JOHN A. REIF, JR. DEPARTMENT OF
CIVIL AND ENVIRONMENTAL ENGINEERING
NJIT New Jersey Institute of Technology

MECH 238 –001 APPLICATION OF DYNAMICS Fall 2025

(1 credit)

Lectures Tuesdays: 4:00 pm – 6:05 pm
Colton Hall Room 416

Instructor **Safwan (Maurice) Rached**
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Office Hours: By Appointment

Prerequisite **Mech 235 or Mech 234**

Required Textbook

No textbook required. The course material will be based solely on handouts.

Other Recommended Texts & Reading

NCEES, Fundamentals of Engineering Supplied-Reference Handbook. Download from the NCEES website for FREE:

https://ncees.org/ncees-publishes-new-version-of-fe-reference-handbook/

Course Description

This course introduces civil engineering students to the principles of dynamics, with a focus on particle motion, rigid body dynamics and vibration systems. Students will apply mathematical models to analyze forces, motion, energy, and moment, while also learning and solving problems with practical applications in civil engineering.

Course Objectives (General)
By the end of this course, the student will be able to:

- Develop a solid understanding of kinematics and kinetics of particles and rigid bodies in two and three dimensions.
- Apply Newton's laws, energy methods, and impulse-momentum principles to analyze dynamic systems.
- Strengthen problem-solving and critical thinking skills by modeling and solving real-world engineering motion problems.
- Enhance the ability to use mathematical tools and engineering reasoning to design and evaluate dynamic systems.
- Build a foundation for advanced studies in civil, mechanical, aerospace, and related engineering fields.

POLICIES & PROCEDURES

Academic Integrity: It is expected that NJIT's University Code on Academic Integrity will be followed in all matters related to this course. Refer to NJIT's Dean of Students website to become familiar with the Code on Academic Integrity and how to avoid Code violations.

https://www.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf

Communication: Email, texts, and telephone calls.

Lectures/Class: An attendance sheet will be passed around at the beginning of each class. Ensure you sign it. For online lectures, attendance is noted at the start and at the end of the session. Attendance will count as 10% of the final grade. If you must miss a class for unavoidable personal or medical reasons, please notify me as soon as possible for accommodation. Unexcused absences are not acceptable.

Handouts: Handout will be made available to the student at least 24 hours prior to lectures.

Homework: Homework will be assigned once a week. Assignments are expected to be turned in before the next class.

Homework Format: Homework assignments will be distributed electronically or published in the system as a PDF file.

Late Homework: Late homework submissions are not accepted.

Exams: There will be 1 mid-term exam and 1 final exam.

Calculation of Course Grade: A weighted average grade will be calculated as follows:

Homework	20%
Attendance & Participation	10%
Mid-Term Exam	30%
Final Exam	40%

The minimum requirements for final letter grades are as follows:

A = 90.%, B+ = 85%, B = 80.0%, C+ = 75%, C = 70%, D = 60%, F < 60%

Instructor Commitment: You can expect the instructor to be courteous, punctual, organized, and prepared for lecture and other class activities; to answer questions clearly; to be available during office hours or to notify you beforehand if office hours are moved; to provide a suitable guest lecturer or pre-recorded lecture when they are traveling or unavailable; and to grade uniformly and consistently.

AI statement: The use of artificial intelligence (AI) is permitted in this course only when explicitly stated in assignments. If students use AI for any course-related work, they must cite it according to the guidelines provided on the **NJIT Library AI Citation page**. If you have any questions about AI use in this course, please contact the course instructor before submitting any assignments. In cases where AI use is not allowed, students are expected to complete work without AI assistance to develop their skills in this subject area.

Students with Documented Disabilities: NJIT is committed to providing students with documented disabilities equal access to programs and activities. If you have, or believe that you may have, a physical, medical, psychological, or learning disability that may require accommodations, please contact the Coordinator of Student Disability Services located in the Center for Counseling and Psychological Services, in Campbell Hall, Room 205, (973) 596-3414. Further information on disability services related to the self-identification, documentation and accommodation processes can be found on the webpage at: (http://www.njit.edu/counseling/services/disabilities.php)

Course Schedule:

Course Objectives Matrix – MECH 238 – Section Number 001

1	2-Sep	Introduction to Basics
2	9-Sep	Linear Motion
3	16-Sep	Curvilinear Motion
4	23-Sep	Projectile Motion
5	30-Sep	Angular Motion
6	7-Oct	Angular Motion
7	14-Oct	Dependent and Relative Motion
8	21-Oct	Center of Zero Velocity
9	28-Oct	Mid-Term Exam
10	4-Nov	Pulley System
11	11-Nov	Force & Acceleration
12	18-Nov	Relative Velocity
13	25-Nov	Moment of Inertia
14	2-Dec	Work and Energy
15	9-Dec	Work and Energy
	TBD	Final Exam

Course Objectives Matrix - MECH 238 - 001

Strategies, Actions and Assignments	ABET Student Outcomes (1-7)	Program Educational Objectives	Assessment Measures
Student Learning Outcome 1: Understand the theoretical relationship among velocity, acceleration, force, energy and momentum for particles. Apply the theory to engineering problems			
Learn equations and apply them to solve engineering problems for kinematics only situation	1,2	1	Weekly homework, quizzes.
Learn equations and apply them to solve engineering problems for motion and force.	1,2	1	Weekly homework, quizzes.
Student Learning Outcome 2: Understand the theoretical relationship among velocity, acceleration, force and moment for rigid body. Apply the theory to engineering problems			
Learn equations and apply them to solve engineering problems for kinematics only situation	1,2	1	Weekly homework, quizzes
Learn equations and apply them to solve engineering problems for motion and force.	1,2	1	Weekly homework, quizzes
Student Learning Outcome 3: Learn to solve combined particle and rigid body problems.			
Apply particle and rigid body equations to combined engineering problems	1, 2	1	Weekly homework, quizzes

CEE Mission, Program Educational Objectives and Student Outcomes

The mission of the Department of Civil and Environmental Engineering is:

- to educate a diverse student body to be employed in the engineering profession
- to encourage research and scholarships among our faculty and students
- to promote service to the engineering profession and society

Program Educational Objectives

Our **Program Educational Objectives** are reflected in the achievements of our recent alumni:

1. **Engineering Practice:** Alumni will successfully engage in the ethical practice of civil engineering within industry, government, and private practice, working towards safe, practical, resilient and sustainable solutions in a wide array of technical specialties including construction, environmental, geotechnical, structural, transportation, and water resources.

2. **Professional Growth:** Alumni will advance their technical and interpersonal skills through professional growth and development activities such as graduate study in engineering, research and development, professional registration and continuing education; some graduates will transition into other professional fields such as academia, business, and law through further education.
3. **Service:** Alumni will perform service to society and the engineering profession through membership and participation in professional societies, government, educational institutions, civic organizations, charitable giving and other humanitarian endeavors.

Student Outcomes

Our **Student Outcomes** are what students are expected to know and be able to do by the time of their graduation:

1. an ability to identify, formulate and solve complex engineering problems by applying principles of engineering, science and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety and welfare, as well as global, cultural, social, environmental and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative environment, establish goals, plan tasks and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data and use engineering judgment to draw conclusion
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies Updated 8/2025