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

<table>
<thead>
<tr>
<th>Topics Covered</th>
<th>Learning Outcomes</th>
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<tbody>
<tr>
<td>Application of Vector Algebra and Vector Calculus in dynamics and transformation of coordinates</td>
<td>Students will understand the topic elements and will be able to analyze, compute and apply the results of the following: 1. Express force and position vectors in Cartesian and polar vector form, determine unit vectors, vector operations, scalar and cross products. 2. Express transformations of coordinates as orthogonal matrices and perform such transformations. 3. Determine the first and second time derivatives of vectors.</td>
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<tr>
<td>Kinematics: \nRectilinear and Cartesian Coordinates\nCurvilinear Sec Coordinates</td>
<td>Analyze the: 4. Rectilinear and general curvilinear motion in Rectangular coordinate. 5. Motion of a projectile 6. Curvilinear motion in normal, tangential and cylindrical coordinates 7. Equations of motion in rectangular, normal-tangential and cylindrical coordinates and the equations of a system of particles</td>
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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

Analyze the:
13. Translation, Fixed-Axis Rotation and General Plane Motion of a Rigid Body
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

CE 235
Engineering Mechanics II: Dynamics
3 Units

Lecture and Lab Schedule

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Lab</th>
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<tbody>
<tr>
<td>Sessions per Week</td>
<td>Duration per Session</td>
</tr>
<tr>
<td>3</td>
<td>1 hour</td>
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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)  

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Professor of Civil Engineering

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