

- **Instructor**

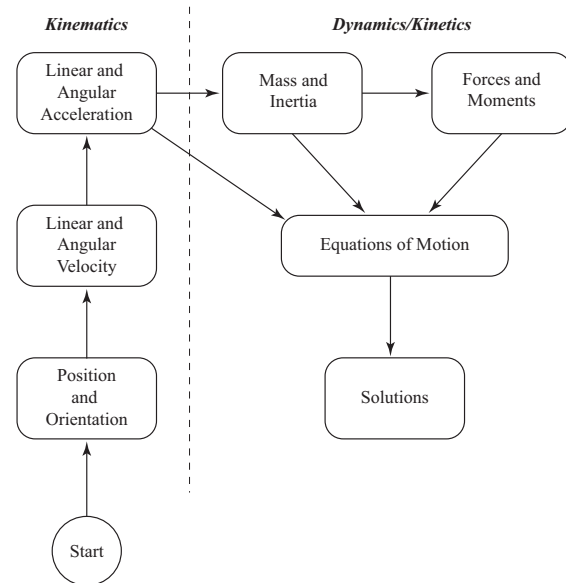
- Alan Bowling
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Office Hours: Tuesday 11am-12:30pm and 4-5pm
and by appointment

- **Teaching Assistant**

- TBA

- **Course Specifics**

- MAE 2323-001
T TH 9:30-10:50am
Nedderman 202
Web Site: elearn.uta.edu



- **Course Overview**

Dynamics is the study of how to model and predict the effect of forces in the creation of motion. This course is intended to give students a clear understanding of how to use reference points, reference frames, and coordinates to develop coordinate systems in which two-dimensional, planar, motion can be described and analyzed. This description allows one to predict how the position of points comprising bodies move over time due to the influence of external forces. The key mathematical tools involved in developing this description are vectors and matrices manipulated using techniques from linear algebra and vector calculus. These tools are used to develop the equations of motion for a system of particles or rigid bodies using vector mechanics and energy-based methods. The course also examines impulse-momentum principles that are often used to analyze collisions.

- **Course Content**

Geometry of position and orientation, translational and rotational velocity and acceleration, kinematics, mass and moments of inertia, kinetics, equations of motion, Newton's Laws, Euler's Laws, Euler's equations, impulse-momentum principles, vector algebra.

- **Student Learning Outcomes**

By the end of this course students should be able to:

- use reference points and frames as a basis for developing a description of a rigid bodies position and orientation in space
- describe the position and orientation of rigid bodies in terms of position vectors and orientation relations
- differentiate position and orientation descriptions to find velocities and accelerations
- express the mass properties of a rigid body in terms of moments and products of inertia
- draw free body diagram and analyze the sum of forces and moments on a rigid body
- develop equations of motion for a system of rigid bodies using Newton-Euler dynamics
- apply conservation laws to the analysis of the motion of a system of rigid bodies
- apply the principles of Impulse and Momentum to analysis of collisions

- **Course Materials**

- *Optional (strongly encouraged):* “Vector Mechanics: A Systematic Approach”, Alan Bowling, Third Edition, Aqualan Press, LLC, 2017.
- *Optional:* “Engineering Mechanics Dynamics”, R. C. Hibbeler, Thirteenth Edition, Pearson Prentice Hall, 2012. Copies of this textbook are on reserve in the engineering library.
Homework problems will be assigned from the Hibbeler book.

- **Major Assignments and Examinations (tentative)**

Test 1	September 28	7:30-9:00pm	GACB 105
Test 2	October 26	7:30-9:00pm	GACB 105
Test 3	November 30	7:30-9:00pm	GACB 105
Final Exam	December 14	8:00-10:30am	NH 202

The final exam date and time cannot be changed, except in very extreme cases.

- **Attendance** At The University of Texas at Arlington, taking attendance is not required but attendance is a critical indicator in student success. Each faculty member is free to develop his or her own methods of evaluating students academic performance, which includes establishing course-specific policies on attendance. As the instructor of this section, I do not record attendance, but it is recommended that students attend class. However, while UT Arlington does not require instructors to take attendance in their courses, the U.S. Department of Education requires that the University have a mechanism in place to mark when Federal Student Aid recipients begin attendance in a course. UT Arlington instructors will report when students begin attendance in a course as part of the final grading process. Specifically, when assigning a student a grade of F, faculty report the last date a student attended their class based on evidence such as a test, participation in a class project or presentation, or an engagement online via Blackboard. This date is reported to the Department of Education for federal financial aid recipients.

- **Grading Policy**

1. Homework (20%)
2. Test 1 (20%)
3. Test 2 (20%)
4. Test 3 (20%)
5. Final exam (20%)

- **Make-up Exams** I do not offer make-up exams under any circumstances.

- **Expectations for Out-of-Class Study**

Beyond the time required to attend each class meeting, students enrolled in this course should expect to spend a minimum of 9 hours per week of their own time in course-related activities, including reading required materials, completing assignments, preparing for exams, etc.

- **Homework Policy**

Collaboration on homework is encouraged. You may consult outside reference materials, other students, the teaching assistants, and/or the instructor. However, all solutions that are handed in should reflect your understanding of the subject matter at the time of writing.

The homework assignments and solutions will be posted on the course web site. Late homeworks will not be accepted.

- **Grade Grievances**

Objections concerning the grading of homeworks and tests should be raised within one week after they are returned. After one week the grade is permanent. Questions about homework grading should be discussed with the TA first. If the problem cannot be resolved with the TA, then it can be brought to my attention.

- **Code of Conduct**

- No persistent talking during lecture.
- No newspaper reading during lecture.
- No laptops open during lecture unless specifically requested by instructor.

- **Drop Policy** Students may drop or swap (adding and dropping a class concurrently) classes through self-service in MyMav from the beginning of the registration period through the late registration period. After the late registration period, students must see their academic advisor to drop a class or withdraw. Undeclared students must see an advisor in the University Advising Center. Drops can continue through a point two-thirds of the way through the term or session. It is the student's responsibility to officially withdraw if they do not plan to attend after registering. **Students will not be automatically dropped for non-attendance.** Repayment of certain types of financial aid administered through the University may be required as the result of dropping classes or withdrawing. For more information, contact the Office of Financial Aid and Scholarships (<http://wwwb.uta.edu/aao/fao/>).

- **Disability Accommodations** UT Arlington is on record as being committed to both the spirit and letter of all federal equal opportunity legislation, including The Americans with Disabilities Act (ADA), The Americans with Disabilities Amendments Act (ADAAA), and Section 504 of the Rehabilitation Act. All instructors at UT Arlington are required by law to provide reasonable accommodations to students with disabilities, so as not to discriminate on the basis of disability. Students are responsible for providing the instructor with official notification in the form of a letter certified by the Office for Students with Disabilities (OSD). Only those students who have officially documented a need for an accommodation will have their request honored. Students experiencing a range of conditions (Physical, Learning, Chronic Health, Mental Health, and Sensory) that may cause diminished academic performance or other barriers to learning may seek services and/or accommodations by contacting:

The Office for Students with Disabilities, (OSD) wwwb.uta.edu/disability or calling 817-272-3364. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at wwwb.uta.edu/disability.

Counseling and Psychological Services, (CAPS) wwwb.uta.edu/caps/ or calling 817-272-3671 is also available to all students to help increase their understanding of personal issues, address mental and behavioral health problems and make positive changes in their lives.

- **Non-Discrimination Policy** The University of Texas at Arlington does not discriminate on the basis of race, color, national origin, religion, age, gender, sexual orientation, disabilities, genetic information, and/or veteran status in its educational programs or activities it operates. For more information, visit uta.edu/eos.
- **Title IX Policy** The University of Texas at Arlington (University) is committed to maintaining a learning and working environment that is free from discrimination based on sex in accordance with Title IX of the Higher Education Amendments of 1972 (Title IX), which prohibits discrimination on the basis of sex in educational programs or activities; Title VII of the Civil Rights Act of 1964 (Title VII), which prohibits sex discrimination in employment; and the Campus Sexual Violence Elimination Act (SaVE Act). Sexual misconduct is a form of sex discrimination and will not be tolerated. For information regarding Title IX, visit wwwb.uta.edu/titleIX or contact Ms. Jean Hood, Vice President and Title IX Coordinator at (817) 272-7091 or jmhood@uta.edu.
- **Academic Integrity** Students enrolled all UT Arlington courses are expected to adhere to the UT Arlington Honor Code:

I pledge, on my honor, to uphold UT Arlingtons tradition of academic integrity, a tradition that values hard work and honest effort in the pursuit of academic excellence.

I promise that I will submit only work that I personally create or contribute to group collaborations, and I will appropriately reference any work from other sources. I will follow the highest standards of integrity and uphold the spirit of the Honor Code.

UT Arlington faculty members may employ the Honor Code in their courses by having students acknowledge the honor code as part of an examination or requiring students to incorporate the honor code into any work submitted. Per UT System Regents Rule 50101, 2.2, suspected violations of university standards for academic integrity (including the Honor Code) will be referred to the Office of Student Conduct. Violators will be disciplined in accordance with University policy, which may result in the students suspension or expulsion from the University. Additional information is available at <https://www.uta.edu/conduct/>.

- **Electronic Communication** UT Arlington has adopted MavMail as its official means to communicate with students about important deadlines and events, as well as to transact university-related business regarding financial aid, tuition, grades, graduation, etc. All students are assigned a MavMail account and are responsible for checking the inbox regularly. There is no additional charge to students for using this account, which remains active even after graduation. Information about activating and using MavMail is available at <http://www.uta.edu/oit/cs/email/mavmail.php>.
- **Campus Carry** Effective August 1, 2016, the Campus Carry law (Senate Bill 11) allows those licensed individuals to carry a concealed handgun in buildings on public university campuses, except in locations the University establishes as prohibited. Under the new law, openly carrying handguns is not allowed on college campuses. For more information, visit <http://www.uta.edu/news/info/campus-carry/>
- **Student Feedback Survey** At the end of each term, students enrolled in face-to-face and online classes categorized as lecture, seminar, or laboratory are directed to complete an online Student Feedback Survey (SFS). Instructions on how to access the SFS for this course will be sent directly to each student through MavMail approximately 10 days before the end of the term. Each students feedback via the SFS database is aggregated with that of other students enrolled in the course. Students anonymity will be protected to the extent that the law allows. UT Arlingtons effort to solicit, gather, tabulate, and publish student feedback is required by state law and aggregate results are posted online. Data from SFS is also used for faculty and program evaluations. For more information, visit <http://www.uta.edu/sfs>.
- **Final Review Week** for semester-long courses, a period of five class days prior to the first day of final examinations in the long sessions shall be designated as Final Review Week. The purpose of this week is to allow students sufficient time to prepare for final examinations. During this week, there shall be no scheduled activities such as required field trips or performances; and no instructor shall assign any themes, research problems or exercises of similar scope that have a completion date during or following this week unless specified in the class syllabus. During Final Review Week, an instructor shall not give any examinations constituting 10% or more of the final grade, except makeup tests and laboratory examinations. In addition, no instructor shall give any portion of the final examination during Final Review Week. During this week, classes are held as scheduled. In addition, instructors are not required to limit content to topics that have been previously covered; they may introduce new concepts as appropriate.
- **Emergency Exit Procedures** Should we experience an emergency event that requires us to vacate the building, students should exit the room and move toward the nearest exit. When exiting the building during an emergency, one should never take an elevator but should use the stairwells. Faculty members and instructional staff will assist students in selecting the safest route for evacuation and will make arrangements to assist individuals with disabilities.
- **Student Support Services** UT Arlington provides a variety of resources and programs designed to help students develop academic skills, deal with personal situations, and better understand concepts and information related to their courses. Resources include tutoring, major-based learning centers, developmental education, advising and mentoring, personal counseling, and federally funded programs. For individualized referrals, students may visit the reception desk at University College (Ransom Hall), call the Maverick Resource Hotline at 817-272-6107, send a message to resources@uta.edu, or view the information at <http://www.uta.edu/universitycollege/resources-/index.php>.

• **Course Schedule**

		Lecture	Material	Assign	Due
H	Aug. 24	Introduction, Tools of the trade	Ch. 1		
T	Aug. 29	Points, frames, directions, vectors	Ch. 2		
H	Aug. 31	Position/Orientation		HW1	
T	Sep. 5	Constraints			
H	Sep. 7	Constraints		HW2	HW1
T	Sep. 12	Velocity	Ch. 3		
H	Sep. 14	Velocity		HW3	HW2
T	Sep. 19	Velocity			
H	Sep. 21	Acceleration			HW3
T	Sep. 26	Acceleration			
H	Sep. 28	Test 1 (7:30pm-9:00pm GACB 105)	HW1-HW3	HW4	
T	Oct. 3	Mass and Linear Momentum	Ch. 4		
H	Oct. 5	Inertia and Angular Momentum		HW5	HW4
T	Oct. 10	Inertia and Angular Momentum			
H	Oct. 12	Inertia and Angular Momentum		HW6	HW5
T	Oct. 17	Inertia and Angular Momentum			
H	Oct. 19	Inertia and Angular Momentum			HW6
T	Oct. 24	Forces and Moments	Ch. 5		
H	Oct. 26	Test 2 (7:30pm-9:00pm GACB 105)	HW1-HW6	HW7	
T	Oct. 31	Conservation Laws			
H	Nov. 2	Conservation Laws		HW8	HW7
T	Nov. 7	Eqns. of Motion: Newton-Euler Dynamics	Ch. 6		
H	Nov. 9	Eqns. of Motion: Newton-Euler Dynamics		HW9	HW8
T	Nov. 14	Eqns. of Motion: Newton-Euler Dynamics			
H	Nov. 16	Eqns. of Motion: Impulse-Momentum Theory		HW10	HW9
T	Nov. 21	Eqns. of Motion: Impulse-Momentum Theory			
H	Nov. 23	Thanksgiving			
T	Nov. 28	Eqns. of Motion: Impulse-Momentum Theory			
H	Nov. 30	Test 3 (7:30pm-9:00pm GACB 105)	HW1-HW9		
T	Dec. 5	(Final Review Week)			HW10
H	Dec. 14	Final Exam 8-10:30am			

As the instructor for this course, I reserve the right to adjust this schedule in any way that serves the educational needs of the students enrolled in this course. **This schedule is subject to change without notice.** - Alan P. Bowling