University of Texas at Dallas
Department of Mechanical Engineering

MECH 2330 Dynamics

Course Information

Course number	MECH 2330
Term	Spring 2024
Lectures	Monday & Wednesday, 8:30 am – 9:45 am, JO 4.102
Instructor	Professor Xinchen Ni, xinchen.ni@utdallas.edu (Office hours: Wednesday, 1 pm – 2 pm, ECSW 3.150A)
TA	Sri Dutta Akhil Atchyutuni, atchyutuni.akhil@utdallas.edu
Prerequisites	MECH 2310. Pre/Co-requisites: MATH 2340 or ENGR 2300 or equivalent

Course Description

We will have discussions on kinematics and kinetics of particles, planar rigid bodies, three-dimensional rigid bodies, and equations of motion. We will study methods/analysis utilizing force and acceleration, momentum principles, and work and energy to understand dynamical systems. (Time permitting) Lagrange method, single degree of freedom vibration systems, and computational engineering tools will be introduced.

Course Learning Outcomes

Students finishing this course will be able to:

- Apply and interpret the momentum principles to systems of particles and rigid body dynamic systems.
- Apply and interpret the work and energy principles to systems of particles and rigid body dynamic systems.
- Apply Newton's law to derive equation of motion and solve dynamic system problems.
- Demonstrate the ability to apply all the above to realistic dynamic systems and engineering mechanisms and simulate dynamical systems using modern engineering tools.

Required Textbook and Online Registration

Engineering Mechanics: Statics & Dynamics, R.C. Hibbeler (15th edition).

You might purchase either the eText, hard cover, or loose-leaf version. Along with the copy of the textbook, you are required to be enrolled in Pearson's MyLab & Mastering Engineering to complete HW assignments. Click the "Pearson's Mastering Engineering" link on eLearning to enroll. You will need to purchase the access code or use the one that is available with your copy of the textbook (you can use the access code that you purchased earlier in MECH 2310). Please enroll ASAP but no later than January 23 and resolve any difficulties in accessing Mastering Engineering with the TA. Textbooks can be ordered online or purchased at the UT Dallas Bookstore.

There also exists a wealth of materials online to help you study. We highly recommend the following resources:

- MIT's OCW lectures (2.003SC Fall 2011, Professors Vandiver and Gossard), with excellent videos, notes, and problems.
- Highlights of Calculus by Professor Strang. Calculus is required for this class. These short videos capture the essence of calculus without all the heavy math.

eLearning

All documents (handouts, homework, solutions, announcements, etc.) will be posted on the course's eLearning website. Please check this website regularly for announcements, corrections, etc.

Grading Policy

Quiz 1	30%
Quiz 2	30%
Quiz 3	30%
Homework	5%
Participation	5%

Quizzes

- There will be three in-class quizzes during the semester. There will be no final exam.
  - Quiz 1 will be given in class on Wednesday, February 14
  - Quiz 2 will be given in class on Wednesday, March 27
  - Quiz 3 will be given in class on Wednesday, May 1
- The quizzes are pencil-and-paper and closed-book (equation sheets, if necessary, will be provided). You will not need a calculator.
- Special accommodation requests must be submitted with an approved letter from the AccessAbility Resource Center. It is preferable to submit the requests in the first two weeks of the semester, but they must be submitted at least two weeks prior to the scheduled quiz date.
- Missed tests due to health reasons or family/other emergencies must be supported by acceptable documentation to be considered for make-up arrangements. It will be dealt with on a case-by-case basis by the instructor. Acceptable excuses will be rare. A grade of zero will be assigned for unexcused missed tests.
- After the final exam, no remedial measures can be given to improve the grade. Students are expected to monitor their progress to assess where they stand in the course based on the grading policy above.

Homework

- Homework is typically assigned on Wednesdays (via eLearning) and is due by 11:59pm on the following Tuesdays.
- We do NOT accept any late submissions. For conflicts known in advance (such as religious holidays or travel) homework should be turned in before the deadline. Illness or emergencies must be documented if you want to excuse a late homework. It will be dealt with on a case-by-case basis by the instructor. Acceptable excuses will be rare.
- To allow for unforeseen circumstances (such as work overload, an annoying headache, forgetting to turn in the p-set on time, etc., etc.), one problem set, either an omitted set or

the one with the lowest score, will be removed from the calculation of the homework average.

- We strongly encourage collaboration in studying and on problem sets in this course. There is much to be gained in sharing the learning process with your peers. However, the final submission should represent your own solution to the problem. The short-answer format of eLearning and Mastering Engineering may tempt some of you to take the low road (i.e., copy your friend or use previous year's solution), but you will do much better on the quizzes if you make a real effort on the problem sets.

Participation

Students are required to attend lectures on time. Tests/exam may include material exclusively (not in the textbook) covered during lectures. During a lecture, the instructor will assume that students had been present for previous lectures as it relates to continuity of discussions. Your participation will be assessed based on your attendance at lectures, your interactions with the TA and instructor during office hours or other contacts.

Final grades

Instructors reserve the right to flex the grade range slightly to accommodate "borderline" students who have demonstrated efforts towards success in the course to the next higher grade.

Topics for Study

Major Topics

- Particle kinematics: position, velocity and acceleration, 2D/3D trajectories, curvilinear motion, generalized coordinates, degrees of freedom, constraints.
- Particle kinetics: force analysis, equations of motion, momentum principles, work and energy principle.
- Rigid body kinematics: translation, rotation, general motion.
- Rigid body kinetics: moments of inertia, equations of motion, momentum principles, work and energy principle.

Advanced Topics (time-permitting):

- Lagrangian method, vibrations, 3D dynamics

Course Policy

Basic classroom etiquette

We expect every student to observe basic classroom etiquette – i.e., arrive on time, raise your hand to speak, turn off/silence your cellphone, etc. The bottom line is that you should be respectful to your classmates and your instructor. If you need to do something that might disrupt the lecture, please do so outside of the classroom.

Notetaking

Old-fashioned pencil-and-paper is recommended for notetaking. Alternatively, students may also choose to use write on their tablets/laptops if this is their preferred method of learning. Being lazy and simply taking photos of the whiteboard/projector is not allowed. Tablets/laptops should be used for course-related activities only.

Class Recordings

Students are prohibited from recording any part of this course except to implement an approved AccessAbility Resource Center accommodation. Failure to comply with these University requirements is a violation of the Student Code of Conduct.

Class Materials

The instructor may provide class materials that will be made available to all students registered for this class as they are intended to supplement the classroom experience. These materials may be downloaded during the course; however, these materials are for registered students' use only. Classroom materials may not be reproduced or shared with those not in class or uploaded to other online environments except to implement an approved AccessAbility Resource Center accommodation. Failure to comply with these University requirements is a violation of the Student Code of Conduct.

Statement on Academic Honesty and Collaborations

The fundamental principle of academic integrity is that you must fairly represent the source(s) of intellectual content in the work you submit for credit. Students are trusted to adhere to this principle and its meaning in the context of this course as subsequently explained. Official Institute policy regarding academic honesty can be in this link: https://conduct.utdallas.edu/integrity/. In general, we expect students to adhere to basic, common-sense concepts of academic honesty. Presenting another's work as if it were your own, or cheating in exams will not be tolerated. The appropriate authorities at UTD will be notified in cases of academic dishonesty.

What about homework assignments? Can we work together? Students are highly encouraged to work together in this course to understand the homework assignments, to prepare for quizzes, and to learn in general. There is much to be gained in sharing the learning process with your peers. The following is a fruitful (and acceptable) form of collaboration: discuss with your classmates about possible approaches to solving the problems, and then have each one work out the details and write her/his solution independently. An unacceptable form of dealing with homework is to copy a solution that someone else has written.

More specific guidelines, geared towards online problem sets are as follows:

- Given a problem, it is ok to discuss the general approach to solving the problem.
- You can work jointly to come up with the general steps for the solution.
- It is ok to get a hint, or several hints for that matter, if you get stuck while solving a problem.
- You should work out the details of the solution yourself.
- It is not ok to take someone else's solution and simply copy the answers from their solution into your checkboxes.
- It is not ok to take someone else's formula and plug in your own numbers to get the final answer.
- It is not ok to post answers to homework problems before the submission deadline.
- It is not ok to look at a full step-by-step solution to a problem before the submission deadline.
- It is ok to have someone show you a few steps of a solution where you have been stuck for a while, provided, of course, that you have attempted to solve it yourself without success.

- After you have collaborated with others in generating a correct solution, a good test to see if you were engaged in acceptable collaboration is to make sure that you are able to re-solve the problem on your own.

Comet Creed

This creed was voted on by the UT Dallas student body in 2014. It is a standard that Comets choose to live by and encourage others to do the same. *"As a Comet, I pledge honesty, integrity, and service in all that I do."*

Academic Support Resources

The information contained in the following link lists the University's academic support resources for all students. Please see http://go.utdallas.edu/academic-support-resources.

UT Dallas Syllabus Policies and Procedures

The information contained in the following link constitutes the University's policies and procedures segment of the course syllabus. Please review the catalog sections regarding the credit/no credit or pass/fail grading option and withdrawal from class. Please go to http://go.utdallas.edu/syllabus-policies for these policies.

The descriptions and timelines contained in this syllabus are subject to change at the discretion of the instructor.