

MAE 3319: Dynamic Systems Modeling and Simulation
Spring 2017

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Office Hours: T-TH 9:30 am-10:50 am and by appointment

Section Information: MAE 3319-001

Time and Place of Class Meetings: Tues-Thurs 8:00-9:20, WH 404

Description of Course Content: This course pertains to mathematical modeling, simulation, and analysis of the dynamics of engineering systems. Lumped parameter models for mechanical, fluid, thermal, electrical, and mixed systems are covered. Methods for laminar and turbulent flow in fluid lines are also covered.

Student Learning Outcomes: This course is intended to teach the students how to formulate simple lumped parameter models for the dynamics of engineering systems and then apply common sense to checking the accuracy of the equations by checking the boundary conditions. Common sense is also used to evaluate the meaning and solution to the differential and algebraic equations representing the models. Emphasis is placed on learning MATLAB algorithms for solving equations and presenting results. Professional methods for reporting results will be taught and required when submitting assignments.

Required Textbooks and Other Course Materials: *Dynamic Systems Modeling and Simulation-13th Edition*, a notebook of lecture materials and solved problems by Professor Hullender, available on Blackboard; a printed copy available at Birds Copies, 208 S. East Street, Arlington 817-459-1688. Call Birds in advance to let them know you want a printed copy.

Recommended additional materials: *Student Ed. of MATLAB* available to be downloaded on your laptop from the University; check with the 'help desk' for details. **Recommended library reference:** *Modeling and Simulation of Dynamic Systems, Robert Woods and Kent Lawrence*, Prentice Hall, 1997

Descriptions of major assignments and examinations In-class examinations will be given; all exams are comprehensive. There are no make-up exams. Should absence from an exam be excused, the final average for the course will be based on one less exam. Unless stated otherwise, all exams are closed book and only a calculator approved by Professor Hullender may be used. Key Assignments will be included as part of the exams but these key assignments no longer must be passed in order to receive a passing grade for the course. **A ten minute quiz over the previous or a recent lecture will be given at the beginning of almost every class.** At the end of the semester, two of the quiz grades will be dropped when computing the quiz grade average; this is to assist the students in case of a necessary absence or late arrival to class.

Attendance: Class and exam attendance is mandatory. Reasons for absence must be documented in writing to the instructor. Homework assignments will be included in computing the final grade; unless otherwise stated, all assignments are due at the beginning of the class on the due date. Late homework submissions will not be accepted. Students are expected to do their own work and to seek help from the teaching assistant or Professor Hullender for proper guidance and overcoming difficulties.

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: There will be 3 in-class exams (75%), quizzes (15%), and homework (10%). All exams are comprehensive; there will not be a final exam during finals week. Letter grades at the end of the semester will be determined by the distribution of the averages of the students in the class. For example, in the case of several high averages, the distribution might be 93-100 for A, 83-92 for B, etc. If the highest averages are in the low 90’s, then the distribution might be 86-94 for A, 76-85 for B, etc. Typically it works out to: 90-100 for A, 80-89 for B, 70-79 for C, etc.

Grade Grievances: Any appeal of a grade in this course must follow the procedures and deadlines for grade-related grievances **as published in the current undergraduate catalog.**

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://www.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) www.uta.edu/disability or calling 817-272-3364. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at www.uta.edu/disability.

Counseling and Psychological Services, (CAPS) www.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 www.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 Arlington's 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's 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 student's 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 student's 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 Arlington's 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, [which is located at the front of](#)

[the room](#). 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>.

The IDEAS Center (2nd Floor of Central Library) offers **free** tutoring to all students with a focus on transfer students, sophomores, veterans and others undergoing a transition to UT Arlington. To schedule an appointment with a peer tutor or mentor email IDEAS@uta.edu or call (817) 272-6593.

The English Writing Center (411LIBR): The Writing Center Offers free tutoring in 20-, 40-, or 60-minute face-to-face and online sessions to all UTA students on any phase of their UTA coursework. Our hours are 9 am to 8 pm Mon.-Thurs., 9 am-3 pm Fri. and Noon-6 pm Sat. and Sun. Register and make appointments online at <http://uta.mywconline.com>. Classroom Visits, workshops, and specialized services for graduate students are also available. Please see www.uta.edu/owl for detailed information on all our programs and services.

The Library's 2nd floor Academic Plaza offers students a central hub of support services, including IDEAS Center, University Advising Services, Transfer UTA and various college/school advising hours. Services are available during the library's hours of operation. <http://library.uta.edu/academic-plaza>

Teaching Assistant: To be determined

**Course Schedule
MAE 3319
Spring 2017**

Tentative Lecture Schedule and Reference Reading Assignments

			Page No.
Jan.	17	Objectives of course and math review assignment	5
	19	Basic math concepts including linearization	5
	24	Laplace transforms and solving differential equations	22
	26	Using MATLAB to solve diff. eqn's & Z transform	34
	31	Expressing diff. eqn's and transfer functions in state var. format	70
Feb.	2	State variables continued	
	7	Lumped parameter models for mechanical systems	79
	9	Mechanical systems continued including rotation	79
	14	Exam #1, closed book and no personal calculators allowed	
	16	Modeling mechanical systems with linear translation and rotation	79
	21	Transfer functions for mechanical systems	79
	23	Modes of a system and 'pfract'	36
	28	MATLAB solution techniques using numerical integration	43
March	2	Using MATLAB to obtain the frequency response for a system	47
	7	Frequency response continued	
	9	Using MATLAB to obtain lower order transfer function approx.'s	52
	14	Spring Break	
	16	Spring Break	
	21	Lumped parameter models for liquid systems	108
	23	Exam #2, closed book and no personal calculators allowed	
	28	Examples of liquid systems	
	30	Lumped and distributed parameter models for fluid lines	123
April	4	Lumped parameter models for gas systems	161
	6	Lumped parameter models for gas systems, continued	
	11	Models for linear valve controlled actuators	179
	13	Lumped parameter models for thermal systems	186
	18	Modeling electrical circuits with passive components	192
	20	Modeling electrical circuits containing operational amplifiers	199
	25	Examples and review	
	27	Exam #3, closed book and no personal calculators allowed	
May	4	No class	
	6	No class	
		No final exam; first three exams were comprehensive	

Emergency Phone Numbers: In case of an on-campus emergency, call the UT Arlington Police Department at **817-272-3003** (non-campus phone), **2-3003** (campus phone). You may also dial 911. Non-emergency number 817-272-3381

Library Home Page library.uta.edu

Resources for Students

Academic Help

Academic Plaza Consultation Services library.uta.edu/academic-plaza

Ask Us ask.uta.edu/

Library Tutorials library.uta.edu/how-to

Subject and Course Research Guides libguides.uta.edu

Subject Librarians library.uta.edu/subject-librarians

Resources

A to Z List of Library Databases libguides.uta.edu/az.php

Course Reserves pulse.uta.edu/vwebv/enterCourseReserve.do

FabLab fablab.uta.edu/

Special Collections library.uta.edu/special-collections

Study Room Reservations openroom.uta.edu/

Teaching & Learning Services for Faculty

Copyright Consultation library-sc@listserv.uta.edu

Course Research Guide Development, Andy Herzog amherzog@uta.edu or your subject librarian

Data Visualization Instruction, Peace Ossom-Williamson peace@uta.edu

Digital Humanities Instruction, Rafia Mirza rafia@uta.edu

Graduate Student Research Skills Instruction, Andy Herzog amherzog@uta.edu or your subject librarian

Project or Problem-Based Instruction, Gretchen Trkay gtrkay@uta.edu

Undergraduate Research Skills Instruction, Gretchen Trkay gtrkay@uta.edu or your subject librarian.