Engineering Mechanics: Dynamics

EGM 3401, 24985, Section 1846
Class Periods: M, W, F Period 6, 12:50pm-1:40pm
Location: MAE-A 303
Academic Term: Spring 2026

Instructor:
Alicia K. Petersen
petersen.alicia@ufl.edu
(352) 392-3496
Office: NEB 441
Office Hours: Wednesday, 3:30pm-4:30pm

Teaching Assistants/Graders:

- Natalie Sleiman
- Matthew Krininger

Course Description
Kinematics and dynamics of particles and rigid bodies in one, two, and three dimensions. Work-energy and impulse-momentum concepts. [3 credits]

Course Pre-Requisites / Co-Requisites
EGM 2511 and MAC 2313.

Course Objectives
The objective of this course is to cover fundamental principles and provide a thorough and systematic introduction to the subject of dynamics of particles and rigid bodies from Newton-Euler and analytical mechanics perspectives. This course emphasizes a first-principles approach to the development of theory and its application to a range of problems of interest. The primary learning objective is for students to be able to model multibody mechanical systems and derive their equations of motion for a range of applications and assumptions.

Students will develop the ability to write the equations of motion for a system—the equations that govern a mechanical system's motion over time. Students will learn to be able to put these equations into a solvable form. Through this course students will learn to identify the goal, the assumptions, formulate equations, and solve systems of motion (Unit 1). Course material will build up in complexity beginning with kinematics of particles (Unit 2), to kinetics of multiparticle systems (Unit 3), through to kinetics of rigid bodies, from planar (Unit 4) to 2-D (Unit 5) to 3-D motion (Unit 6).

Materials and Supply Fees
None.

Relation to Program Outcomes (ABET):

Outcome	**Coverage***
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	High
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 conclusions	Low
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	

Required Resources and Software

- MATLAB and/or Python may be required for some assignments.
- Additional resources will be available on the CANVAS course page.

Recommended Textbooks

- Dynamics: Analysis and Design of Systems in Motion
  Benson H. Tongue
  Wiley
  2010, 2nd Edition
  ISBN: 9780470563236

- Dynamics of Particles and Rigid Bodies: A Systematic Approach
  Anil V. Rao
  Cambridge University
  2006 Edition
  ISBN: 9780521187909

Additional Optional Textbooks

- Engineering Mechanics: Dynamics
  Benson H. Tongue, Daniel T. Kawano
  Wiley
  2017, 1st Edition
  ISBN: 9781119322054

- Engineering Mechanics: An Introduction to Dynamics
  David J. McGill and Wilton W. King
  PWS Publishing
  1995, 3rd Edition
  ISBN: 9780534933999

Required Computer

UF Recommended Computer Specifications: https://it.ufl.edu/get-help/student-computer-recommendations/
HWCOE Computer Requirements: https://www.eng.ufl.edu/students/advising/fall-semester-checklist/computer-requirements/
MAE Computer Requirements: https://mae.ufl.edu/students/undergraduate/computer-requirements/

Graded Assignments

Homework Sets:

Homework sets are meant to give practice applying the course content to a variety of problems relevant to Mechanical and Aerospace Engineering. Throughout these assignments students will be graded based on a mix of problem set-up, process, mathematical calculations, implementing dynamics in code, drawing conclusions, and extending course concepts to new scenarios, as well as accuracy.

Lecture Reviews:

Lecture reviews are meant to be a check-in to test your top-level understanding of key concepts from the lectures. They are typically due one week following the relevant lecture. They are typically multiple choice or fill-in-the-blank questions.

Application Assignments:

Application assignments for this course may be assigned in a few formats. Some may be graded, while some may be graded for completion/effort. Potential examples include: a guided dynamics problem worked on during class in small groups, a guided worksheet done alone to deepen understanding of key concepts, a step-by-step coding tutorial, a small project in small groups outside of class time. Some of these activities may be graded for effort, others for accuracy, or a combination thereof.

AI Policy – Restricted Use:

For any assignment without explicit AI use in its instructions, no use of generative AI is permitted. Generative AI tools may be used to enhance **some** assignments in this course. Assignment instructions will differentiate between distinct human and AI tasks. Any and all work that is done using generative AI must be cited in your submission.

Course Schedule *Subject to change.*

Unit 1, Weeks 1-2:	Dynamics Roadmap, Reference Frames, Translation, Rotation, Coordinate Systems,
Unit 2, Weeks 3-5:	Kinematics of Particles, Systems of Motion over Time,
Unit 3:	Kinetics of Particles, Kinetics of Multiparticle Systems,
Unit 4:	Kinetics of Rigid Bodies in Planar Motion
Unit 5:	Kinetics of Rigid Bodies undergoing 2-D Motion
Unit 6:	Kinetics of Rigid Bodies undergoing 3-D Motion

Important Dates

02/25/26	*Exam 1 – Covering Units 1-3 (12:50pm, MAE-A 303) Subject to change.*
04/22/26	*Last Homework Assignment, Lecture Review, or Application Assignment Due*
04/30/26	*Final Exam – In-person (10:00am -12:00pm, MAE-A 303)*

Attendance Policy, Class Expectations, and Make-Up Policy

Regular in-class attendance is expected. In-class activities may be required and graded for credit, which may or may not be announced ahead of time. Make-up activities will be available for some prior approved absences. Additional accommodations or make-up activities will be accommodated only at instructor discretion.

When in class, all personal communication devices should be off or set to silent.

Homework assignments will be accepted with a 50% penalty if submitted within 24 hours after the deadline. This applies only to assignments in the "Homework Assignments" category on CANVAS. Any additional accommodations will be considered on a case-by-case basis.

Students are expected to have access to a personal computer and regularly monitor both email and CANVAS for class communications.

If students have a planned absence of academic relevance or otherwise, reach out to instructor directly, via direct

message on CANVAS more than one week ahead for any requested accommodations or extensions. Face-to-face conversations, while welcome, do not replace written notification. For emergency and medical absences, please notify instructor via CANVAS prior to the missed class times for notification and requested accommodations or extensions. Any requested accommodations or extensions will be assessed on a case-by-case basis with a concerted effort towards equity. Types of requests which, for example, will be given consideration may include, but are not limited to: illnesses, research conference travel, university sports competitions, design team competitions, or funeral services.

Evaluation of Grades

Assignment	**Total Points**	**Percentage of Final Grade**
Homework Sets (3-6)	100 each	40%
Lecture Reviews (6-12)	Variable value	15%
Applications Assignments (quantity TBD)	Variable value	15%
Exam I	100	15%
Final Exam	100	15%
		100%

Subject to change.

Grading Policy

Percent	**Grade**	**Grade Points**
93.34 - 100	A	4.00
90.0 - 93.33	A-	3.67
86.67 - 89.99	B+	3.33
83.34 - 86.66	B	3.00
80.00 - 83.33	B-	2.67
76.67 - 79.99	C+	2.33
73.34 - 76.66	C	2.00
70.00 - 73.33	C-	1.67
66.67 - 69.99	D+	1.33
63.34 - 66.66	D	1.00
60.0 - 63.33	D-	0.67
0 - 59.9	E	0.00

More information on UF grading policy may be found at:
Grades and Grading Policies

Academic Policies & Resources

To support consistent and accessible communication of university-wide student resources: Here is a link to academic policies and campus resources: https://go.ufl.edu/syllabuspolicies.

Commitment to a Positive Learning Environment

The Herbert Wertheim College of Engineering values varied perspectives and lived experiences within our community and is committed to supporting the University's core values.

If you feel like your performance in class is being impacted, please contact your instructor or any of the following:

- Your academic advisor or Undergraduate Coordinator
- HWCOE Human Resources, 352-392-0904, student-support-hr@eng.ufl.edu
- Pam Dickrell, Associate Dean of Student Affairs, 352-392-2177, pld@ufl.edu