AE & ME5305-001 & 002: Dynamic Systems Modeling
Fall 2017

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Office Hours: Tues. & Thurs. 11:00-12:15 and by appointment
Course site for reference notes: ELEARN.UTA.EDU

Office Hours: Tue. & Thurs. 11 am – 12:15 pm and by appointment
Graduate Teaching Assistant: TBA
Section Information: ME5305-001 & 002 and AE5305-001 & 002

Time and Place of Class Meetings: Room TBA, Tue & Thurs. 9:30 am – 10:50 am

Description of Course Content: Lumped parameter modeling and simulation of engineering systems

Student Learning Outcomes: The objectives of this course are to teach lumped parameter modeling and simulation techniques for engineering systems which may include mechanical, fluid, thermal, and electrical components for deterministic and stochastic inputs. Simulation techniques for hydraulic systems containing lines with laminar or turbulent flow modeled by partial differential equations are included. As will be emphasized, to be proficient at modeling, it is beneficial to know in advance which simulation algorithms are to be used; in addition, accurate modeling requires, in general, common sense knowledge of the initial and final values as well as somewhat reasonable estimates of the solution. MATLAB algorithms will be used for solving the equations and plotting the output solutions. Prior experience using MATLAB will be useful but is not mandatory. Students inexperienced with MATLAB should consider this to be an introductory course on MATLAB as most of the solution methods will utilize existing MATLAB algorithms and examples.

Required Textbooks and Other Course Materials*: Dynamic Systems Modeling and Simulation, 14th Edition – Theory & Examples, August, 2017,* by Professor David A. Hullender. In addition, *Dynamic Systems Modeling and Simulation, 14th Edition – Homework and Exams.* Soft copies are available on Blackboard. Hard copies can be obtained at Bird's Copies, 208 S. East St., Arlington 817-459-1688; call and request copies to be printed in advance. Also, it is recommended that each student purchase a student version of MATLAB. However, UTA does have a license for MATLAB for use on campus; contact the UTA Help Desk (817-272-2208) for instructions on using the UTA MATLAB license on your personal laptop.

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. Written documentation is required for an excused absence from an exam. Unless stated otherwise, all exams are closed book; only calculators provided by the exam proctor or approved in advance will be allowed to be used; calculators that can be programmed or text or equations entered will not be approved.

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, class and exam attendance is mandatory. Reasons for absence must be documented in writing to the instructor. 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.

For **distance education** students, it is critical, but not mandatory, that the lectures be watched within 24 hours of the actual presentation to avoid missing important information regarding assignments and class activities and to avoid getting behind.

Other Requirements: 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. **Distance education** students must have their assignments submitted or mailed to Professor Hullender by 5 pm on the due date of an assignment.

Grading: Exams, Quizzes, and Homework: There will be 3 in-class exams; there are no make-up exams. Should absence from an exam be excused which requires written documentation, the final average for the course will be based on one less exam. Since all

exams are comprehensive, there will not be a final exam given during finals week. The final grade for the course will be based on a weighted average of the homework and exam grades: Exams 75% and Homework 25%. Letter grades will be assigned based on the distribution of all students' grades. For example, if there are students with very high averages, then an average of 94 might be required for an A, On the other hand, if the highest average is in the low 90's, then it may only require an average in the mid 80's for an A, etc. The exact curve for determining the course grades will not be known until all work has been graded.

Exams for **distance education** students must be taken with an approved proctor and on the same day and time as the on-campus class. Students are welcome to take the exams on-campus with the class.

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://wweb.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 [insert a description of the nearest exit/emergency 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.

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.

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 Search: Engineering Village

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

Study Room Reservations openroom.uta.edu/

Tentative Lecture and Exam Schedule

"*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. –David A. Hullender."*

Aug.	24	Overview and objectives of class
	29	Basic math concepts including linearization, **read pages 7-22**
	31	Laplace transform properties, differential equations, & inputs Transfer functions, eigenvalues, and time constants, **pages 23-27**
Sept.	5	Inverse Laplace Transforms (residue theorem and MATLAB), **pages 28-36**
	7	Simulation of systems using MATLAB and the 'impulse' command, **pages 37-40**
	12	Lumped parameter models for mechanical systems, **pages 84-90**
	14	Mechanical systems with rotation, **pages 84-90**
	19	Lumped parameter models for systems with beams, **pages 91-110**
	21	**Exam #1, closed book, comprehensive, and no personal calculator**
	26	Modes of a system and transfer function approximations, **pages 53-65**
	28	State variable representation of dynamic systems, **pages 71-79**
Oct.	3	State variables simulation diagram approach, **pages 72-73**
	5	MATLAB simulation methods: 'lsim', 'initial', 'ode45', **pages 39-48, 71-79**
	10	Review of basic statistics and stochastic processes, **pages 233-241**
	12	Frequency response analysis of dynamic systems and bode diagrams, **pages 49-53**
	17	SIMULINK, **pages 80-83 and MATLAB tutorial**
	19	Stationary stochastic processes, **pages 242-276**
	24	MATLAB exercises for simulation of stochastic processes, **pages 274-310**
	26	**Exam #2, closed book, comprehensive, and no personal calculator.**
	31	Lumped parameter models for systems with liquids, **pages 111-121**
Nov.	2	Models for fluid line transients, **pages 124-184**
	7	Models for Linear Valve Controlled Actuators, **pages 204-207**
	9	Lumped parameter capacitance models for systems with gases, **pages185-189**
	14	Lumped parameter gas inertance and resistance models, **pages 190-203**
	16	Lumped parameter thermal models, **pages 211-220**
	21	Modeling of passive electrical circuits, Operational amplifier circuits, **pages 221-232**
	23	**Thanksgiving Holiday**
	28	**Exam #3, closed book, comprehensive, and no personal calculator**
Nov.	30	TBA
	5	TBA
		Since all exams are comprehensive, **there will not be a final exam.**

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