation and calculation of moment of inertia of irregular shapes
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CE 235

Engineering Mechanics II: Dynamics

3 Units

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Lecture and Lab Schedule			
Lecture		Lab	
Sessions per Week	Duration per Session	Sessions per Week	Duration per Session
3	1 hour	n/a	

Relation of Course Objectives to Program Outcomes

The Civil Engineering program is designed to teach beyond the technical content of the curriculum and prepare the students to utilize what they learn in a professional setting.

This course does not contribute to the program outcomes..

Course Contribution to Program Outcomes (a-k)	✓ Key
n/a	

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