ME 302: Engineering Mechanics II
Lecture: MW 4:00 – 6:00 PM GCB 207
Discussion Section: W 3:00 – 4:00 PM GCB 207

Instructor: Calin Belta
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Teaching Fellow: Orin Hall
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Prerequisites: EK 301

Required Textbook:
Williams JH, *Fundamentals of Applied Dynamics*, John Wiley and Sons, Inc., 1996.

Goals:
The goal of ME 302 is to introduce ME juniors to the theory and applications of engineering mechanics. As an outcome of this course, the students will be able to model and analyze simple systems of particles and rigid bodies in two and three dimensions. They will also gain experience in the use of Matlab for modeling and analysis of mechanical systems.

Grading:

Quizzes:	20% (quiz given every Wed)
Projects:	20%
Exams (3):	10%, 20%, 30%

Assignments:
(1) Homework problems will be assigned every Wed. The homework will not be graded. A short quiz based on the homework will be given on the following Wed. The quizzes will be graded. After the quiz, the solutions for all the problems in the homework will be made available in the class Courseinfo.
(2) Projects will serve as a platform for students to apply principles learned in class to real-world scenarios**.** Students will be required to perform some aspect of dynamic analysis (kinematics or kinetics) and / or design. All project will require some knowledge of Matlab.

Topics and Tentative schedule:

Introduction and Motivation (09/02)

Direct vs. Indirect Approaches to Dynamics and Kinematics (2 classes, Ch. 2)

Kinematics and Dynamics via the Direct Approach (11 classes)

Particle velocity and acceleration; planar motion of a rigid body; angular velocity and acceleration; reference frame transformations) (3 classes, Ch. 3)

Newton's law; force and linear momentum; torque and angular momentum; equations of motion (2 classes, Ch. 4)

Models of rigid bodies, Newton-Euler equations, Inertia tensors, principal directions and inertial moments, dynamics of rigid bodies (5 classes, Ch. 6 .1-6.4)

Exam (1 class)

Kinematics and Dynamics via the Indirect Approach (9 classes)

Work and energy, degrees of freedom, generalized coordinates, velocities, and forces, holonomic and nonholonomic systems, Hamilton's principle, Langrange's equations (5 classes, Ch. 5)

Potential energy, kinetic energy, and Lagrangian for rigid bodies; equations of motion of planar systems of rigid bodies (3 classes, Ch. 6.5, 6.6)

Exam (1 class)

Vibrations of Mechanical Systems (4 classes)

First order systems: free response, step response, ramp response, frequency response (1 class, Ch. 8.2)

Second order systems: free response, frequency response, natural frequency (2 classes, Ch. 8.3, 8.4)

Stability of Mechanical Systems (1 class)

Review for Final Exam (1 class)

Note: BU Holidays: 09/07, 10/12, 11/11, 11/25,; 10/13 substitute Monday; last day of classes: 12/11