ENES 221 DYNAMICS
Fall 2022
3 credit hours

Instructor: Julie Wang, Ph.D., P.E.
Office: CSC 102
Office Hour (vitual): MW 2:00-3:00 PM, TTh 3:00-4:00 PM
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Class Hours: MW 8:00-9:50 Lecture/ Discussion, IN PERSON
Text Book: Engineering Mechanics, Dynamics, by R.C. Hibberler, 14th edition, 2016, Pearson.

Catalog Description
Systems of heavy particles and rigid bodies at rest and in motion; Force-acceleration; work-energy and impulse-momentum relationships; Motion of one body relative to another in a plane and in space.

Prerequisite: **PHYS 261**, **ENES 102 (Statics),** and **MATH 237 (Calculus II).**

Designation: Required

Course Objectives

The student will learn to apply the mathematical concepts of vectors and calculus and Newton's laws to determine the motion of rigid bodies when given forces are applied and to determine the forces required to produce given motions.

The students should demonstrate their knowledge of the material covered in Dynamics through their mastery of the following course objectives:

- Understand the principles of Newton's laws and their application to the real life physical problems that require knowledge of the relationship between force and motion.
- Understand the vector concepts and how it can be use to describe the motion of particles and rigid bodies.
- Develop the analytical skills needed to systematically formulate, solve, and analyze a wide range of dynamics problems.
- Model dynamical problems consisting of mechanical systems composed of rigid components.
- Develop equations of motions for simple systems of particles and rigid bodies,
- Continue to higher-level dynamics and mechanics courses and apply these concepts to design courses, and design in general.

Relationship of course to program objectives: This course develops the fundamentals of engineering mechanics and problem solving skills essential for engineering.

Relationship of course to learning outcomes:
ENES 221 contributes directly to the following specific Mechanical Engineering Program ABET Outcomes (1,4,7)

1 . (1) Students will develop the ability to identify formulate, construct equations, and solve dynamics problems using Newton's laws, impulse-momentum and work-energy concepts including collisions.
2. (4) This course will contribute to the ability of the student to work professionally in mechanical systems. Students will master problem-solving skills and methodologies that are essential to all engineering disciplines. Students will learn to recognize dynamic phenomena that occur in the analysis and design of both mechanical systems and non-mechanical systems.
3, (7) This course will contribute to the ability of student problem solving skills by applying knowledge of mathematics, science, and engineering. Dynamics is an essential part of a comprehensive foundation in the engineering sciences; it requires the application of calculus, vector algebra, and other elements of mathematical reasoning.

Topics Covered

- Kinematics of a particle
- Force and Acceleration- Particles
- Work Energy- Particles
- Impulse and Momentum concepts- Particles
- Kinematics of Rigid Bodies
- Force and Acceleration- Rigid Bodies
- Work Energy- Rigid Bodies
- Impulse and Momentum concept- Rigid Bodies, with specific applications concerning elastic and inelastic collisions

Attendance This is in-person class, you are expected to attend every class. If you miss class, you will be responsible for complying with all requirements.

Homework Assignments (see the tentative schedule assignment)

- The homework problems with letter **F** are not collected. The solutions are in the fundamental problems sections shown on pages 692-712 in from textbook
- The problems with red color will be collected,
- Homework will be submitted to CANVAS. Late homework will not be accepted.
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Each homework problem should be organized into the following sections:

(a) A statement for the given information and for what is required
(b) Draw free body diagram
(c) Basic equations
(d) Correct calculation and units
(e) Answers clearly indicated.

Exercises/Quizzes
Exercises/Quizzes are given during the classes. The quizzes are collected and there are NO make-up quizzes, three lowest scores will be dropped..

Tests and Final Exam

There will be three hourly tests during the semester and one comprehensive final exam at the end of the semester. You are expected to take the tests and exam on the scheduled dates. There will be no make-up exam unless you have an emergency and inform the instructor prior to the exam. There are no exemptions from the final exam.

Grading

The course grade will be determined in the following distributions.

Quizzes/Homework	20%
Hour Exams	45% (15% for each)
Final Exam.	30%
Total	**100**

Grading Scale	**A**	90 – 100%
	B	80 – 89%
	C	70 – 79%
	D	60 – 69 %
	F	0 - 59%

Courses related Policies
Please reference the following Websites:

https://www.frostburg.edu/about-frostburg/student-affairs/_files/pdfs/policystatements.pdf

https://www.ugst.umd.edu/courserelatedpolicies.html#collapseSeven