

ENGR 80 DYNAMICS

(Elective for EE)

- Catalog Data:** **ENGR 80: Dynamics (Credit Units: 4)** Introduction to the kinetics and dynamics of particles and rigid bodies. The Newton-Euler, Work/Energy, and Impulse/Momentum methods are explored for ascertaining the dynamics of particles and rigid bodies. An engineering design problem using these fundamental principles is also undertaken. Prerequisites: Mathematics 2D and Physics 7C. Same as MAE80 and CEE80. (Design units: 0.5)
- Textbook:** Beer and Johnston, *Vector Mechanics for Engineers: Dynamics*, 8th Edition, McGraw-Hill, 2007.
- References:** Hibbeler, R.C., *Engineering Mechanics: Dynamics*, Prentice Hall.
- Coordinator:** John C. LaRue
- Relationship to Program Outcomes:** The course relates to Program Outcomes
EE: a, c, and e as stated at:
<http://undergraduate.eng.uci.edu/degreeprograms/environmental/mission>
- Course Outcome/Performance Criteria:** Students will:
- Understand (through review) particle motion and elementary laws of motion (physics). (EE a)
 - Use calculus in understanding motion: angular velocity and derivative of rotating vectors, maximum and minimum concept in energy, etc. (EE a)
 - Understand force and momentum relationship as well as energy, rotation, angular momentum and collision. (EE c)
 - Understand rigid body motion (rotation and translation) (AE c)
 - Understand the relationship among energy, force/torque and resulting rigid body motion. (EE c)
 - Analyze motion of simple models for real life problems (gears, cranks, cranes, robots) (EE e)
 - Have some understanding of simulation and realistic constraints for design consideration (EE e)
- Prerequisites By Topic:** Physics - Newtonian mechanics
Math - calculus through multiple integration
- Lecture Topics:**
- Kinematics of particles (1 week)
 - Kinetics of particles: Equations of motion, Newton's Second Law (1 week)
 - Kinetics of particles: Work and energy, impulse and momentum (2 weeks)
 - Systems of particles (1 week)
 - Kinematics of rigid bodies in plane motion (2 weeks)
 - Kinetics of rigid bodies in plane motion: Equations of motion, Newton's Second Law (1 week)
 - Kinetics of rigid bodies in plane motion: Work and energy, impulse and momentum (2 weeks)

Class Schedule: Meets for 3 hours of lecture and 1 hour of discussion each week for 10 weeks.

Computer Usage: Minimal. The small orbital mechanics project requires a modest amount of calculations, any CAD program (even Excel) would suffice. Furthermore class management relies heavily on email, class web page and similar activities.

Laboratory Projects: There are two paper/simulation design projects.

Professional Component: Contributes to the design experience and Engineering Topics courses of Electrical Engineering majors.

Design Content Description

Approach: Students learn the engineering design concept and process in the context of an integrative design project that constitutes several weeks of the course. In this assignment, teams of 2-4 students are tasked with designing an engineering component and/or system. Students must apply both technical and creative skills to develop a conceptual design and then apply analysis skills to ensure that the design is workable. The concept and process of design are integrated throughout the entire 10 weeks of lectures. Oral presentations are also given in class by each team. Each team also submits a written report.

Lectures: 100%

Laboratory Portion: %

Grading Criteria:

Homework:	6%
Projects:	7%
Midterm Exam:	47%
Final Exam:	<u>40%</u>
	100%

Estimated ABET Category Content:

Mathematics and Basic Science: ___ credit units or ___%

Engineering Science: 3.5 credit units or 88 %

Engineering Design: .5 credit units or 12 %

Prepared by: John C. LaRue **Date:** July 2008

CEP Approved: Fall 2008