

Syllabus for ENGR/CEE/MAE 80: DYNAMICS
Spring 2024

Catalog Data: **ENGR/CEE/MAE 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. Prerequisite: MATH 2D and Physics 7C . School of Engineering majors have first consideration for enrollment. (Design units: 0.5)

Course Website: Canvas(<https://canvas.eee.uci.edu>)

Time/Location: Class meets Tuesdays and Thursdays from 8:00AM - 9:20AM in the McDonnell Douglas Engineering Auditorium (MDEA). Class, discussions, and office hours will be held in person as listed in the Schedule of Classes.

Instructor: David Copp, Ph.D.
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Textbook: *Vector Mechanics for Engineers: Dynamics, 12th Edition*, by Beer, Johnston, Cornwell, and Self. An older edition would be fine.

Prerequisites: MATH 2D and Physics 7C. MAE 30 or CEE 30

Topics:

- Particle and rigid body motion, based on elementary laws of physics.
- Force and momentum concepts, conservation of energy, as well angular momentum and rotation for more complicated systems and simple models of real life mechanisms (cranes, robots, etc).
- The relationships between force/moment applied and the desired motion and rotation, for use in design and analysis of engineering systems.

Discussion Sessions: Discussion sessions will be held every week, except weeks 1 and 9. Please see your schedule for the time and location of your particular section. In these discussion sections, the TA will go over example problems, and you will work in small groups. Attendance will be taken in each of the discussion sessions; attending four discussion sections will earn a token, so two tokens can be earned during the quarter for attending discussion sections.

Office Hours: Office hours will be posted on the course Canvas page. You are encouraged to attend to ask questions and work on problems together.

Learning Objectives: By the end of the course, students will be able to...

1. translate polar coordinates to arbitrary i, j, k coordinates
2. take the derivative of a rotating unit vector
3. translate rotating vectors to fixed coordinate system vectors
4. define the correct direction for the force of friction
5. determine the motion/distance traveled/velocity of a particle using kinematic relations
6. determine the motion/distance traveled/velocity of a rigid body using kinematic relations
7. draw free body diagrams and equate forces and motion (apply Newton's 2nd Law) for
 - a single particle
 - systems of particles
 - rigid bodies
8. apply physical constraints to reduce number of unknowns
9. apply the work and energy principle to
 - a single particle
 - systems of particles
 - rigid bodies
10. apply impulse and momentum techniques (with impulse-momentum diagrams) to
 - a single particle
 - systems of particles (including collisions using coefficient of restitution)
 - rigid bodies
11. calculate the work done, and use correct sign for work done, on/by a particle
12. apply the "no slip" condition and describe how it relates to friction
13. define body-fixed coordinate systems in 2D and 3D

Computer Usage and Communication: Canvas will be used for posting and uploading all course materials, including notes, homework, etc. Class, discussion sessions, and office hours will be held in person. Details are available on Canvas. Students are highly encouraged to interact asynchronously any time using the course's Ed Discussion.

Grading Criteria: Course grades will be determined according to the criteria in the "Grade Tracker" below. Please see the Canvas assignments for detailed rubrics and criteria for passing the assignments.

Assignments: *Homework:* Eight weekly homeworks will be assigned and submitted on Canvas. A token can be used to receive a 48-hour extension on the homework due date. This can be done up to three times.

Homework quizzes: Students will work on weekly homework quizzes together during class time. These quizzes will cover material from the previous week's homework problems to assess comprehension of the problem solutions. They will be Canvas quizzes with multiple choice questions. **Everyone receives two attempts on all homework quizzes.**

Concept Quizzes: Students will complete eight weekly concept quizzes on Canvas outside of class. These will be timed quizzes with multiple choice questions related to the concepts discussed in class each week.

Retakes: A token can be used to retake a concept quiz. The retakes will be timed Canvas quizzes done outside of class. Retakes are only allowed within one week of the quiz due date. A total of three concept quiz retakes are allowed.

Mini Exam Questions: There will be three mini exams given during the quarter, each with two free response problems to solve. Students who have a legitimate reason for missing a mini exam, and communicate with Prof. Copp *prior* to the exam, may be able to arrange an alternative solution. Out of fairness to other students, Prof. Copp cannot accommodate conflicts that are disclosed *after* the exam is given. One double-sided 8.5in×11in page of notes may be used during the mini exams. No other material is allowed.

Retakes: A token can be used to retake a mini exam question (1 allowed per mini exam). The retakes will be timed Canvas quizzes (with free response questions for which you will upload your work) done outside of class. Retakes are only allowed within two weeks after the mini exam date.

Prof. Copp's Engr/MAE/CEE 80 Grade Tracker

**Your grade is the highest category for which you meet all criteria.
See Canvas for each assignment's completion criteria/rubrics.**

Assessments

- ✓ 8 Homeworks (HWs)
- ✓ 5 Homework Quizzes (HQs)
- ✓ 8 Concept Quizzes (CQs)
- ✓ 6 Mini Exam Questions (MEQs)

Letter Grade

A

- Pass 8 HWs
(6 high pass)
- Pass 5 HQs
- Pass 8 CQs
(6 high pass)
- Pass 6 MEQs
(5 high pass)

B

- Pass 7 HWs
(5 high pass)
- Pass 4 HQs
- Pass 7 CQs
(5 high pass)
- Pass 5 MEQs
(4 high pass)

C

- Pass 6 HWs
(4 high pass)
- Pass 3 HQs
- Pass 6 CQs
(4 high pass)
- Pass 4 MEQs
(3 high pass)

D

- Pass 5 HWs
(2 high pass)
- Pass 2 HQs
- Pass 5 CQs
(2 high pass)
- Pass 3 MEQs
(2 high pass)

Add a (+) to Letter Grade

- No more than 1 MEQ retake

Add a (-) to Letter Grade

- 3 MEQ retakes

Token System

Redeem tokens for:	Cost (# of tokens):	# of opportunities:	
48-hour HW extension	1	3	<input type="checkbox"/>
CQ retake	1	3	<input type="checkbox"/>
MEQ retake	1	3 (1 MEQ per exam)	<input type="checkbox"/>
Everyone starts with 2 tokens. Earn more by:		# of tokens earned:	
Completing how I earned an "A" assignment		3	
Completing mid-quarter course evaluation		1	
Completing course surveys		1	
Attending 4 discussion sections		1 (plus another 1 for attending all 8 sections)	

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Quarter and Weekly Schedules (tentative):

Week number	Week of	Monday	Tuesday	Wednesday	Thursday	Friday
1	March 31		Class 1 (Ch 11) HW1 assigned		Class 2 (Ch 11)	
2	April 7	Discussion Ch 11 concept quiz	Class 3 (Ch 12) HW1 due, HW2 assigned		Class 4 (Ch 12) HW1 quiz	
3	April 14	Discussion Ch 12 concept quiz	Class 5 (Ch 13) HW2 due, HW3 assigned		Class 6 (Ch 13) HW2 quiz	
4	April 21	Discussion Ch 13 concept quiz	Class 7 (Ch 14) HW3 due, HW4 assigned		Mini Exam 1 (Ch 11-13)	
5	April 28	Discussion	Class 8 (Ch 14)	Ch 14 concept quiz	Class 9 (Ch 15) HW4 due, HW5 assigned	
6	May 5	Discussion	Class 10 (Ch 15) HW4 quiz	Ch 15 concept quiz 1	Class 11 (Ch 15) HW5 due, HW6 assigned	
7	May 12	Discussion	Class 12 (Ch 15) HW5 quiz	Ch 15 concept quiz 2	Class 13 (Ch 16) HW6 due, HW7 assigned	
8	May 19	Discussion	Mini Exam 2 (Chp 14-15)		Class 14 (Ch 16)	
9	May 26	Holiday Ch 16 concept quiz	Class 15 (Ch 17) HW7 due, HW8 assigned		Class 16 (Ch 17) HW7 quiz	
10	June 2	Discussion Ch 17 concept quiz	Review Ch 16-17 HW8 due		Mini Exam 3 (Ch 16-17)	
Finals week	June 9		No Final Exam			

Course Policies

Mental Health: Student life can cause stress and anxiety. If you are experiencing symptoms that are affecting your performance in this class, please come talk with me. You need not share any details with me, but I am here to point you to resources on campus that can help. You can get help by calling (949) 824-6457 or visiting the Counseling Center at 203 Student Services I. For more information, please visit <http://www.counseling.uci.edu>.

Class Discussion: Students are expected to participate actively in class and discussion sections. When students share ideas and experiences, all students benefit.

Equity and Respect: In this course, I encourage you to examine your perspectives and values as individuals, students, and aspiring professionals situated in a variety of contexts. As we experience self-discovery and learn about one another, I encourage everyone to strive for a classroom climate where differences are acknowledged, respected, and appreciated. Our classroom must be open and hospitable to all members of the class, and we will strive to practice the attitudes and behaviors characteristic of professionals.

Additionally, students should expect the instructor and TA to treat them professionally and with respect. Students are encouraged to attend office hours and, in all interactions, should have their questions and concerns taken seriously. We will also do our best to give timely and appropriate feedback on all assessments.

Profanity, hate speech, and all other derogatory language is strictly prohibited in all course interactions (in class, Ed discussion, etc.) and will not be tolerated.

Electronic Devices: You are expected to bring an electronic device (laptop, phone, tablet) to every class in order to complete in-class activities. You may use your laptop and/or tablet computer for work related to this course during class. Please silence your cell-phones for the duration of each class period.

Emergency Provisions: In the event of a campus emergency, course requirements, deadlines, and grading percentages may be subject to change due to a revised term calendar or other circumstances. Here are ways to get information about changes in this course: Canvas course web page, instructor's e-mail, and instructor's office phone.

University Policies

We will follow all UC and UCI polices as described by the University Registrar (<https://www.reg.uci.edu/navigation/policies.html>).

Academic Integrity Policy: “All academic integrity cases will be processed through the Office of Student Conduct under the Academic Honesty Policy.” Please see the Academic Integrity Policy (<https://aisc.uci.edu/students/academic-integrity/>).

Students with Disabilities: “The UCI Disabilities Services Center (DSC) is the office designated to address the needs of students with disabilities and their appropriate accommodations. Students are charged with the responsibility to inform faculty of their accommodation needs in a timely manner and may do so via the verification letter listing appropriate accommodations. Faculty and instructors are obligated by law and this policy to facilitate appropriate accommodations and may be responsible for providing elements of accommodations.” (Please visit <http://senate.uci.edu/uci-academic-senate-manual/part-iii-appendices/#appendixVI>).

If you are a person with special circumstances that may affect your class performance (e.g., visual, hearing, or learning disabilities, language differences, etc.), please let me know so that we can discuss and make appropriate accommodations.

Religious Accommodation and Religious Observance “In accordance with California State Education Code section 92640, it is the policy of the Irvine campus that an instructor will make a reasonable attempt to accommodate student needs in the case of serious incompatibility between a student’s religious creed and a scheduled test or examination. Accommodation for alternative examination dates will be worked out directly and on an individual basis between the student and the instructor involved. Students should make such requests of the instructor during the first two weeks of an academic term, or as soon as possible after a particular examination date is announced by the instructor.” (<https://www.reg.uci.edu/grades/accommodation.html>)

Incomplete Grades: “The grade Incomplete (I) may be assigned when a student’s work is of passing quality but is incomplete for good cause. The student must make arrangements with their instructor to complete the coursework within a period of no more than 12 months following the term in which the grade Incomplete was originally awarded, or prior to the end of the quarter immediately preceding award of the degree, whichever comes first. The instructor is not obligated to allow the maximum time period. The student should not reenroll in the course to make up the Incomplete.” Please visit <https://www.reg.uci.edu/grades/gradingpolicy.html> for more information.