MECH 3v95.001

System Dynamics Modeling and Analysis
Fall 2018 Course Syllabus

Lecture: Tuesday, Thursday 11:30 – 12:45pm, ECSW 1.355

Professor: Dr. Justin Koeln
Office: ECSN 3.204
Office Hours: M 3-5pm or by appointment
Email: Justin.Koeln@UTDallas.edu

TA: Devesh Kumar – dxk151630@utdallas.edu

Prerequisite: MECH 2330 Dynamics
MECH 3320 Heat Transfer
ENGR 3300 Adv. Engr. Math

Textbook: *System Dynamics*, 3rd edition; William Palm; ISBN 978-0-07-339806-8
Note: The 2nd edition is similar but may not have the same problem numbers and examples. A hard copy of the textbook is not required.

Website: UT Dallas eLearning: https://elearning.utdallas.edu/

This site includes course administrated and schedule information and will be used to post homework assignments and solutions, lecture notes, announcements, etc. **Check it frequently.**

The following descriptions and timelines are subject to change at the discretion of the Professor.

Course Content: This is an introductory course to dynamic system modeling, analysis, and simulation with application to common real-world engineering systems. The goal of this course is to provide students with an introduction to systems and signals, focusing on modeling and analyzing the dynamics of systems both analytically and through simulation. Time- and frequency-domain analysis techniques are used to study the steady-state and transient dynamics of thermal, fluid, mechanical, and electrical systems. Matlab/Simulink are used to simulate and analyze system behavior. Students are expected to be familiar with linear algebra, differential equations, fluid dynamics, heat transfer, spring-mass-damper mechanical systems and resistor-inductor-capacitor electrical systems.

Outcomes:
1. Derive sets of equations that govern the dynamic behavior of common engineering systems.
2. Solve for steady-state and transient responses of linear systems subject to various stimuli in both the time and frequency domains.
3. Use Matlab/Simulink as a tool to verify analysis and numerically simulate systems with common non-linearities.

Tentative Outline:

Week of…	Topics	Text Chapter(s)
Aug. 21	Syllabus/Intro, ODEs, Complex Numbers	1.1, 2.1
Aug. 28	Laplace Transforms, Transfer Functions	2.2 – 2.4
Sept. 4	Block Diagrams, State-space	5
Sept. 11	Fluid/Thermal Systems, 1st Order	7, 8.1
Sept. 18	Fluid/Thermal Analysis, Examples	7
Sept. 25	Review and Midterm I	
Oct. 2	Mechanical Systems	3,4
Oct. 9	Electrical Systems	6
Oct. 16	2nd Order Systems	8.2
Oct. 23	Numerical Methods, Review	
Oct. 30	Examples and Midterm II	
Nov. 6	Frequency Domain	9
Nov. 13	Bode Plots	9
Nov. 20	Fall Break	
Nov. 27	Linearization and System ID	
Dec. 4	Review and Examples	

Homework: Homework will be assigned via eLearning each week and is due within the first 10 minutes of class on the due date as noted on the schedule (also found on eLearning). **You will not be given credit for late homework but the lowest homework score will be dropped.** To receive credit for homework, your solutions must be neat and organized. While you are encouraged to work together and learn with your fellow students, simply copying homework solutions from others or solution manuals is cheating. Homework solutions will be posted on eLearning after the due date.

Exams: In addition to the final exam, there will be **two 75-minute midterm exams** during the semester.

Exam I: *Tentatively* Thursday Sept. 27, 2018
Exam II: *Tentatively* Thursday Nov. 1, 2018
Final Exam: Based on the University examination schedule

Note: Exams are comprehensive, closed book and closed notes. A formula sheet will be provided when necessary and equations you are responsible for knowing will be made clear during the lectures. **No make-up exams will be given.** In the event of an excused absence (illness, job-related travel, holy day

absence, etc.; Proper documents should be provided), the weight of the exam will be shifted to the remaining exams.

Attendance: Students are highly encouraged to attend every class. In class quizzes and/or polls will be used to assess student understanding, provide instructor feedback, and record attendance. These quizzes/polls are graded based on completion and are denoted as Participation in the following grading breakdown.

Grades: Course grades will be computed based on a curve with percentages assigned as follows:

Homework:	25%
Participation:	5%
Midterm Exams:	20% each
Final Exam:	30%

Additional Course Policies

Classroom Citizenship: Professional at all times. Smelly foods are distracting to others and will not be allowed in the classroom. As courtesy to classmates and instructor, electronic devices should be turned off during class, except when permitted by the instructor. Cell phone use (e.g., texting) is disruptive to class and will not be tolerated. Laptop use is also disruptive to class and is not permitted, unless explicitly discussed with the instructor.

Email Use: The University of Texas at Dallas recognizes the value and efficiency of communication between faculty/staff and students through electronic mail. At the same time, email raises some issues concerning security and the identity of each individual in an email exchange. The university encourages all official student email correspondence be sent only to a student's U.T. Dallas email address and that faculty and staff consider email from students official only if it originates from a UTD student account. This allows the university to maintain a high degree of confidence in the identity of all individual corresponding and the security of the transmitted information. UTD furnishes each student with a free email account that is to be used in all communication with university personnel. The Department of Information Resources at U.T. Dallas provides a method for students to have their U.T. Dallas mail forwarded to other accounts. **Per FERPA policy, grades cannot be discussed via email.**

Student Conduct and Discipline: The University of Texas System and The University of Texas at Dallas have rules and regulations for the orderly and efficient conduct of their business. It is the responsibility of each student and

each student organization to be knowledgeable about the rules and regulations which govern student conduct and activities. General information on student conduct and discipline is contained in the UTD publication, A to Z Guide, which is provided to all registered students each academic year. The University of Texas at Dallas administers student discipline within the procedures of recognized and established due process. Procedures are defined and described in the Rules and Regulations, Board of Regents, The University of Texas System, Part 1, Chapter VI, Section 3, and in Title V, Rules on Student Services and Activities of the university's Handbook of Operating Procedures. Copies of these rules and regulations are available to students in the Office of the Dean of Students, where staff members are available to assist students in interpreting the rules and regulations (SU 1.602, 972/883-6391). A student at the university neither loses the rights nor escapes the responsibilities of citizenship. He or she is expected to obey federal, state, and local laws as well as the Regents' Rules, university regulations, and administrative rules. Students are subject to discipline for violating the standards of conduct whether such conduct takes place on or off campus, or whether civil or criminal penalties are also imposed for such conduct.

Academic Integrity: The faculty expects from its students a high level of responsibility and academic honesty. Because the value of an academic degree depends upon the absolute integrity of the work done by the student for that degree, it is imperative that a student demonstrate a high standard of individual honor in his or her scholastic work. Scholastic dishonesty includes, but is not limited to, statements, acts or omissions related to applications for enrollment or the award of a degree, and/or the submission as one's own work or material that is not one's own. As a general rule, scholastic dishonesty involves one of the following acts: cheating, plagiarism, collusion and/or falsifying academic records. Students suspected of academic dishonesty are subject to disciplinary proceedings**. I take this very seriously. Any case of suspected cheating or plagiarizing will be referred to Judicial Affairs.**

Withdrawal from Class: The administration of this institution has set deadlines for withdrawal of any college-level courses. These dates and times are published in that semester's course catalog. Administration procedures must be followed. It is the student's responsibility to handle withdrawal requirements from any class. In other words, I cannot drop or withdraw any student. You must do the proper paperwork to ensure that you will not receive a final grade of "F" in a course if you choose not to attend the class once you are enrolled.

Student Grievance Procedures: Procedures for student grievances are found in Title V, Rules on Student Services and Activities, of the university's Handbook of

Operating Procedures. In attempting to resolve any student grievance regarding grades, evaluations, or other fulfillments of academic responsibility, it is the obligation of the student first to make a serious effort to resolve the matter with the instructor, supervisor, administrator, or committee with whom the grievance originates (hereafter called "the respondent"). Individual faculty members retain primary responsibility for assigning grades and evaluations. If the matter cannot be resolved at that level, the grievance must be submitted in writing to the respondent with a copy of the respondent's School Dean. If the matter is not resolved by the written response provided by the respondent, the student may submit a written appeal to the School Dean. If the grievance is not resolved by the School Dean's decision, the student may make a written appeal to the Dean of Graduate or Undergraduate Education, and the deal will appoint and convene an Academic Appeals Panel. The decision of the Academic Appeals Panel is final. The results of the academic appeals process will be distributed to all involved parties. Copies of these rules and regulations are available to students in the Office of the Dean of Students, where staff members are available to assist students in interpreting the rules and regulations.

Incomplete Grades: As per university policy, incomplete grades will be granted only for work unavoidably missed at the semester's end and only if 70% of the course work has been completed. An incomplete grade must be resolved within eight (8) weeks from the first day of the subsequent long semester. If the required work to complete the course and to remove the incomplete grade is not submitted by the specified deadline, the incomplete grade is changed automatically to a grade of F.

Disability Services: The goal of Disability Services is to provide students with disabilities educational opportunities equal to those of their non-disabled peers. Disability Services is located in room 1.610 in the Student Union. Office hours are Monday and Thursday, 8:30 a.m. to 6:30 p.m.; Tuesday and Wednesday, 8:30 a.m. to 7:30 p.m.; and Friday, 8:30 a.m. to 5:30 p.m. The contact information for the Office of Disability Services is:

The University of Texas at Dallas, SU 22
PO Box 830688
Richardson, Texas 75083-0688
(972) 883-2098 (voice or TTY)

Essentially, the law requires that colleges and universities make those reasonable adjustments necessary to eliminate discrimination on the basis of disability. For example, it may be necessary to remove classroom prohibitions against tape recorders or animals (in the case of dog guides) for students who are blind. Occasionally an assignment requirement may be substituted (for example, a research paper versus an oral presentation for a student who is hearing impaired). Classes

enrolled students with mobility impairments may have to be rescheduled in accessible facilities. The college or university may need to provide special services such as registration, note-taking, or mobility assistance. It is the student's responsibility to notify his or her professors of the need for such an accommodation. Disability Services provides students with letters to present to faculty members to verify that the student has a disability and needs accommodations. Individuals requiring special accommodation should contact the professor after class or during office hours.

Religious Holy Days: The University of Texas at Dallas will excuse a student from class or other required activities for the travel to and observance of a religious holy day for a religion whose places of worship are exempt from property tax under Section 11.20, Tax Code, Texas Code Annotated. The student is encouraged to notify the instructor or activity sponsor as soon as possible regarding the absence, preferably in advance of the assignment. The student, so excused, will be allowed to take the exam or complete the assignment within a reasonable time after the absence: a period equal to the length of the absence, up to a maximum of one week. A student who notifies the instructor and completes any missed exam or assignment may not be penalized for the absence. A student who fails to complete the exam or assignment within the prescribed period may receive a failing grade for that exam or assignment. If a student or an instructor disagrees about the nature of the absence [i.e., for the purpose of observing a religious holy day] or if there is similar disagreement about whether the student has been given a reasonable time to complete any missed assignments or examinations, either the student or the instructor may request a ruling from the chief executive officer of the institution, or his or her designee. The chief executive officer or designee must take into account the legislative intent of TEC 51.911(b), and the student and instructor will abide by the decision of the chief executive officer or designee.