University Of California, Berkeley
Department of Mechanical Engineering

ME 104: Engineering Mechanics II (3 units)

Required Course

Syllabus

CATALOG DESCRIPTION

This course is an introduction to the dynamics of particles and rigid bodies. The material, based on a Newtonian formulation of the governing equations, is illustrated with numerous examples ranging from one-dimensional motion of a single particle to planar motions of rigid bodies and systems of rigid bodies.

COURSE PREREQUISITES

Engineering 7 or 77, Mechanical Engineering C85 and Mathematics 54.

TEXTBOOK(S) AND/OR OTHER REQUIRED MATERIAL

Required text: Dynamics - Analysis and Design of Systems in Motion, by Benson H. Tongue and Sheri Sheppard

COURSE OBJECTIVES

Reintroduce students to Newton's 3 laws; introduce rigorous kinematical analysis of particles and rigid bodies; discuss creation of equations of motion for particles and rigid bodies in planar motion; discuss orbital mechanics and general momentum conservation problems; introduce energy-based approaches to determining system motion.

DESIRED COURSE OUTCOMES

Upon completion of this course students will be able to: Determine the kinematics and kinetics to allow the calculation of equations of motion for single particles, multiple particles and rigid bodies, all in planar motion; analyze the power-flow in planar mechanisms and determine torque/power relationships in coupled, rotating bodies.

TOPICS COVERED

Rectilinear kinematics; polar, path and cylindrical kinematics; relative and constrained motion, rectilinear kinetics; path and polar kinetics; linear and angular momentum; impact, in-line and oblique; energy - potential, kinetic, work; multiple particles; rigid body kinematics; relative motion; curvilinear kinetics; mass moment of inertia, circular kinetics, general kinetics; general rigid body motion and momentum; energy of rigid bodies.

CLASS/LABORATORY SCHEDULE

Three hours of lecture and one hour of discussion per week.

CONTRIBUTION OF THE COURSE TO MEETING THE PROFESSIONAL COMPONENT

This course contributes primarily to the students' knowledge of engineering topics and does not provide hands-on design experience. It does strengthen the students' abilities to utilize MATLAB as an experimental tool with which to explore the dynamical response of complex systems.

RELATIONSHIP OF THE COURSE TO ABET PROGRAM OUTCOMES

This course provides invaluable training in the modeling and analysis of dynamic systems and as such provides a critical background for students wishing to study vibrations, advanced dynamics, controls, design, biomechanics, solid mechanics, and so on.

An ability to apply knowledge of mathematics, science, and engineering. An ability to function on multi-disciplinary teams. An ability to identify, formulate, and solve engineering problems. The broad education necessary to understand the impact of engineering solutions in a global and societal context. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

ASSESSMENT OF STUDENT PROGRESS TOWARD COURSE OBJECTIVES

Bi-weekly quizzes; weekly homework; final examination.

PERSON(S) WHO PREPARED THIS DESCRIPTION: Benson Tongue Feb. 26, 2006