ME 2202-A: Dynamics of Rigid Bodies, Spring 2026

Credit Hours: 3 semester credit hours

Prerequisites: COE 2001 Statics (C or better). COE 2001, in turn, requires satisfactory completion of PHYS 2211 and MATH 1552. Co-requisite MATH 1553 Linear Algebra or equivalent.

Catalog Description: Kinematics and kinetics of particles and rigid bodies in one, two, and three dimensions. Newton-Euler equations. Work-energy and impulse-momentum principles.

WileyPLUS Textbook: (See Canvas Module "Wiley Textbook Purchase Instructions")

Bookstore ISBN Options **Meriam**, ***Engineering Mechanics: Dynamics, 9e***

9781119501473 –WileyPLUS one-term access ($66)

9781119724216 - WileyPLUS one-term access + loose leaf text

Instructor: Prof. Tony Chen, Rm 438, GTMI. Email: tonygchen@gatech.edu

Summary of Office Hours:

TBD

Recitation or Problem-Solving Sessions: TBD

Further information on Recitation Sections and TA Office Hours:

TBD

The recitation for this section is held on Friday at 12:30pm-1:45pm, Howey S204

Recitations are a 0 credit hour course with no impact on GPA/tuition - It's here simply as a resource for learning the material better (sign up on Oscar before Drop/Add ends on Friday, January 10th)

Course Topics:

1. Particle motion - kinematics and kinetics
2. Planar kinematics of rigid bodies
3. Newton-Euler analysis of planar rigid body systems
4. Angular velocity in three dimensions
5. Angular acceleration in three dimensions
6. Euler angles
7. Rotation matrices
8. Angular momentum

9. Inertia properties
10. Principal moments and axes of inertia
11. Euler equations - 3D rotational motion of rigid bodies
12. Impact - impulse-momentum principles for rigid bodies
13. Work-energy analysis of conservative and nonconservative rigid body systems

Course Outcomes

Outcome 1: Students will learn the basic principles underlying the dynamics of rigid bodies in planar and 3D motion.

1.1 Students will demonstrate an understanding of Newtonian-Eulerian physics and basic equations underlying kinematics and kinetics of rigid bodies in 2D and 3D motion.

Outcome 2: Students will demonstrate the ability to identify, formulate and solve engineering problems in rigid body dynamics.

2.1 Students will demonstrate the ability to isolate rigid bodies and to draw clear and appropriate free body diagrams.

2.2 Students will demonstrate an ability to identify and effectively account for kinematic constraints such as rolling and/or sliding, and their kinetic consequences.

2.3 Students will demonstrate that they can determine the mass moments and products of inertia for arbitrary rigid bodies.

Outcome 3: Students will demonstrate an understanding of the concepts of work-energy and impulse-momentum for rigid body systems.

3.1 Students will demonstrate an understanding of work-energy principles as applied to rigid bodies in 2D and 3D motion.

3.2 Students will be able to evaluate the kinetic energy of rigid bodies as well as the potential energy associated with gravity and spring forces.

3.3 Students will demonstrate an understanding of conservation laws for momentum and energy.

3.4 Students will demonstrate an ability to apply impulse-momentum relations where appropriate.

3.5 Students will demonstrate that they can utilize coefficient of restitution data in the solution of impact problems in rigid-body dynamics.

Course Modality Information

Section A of ME 2202 will be taught in "residential mode." Dr. Ferri will deliver lectures in person in the classroom. While attendance will not be mandatory, students are encouraged to take advantage of this opportunity to interact with the instructor and with peers through active learning. All homework assignments will be submitted through

Canvas. Tests and Exams will be closed-book and closed-notes and will take place in-person in the classroom. Weekly office hours will either take place in Dr. Ferri's office, or in the Love Atrium.

Grading:

1. Hourly Test 1 (25%)
2. Hourly Test 2 (25%)
3. Final Exam (35%)
4. HW (15%)

Grading Scale:

Final letter grades will be assigned based on a standard cutoff scale:

A 90-100%
B 80-89%
C 70-79%
D 60-69%
F 0-59%

Homework Assignments:

Over the course of the semester, there will be approximately 10 homework assignments worth 10 points each. Homework assignments will be distributed via pdf files posted to Canvas. Working in groups is allowed but each student must turn in their own work. The homework assignments are designed to help you to learn the material. Experience has shown that if you do not put in sufficient effort, or if you are relying too heavily on the aid of others in your study-group, it will negatively impact your test and exam grades. Solutions to the homework will be posted to Canvas after the due-date is past; it is your responsibility to review these solutions in detail and to compare them with your returned homework.

All homework assignments will be submitted electronically using Canvas. All homework submissions must be consolidated into a single pdf file that contains all hand-written work, computer codes/scripts, figures, etc.

Late Policy: HW assignments are due at 11:59pm on their respective due dates. These assignments may be turned in after the deadline, but you will be eligible for fewer points once the deadline has passed: Unless you have been granted an extension or accommodation, a late penalty of 2 points will be assigned for each day that the HW is late. HW submitted after the solution has been posted will receive a 50% late penalty.

Academic Integrity:

Academic honesty is essential to achieve a high-quality education and to maintain the value of a Georgia Tech diploma. While I encourage you to work together and to form study groups, it is important that you take responsibility for the content of all

assignments. Cheating on tests and final exams will be reported to the Georgia Tech Office of Student Integrity. A valuable resource for the Georgia Tech Student Code of Conduct and the Academic Honor Code is: http://www.policylibrary.gatech.edu/student-affairs/academic-honor-code

Student use of Artificial Intelligence

Generative AI (GenAI) and other tools have tremendous capability and are growing in performance and availability every day. Engineers are increasingly using GenAI tools in industry as well as research and development. That being said, our goal in ME2202 is to learn the fundamental principles of dynamics so that our graduates are competent in being able to predict and design the motion of mechanical systems and to know the foundational principles of kinematics and kinetics. Engineers must not only know how to get an answer to a "textbook problem," but must understand which techniques to use, how and when to use different approaches, and the requirements and limitations of each method. Engineers must also understand the ethical and societal issues surrounding the work that they perform. GenAI, while powerful, does not always appreciate the nuances of various techniques, nor does it always give correct answers. Thus, the use of GenAI, like the use of any other educational resources, must be done responsibly in order to meet the course learning objectives. Overreliance on any learning resource may result in inadequate understanding of the material, and may hurt a student's performance on closed-book, closed-note tests and exams. In the end, true understanding of engineering principles comes only thorough practice and experience, which I am committed to help you achieve.

Accommodations for Students with Disabilities

If there are aspects of the instruction or design of this course that result in barriers to your inclusion or accurate assessment of achievement, please notify me as soon as possible so we can resolve the issue. Students with disabilities should also contact the Office of Disability Services (ODS), whose purpose is to collaborate with students, faculty, and staff to create a campus environment that ensures all students have an equal opportunity to access the Georgia Tech community. ODS can be reached at 404.894.2563, dsinfo@gatech.edu, or disabilityservices.gatech.edu Please contact me ahead of time to discuss any issues related to disabilities. I am happy to work with you.

Review and Supplemental Material

If you would like to have some additional practice with 2D and 3D dynamics, please check out the two Coursera courses created by Dr. Wayne Whiteman. Access them at: https://www.coursera.org/learn/dynamics and https://www.coursera.org/learn/motion-and-kinetics

Absence From Class:

Attendance is not required, but is strongly recommended. Please, do not come to class if you are feeling ill. In the case of illness and/or family emergencies, it may be necessary for you to delay tests or you may need additional time to complete homework

assignments. In these cases, please work with the Office of VP for Student Life (Dean of Students) with documentation that supports your situation. If the illness or family emergency is deemed serious enough, the Dean's office will then contact me and your other instructors with recommendations on how to proceed. Students who miss a deadline or test date because of participation in a particular religious observance will be permitted to make up the work missed during their absence with no late penalty, provided the student informs me of the upcoming absence, in writing, within the first two weeks of class, and provided the student makes up the missed material within the established timeframe.

Student-Faculty Expectations:

At Georgia Tech we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. See this catalog page for an articulation of some basic expectation that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.

Campus Resources for Students:

The following link lists many important resources that you should investigate as needed:

https://ctl.gatech.edu/sites/default/files/documents/campus_resources_students.pdf

Mental Health and Wellness:

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, depression, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. GT offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know is experiencing any of the issues noted above, consider utilizing the confidential mental health services available on campus. I encourage you to reach out to GT CARE (www.care.gatech.edu, 404-894-3498) or the Counseling Center (www.counseling.gatech.edu, 404-894-2575) for support. An on-campus counselor or after-hours services are available to assist you.