ME240 COURSE PROFILE

DEGREE PROGRAM: Mechanical Engineering

COURSE NUMBER: ME240	**COURSE TIII.E:** Introduction to Dynamics and Vibrations
REQUIRED COURSE OR ELECTIVE COURSE: Required	**TERMS OFFERED:** Fall, Winter, Spring
TEXTBOOK / REQUIRED MATERIAL: Engineering Mechanics: Dynamics by Meriam & Kraige	**PRE / CO-REQUISITES:** Physics 140, preceded or accompanied by Math 216. I, II, lila (4 credits)
COGNIZANT FACULTY: A. Shorter	**COURSE TOPICS:**
BULLETIN DESCRIPTION: Vector description of force, position, velocity and acceleration in fixed and moving reference frames. Kinetics of particles, of assemblies of particles and of rigid bodies. Energy and momentum concepts. Euler's equations. Moment of inertia properties. The simple oscillator and its applications.	1. Kinematics of particles 2. Kinetics of a particles 3. Work and energy methods for particles 4. Vibrations of particles 5. Planar kinematics of rigid bodies 6. Planar kinetics of rigid bodies 7. Work and energy methods for rigid bodies 8. Vibrations of rigid bodies 9. Impulse and momentum methods 10. Computer tools for modeling
COURSE STRUCTURE/SCHEDULE: Lecture: 2 days/week at 1.5 hours, 1 day at 1.0 hour	

COURSE OBJECTIVES: for each course objective, links to the Program Outcomes are identified in brackets.	1. To teach planar kinematics of rigid bodies, systems of rigid bodies and particles [1, 2, 6] 2. To teach problem formulation and solution methods for the dynamic equations of motions for planar motion of rigid bodies [1, 2, 6] 3. To develop simplified, rigid body models for systems of mechanical components [1] 4. To introduce the concepts and uses of work and kinetic energy [1, 2, 6] 5. To teach fundamental concepts and solution strategies for mechanical vibration problems [1, 2, 6]
COURSE OUTCOMES : for each course outcome, links to the Course Objectives are identified in brackets.	1. Describe the planar motion of particles and rigid bodies [1] 2. Describe planar motion of a system of connected rigid bodies including pinned, rolling and sliding connections [1] 3. Draw free body diagrams for particles, rigid bodies and systems of rigid bodies. [2, 3, 4] 4. Apply the laws of motion to relate forces obtained from free body diagrams and accelerations from kinematics to derive the equations of motion for particles and rigid bodies in planar motion [1, 2, 3, 4] 5. Develop simplified models and dynamic equations of motion for connected mechanical systems including rigid links, rigid inextensible cords, sliding and rolling contact conditions, springs and masses [1, 2, 3, 4, 5] 6. Develop closed form solutions for single degree of freedom free and harmonically driven vibratory systems [5] 7. Design to avoid or achieve resonance in single degree of freedom mechanical models [5] 8. Understand definitions of work, potential energy and kinetic energy [4] 9. Know that work and energy principies may be more appropriate for problem solution when forces are not a primary quantity of interest and to use these principles to obtain velocity, position and the work done by external forces [4] 10. Obtain a basic level of understanding of how to apply modern computational softvvare for solving and animating dynamics problems [1, 2, 3, 5] 11. Obtain numerical results for the dynamic equations of motion using algebraic manipulation, solution of differential equations or computational methods [1-5]
ASSESSMENT TOOLS: for each assessment tool, links to the course outcomes are identified	1. Regular homework problems 2. Exams 3. Virtual laboratories and computational assignments

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