

**United States Naval Academy
Mechanical Engineering Department**

EM232 Dynamics

Catalog Description: EM232 Dynamics

Credit: 3 (3-0-3)

A course in classical vector dynamics. Topics include vector algebra and calculus, kinematics and kinetics of particles and rigid bodies, as well as energy and momentum methods. Extensive problem solving involving particle and rigid body motion is required.

Prerequisites: Statics

Corequisites: Differential Equations

Textbooks: Hibbler, R.C., *Engineering Mechanics – Dynamics*, 8th Ed. Prentice-Hall, *Required*

Course Director: Assoc. Prof. C.P. Ratcliffe

Objectives¹:

1. To give students an introduction to engineering mechanics and dynamics, with an emphasis on engineering problem solving strategies and skills, and the synthesis of calculus and physics. (a, b, c)

Course Content:

No.	Topic or Subtopic	hrs.
1	Introduction	1
2	Particle kinematics and coordinate systems	5
3	Particle relative motion	2
4	Equations of motion for particles	11
5	Kinematics of rigid bodies	3
6	Rigid body relative motion	3
7	Equations of motion for rigid bodies	10
8	Design/synthesis project	4

Evaluation:

1. Quizzes YES
2. Homework YES
3. Exams YES
4. Laboratory Reports NO
5. Oral Presentations YES
6. Design Reports/Notebooks NO
7. Prototypes/Demonstrations NO
8. Projects YES
9. any other evaluation tools used NO

Acquired Abilities²:

EM232 Dynamics

- 1.1 Students will demonstrate the ability to select a suitable coordinate system and reference coordinate axes and describe the two-dimensional motion of a particle in those coordinate systems (1, 2, 3)
- 1.2 Students will demonstrate the ability to select a suitable solution method or combination of methods for problems involving particle or rigid body motion (1, 2, 3)
- 1.3 Students will demonstrate the ability to construct free body force diagrams and kinetic diagrams for particle or rigid body motion, understand the relationship between them and use them to formulate equations of motion (1, 2, 3)
- 1.4 Students will demonstrate the ability to construct impulse and momentum diagrams for particle or rigid body motion, understand the relationship between them and use them to formulate equations of motion (1, 2, 3)
- 1.5 Students will demonstrate the ability to formulate work-energy relationships and use them to solve problems involving particles and rigid bodies (1, 2, 3)
- 1.6 Students will demonstrate the ability to apply Coulomb dry friction to particle and rigid body engineering problems (1, 2, 3)
- 1.7 Students will demonstrate the ability to communicate engineering solutions effectively and clearly (2, 3, 5, 8)
- 1.8 Students will demonstrate the ability to work in groups to design the dynamic aspects of a mechanism or engineering structure (2, 5, 8)

Date of Latest Revision: 11 SEP 2001

¹ Letters in parenthesis refer to the [Program Objectives](#) of the [Mechanical Engineering Program](#).

² Numbers in parenthesis refer to the evaluation methods used to assess student performance.