MAE3360-002: Engineering Analysis
Fall 2018

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

Time and Place of Class Meetings: Room WH 404, Tue & Thurs. 12:30 pm – 1:50 pm

Description of Course Content: Solving algebraic and differential equations representing engineering systems

Student Learning Outcomes: The objectives of this course are to teach solution techniques for solving typical equations encountered in the analysis and simulation of engineering systems. When obtaining solutions to equations, it is very beneficial to focus on the common sense details associated with the performance of the actual engineering system for which the equations are written. Consequently, throughout this text, equations for actual engineering systems are utilized so that it is possible to apply common sense to the prediction and approximation of the solution to the equations before actually solving the equations. Knowing the approximate solution provides confirmation to the actual solution in the end. From the very beginning of the course, computer algorithms in MATLAB will be utilized to obtain and plot solutions for equations. Having taken a MATLAB course prior to this course is not necessary. This is the course for learning to program in MATLAB by seeing examples and asking the instructor or TA for assistance with challenges or matters not understood.

Required Textbooks and Other Course Materials*:* *Application of Math Principles to Engineering Problems,11th Edition, July 18, 2018* by Professor David A. Hullender. A soft copy is available on Blackboard. A hard copy can be obtained at the UTA Bookstore or at Bird's Copies, 208 S. East St., Arlington 817-459-1688; call and request a copy be printed in advance. Also, it is recommended that each student purchase a student version of MATLAB or for certain setup a laptop to use the UTA licensed version; 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; calculators that can be programmed, text entered, and/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.

Other Requirements: A key Assignment will be included as part of one of the exams and the results used to evaluate ways to improve the class; passing the key assignment is not required. Homework assignments will be structured to prepare students for quizzes and exams. Thus, students should not work together on homework since working alone helps to determine weaknesses in advance of exams instead of during exams. Each student should make a habit of getting help when needed on homework from the teaching assistant or Professor Hullender. Assigned homework will is to be turned in at the beginning of class on the due date; late homework will not be graded. When a MATLAB or homework question arises, a simple way to get help is either to meet with Professor Hullender or to send an e-mail showing MATLAB code and any error messages.

Grading: 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. There will be a ten minute Quiz on recent previous lectures and homework at the beginning of almost every class. Two of the quiz grades will be dropped; thus, missing a quiz for whatever reason does not require proof of an excused absence. The final grade for the course will be based on a weighted average of the quiz grades (15%), homework grades (10%), and the exam grades (75%). Letter grades at the end of the semester 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, 84 -93 for B, etc. 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. Typically, 90-100 for A, 80-90 for B, 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://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. This class will be completed with the third exam on the last class day prior to the Final Review Week. As stated above, there will not be a final exam.

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. – Professor Hullender."*

Aug.	23	Organization and objectives of class
	28	Definitions, terminology (derivatives, differential eqn's, complex numbers), and differential equations representing mathematical models, transfer functions, **pages 1-6**
	30	Eigenvalues, damping ratios, natural frequencies, time constants, MATLAB commands **tf**, **zpk**, **damp**, **roots**, **parallel**, **series**, and **conv**, **pages 7-9**
Sept.	4	Simultaneous algebraic equations, MATLAB symbolic math, **pages 9-15**
	6	Linear and nonlinear eqn's, straight line approximations, Taylor series, **pages 16-18**
	11	Laplace transform, properties, final value and initial value theorems, **pages 21-24**
	13	Laplace transform of diff. eqns., initial conditions, and common inputs, **pages 24-26**
	18	Partial fractions by means of the residue theorem and MATLAB, **pages 26-27, 29-30**
	20	**Exam #1, closed book, only approved personal calculators allowed**
	25	Inverse Laplace transform using partial fractions and the residue theorem, **pages 27-30**
	27	Inverse Laplace **short cut** for complex poles, **pages 30-33**
Oct.	2	MATLAB commands: **impulse**, **step**, **dcgain**, and **lsim**, **pages 37-40**
	4	Using MATLAB to plot of inverse Laplace transforms without having to first find the inverse Laplace, **page 33**
	9	Periodic inputs, **PulseSeries**, frequency response analysis, and **bode** plots, **p 40, 47-52**
	11	Modes of a system, and modal approximations, **page 35-37, 52-55**
	16	Inverse frequency response for approximations and system identification, **pages 56-67**
	18	MATLAB simulations using **SIMULINK**, **pages 77-80**
	23	**Exam #2, closed book, only approved personal calculators allowed**
	25	Converting differential equations into state variable format, **page 71**
	30	Simulation diagram approach for diff. equations with input derivatives, **pages 71-73**
Nov	1	Numerical integration using ode45 in MATLAB, **pages 42-47**
	6	ode45 examples including nonlinear differential equations and random input problems
	8	State variable matrix format for linear differential equations, **pages 73-78**
	13	State variables from block diagrams, **pages 79-80**
	15	Converting continuous differential eqns. into discrete difference eqns., **pages 68-70**
	20	Laplace transform applied to solving partial differential equations, class notes
	22	Thanksgiving holiday
	27	**Exam #3, closed book, only approved personal calculators allowed**

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