Department of Mechanical and Aerospace Engineering
The University Of Texas at Arlington
Classical Methods of Control Systems Analysis and Synthesis
ME 5303 - SPRING 2016

Instructor: Dr. P. S. Shiakolas
Office: 315 D Woolf Hall, **Phone:** (817) 272-5715 **Email**: shiakolas@uta.edu
Class Meetings: NH 203, Tuesday/Thursday 9:30 – 10:50 am
Course Web Page: http://mars.uta.edu/me5303 and Blackboard
Office Hours: TBA (will be strictly enforced) and by appointment through email
Prerequisites: Graduate Standing or Consent of Instructor, Introductory Modeling and Simulation
Text: *Modern Control Engineering* by K. Ogata, 5th (preferred) or 4th edition

Course Syllabus and Grading Policy

Homework: The purpose of the homework is to provide practice exercises that apply the theory and concepts presented in class in order to identify and improve on any deficiencies that might exist. It could be either analytical and/or computational. It is your responsibility to attempt, solve and understand the concepts in the assigned homework. You are encouraged to discuss homework concepts with each other or obtain information from outside sources. You must include any code with proper documentation and comments on work you turned in. *HW will be assigned based on 5th edition.*
Homework is due at the beginning of class at the assigned due date and before I start lecturing. Once I start the lecture, I will not accept any homework. Late homework will not be accepted except in extreme circumstances and with prior arrangements. If you need more practice or have the desire to learn more, you can solve additional problems from the textbook.
Remember do not just exercise the computer tools but rather spend the time to understand the concepts the problem addresses and further experiment with the concepts.
Questions on HW will be answered in class, during office hours or *through email only for DL students*.
Discussion forums might be setup on Blackboard if you ask for them and provide the discussion topics.
If a GTA is not assigned, *HW will be collected but not graded.*
If a GTA is assigned, *HW will collected and graded at 0.5 point each.* All work turned in for credit must reflect your own understanding of the material at the time of writing. As such, the GTA and I reserve the right to ask you to discuss and demonstrate any work you turned in for credit. If you are not able to discuss and demonstrate your own work, you will be given a grade of zero for that particular homework; for a repeat offense, you will be reported for academic dishonesty and given a failing grade in the course. Not all assigned problems will be graded so it is your responsibility to answer all problems.
Final Exam (40 points): *The final exam will be given at the university scheduled time.* The final exam will be comprehensive and will be closed book-notes-electronic devices.
Distance Learning Students: The DL students must email me their HW solution in PDF format at the due date and time as on-campus students. The DL students are responsible to make arrangements to take the exam at the same time as on-campus students at an approved testing center and must inform the CDE personnel and the instructor of the arrangements at least one week in advance. You will not be able to take the exam in class with the on-campus students. Last minute arrangements will not be accepted. The DL students are responsible to follow the DL guidelines and rules as set forth by the CDE.
Makeup Exam: No makeup exam will be given unless I approve of it in advance and in extreme circumstances.
Attendance: It is your responsibility to attend the lectures, participate in class discussion and be up to date with the course material. If you miss a lecture, note that I will not re-teach material covered in class during office hours. *Once I start lecturing, you will not be allowed in the classroom.*
Guaranteed Grading Scale: Grading scale based on the minimum percentage number of points obtained:
90% - 100%: A, 80% - 89%: B, 70% - 79%: C, 60% - 69%: D, 0 - 60%: F
No incomplete grade will be given unless prior arrangements are made and in extreme circumstances.

Assume no collaboration is allowed unless expressed permission is obtained from the instructor.
Anyone collaborating on work to be turned in for credit will be given a failing grade in the course.

Grade Grievances: Any appeal of a grade in this course must follow the procedures and deadlines for grade-related grievances according to university regulations:
http://wweb.uta.edu/catalog/content/general/academic_regulations.aspx#19

Expectations for Out-of-Class Study: Beyond the time required to attend each class meeting, students in this course should expect to spend at least an additional 9 hours per week of their own time for course-related activities, including reading required materials, completing assignments, etc.

Software: You may use any computer software that you like such as SCILAB, Mathematica, LabVIEW, MATLAB, etc. *Make sure that you have access to software during the semester and you are proficient in it for the purposes of this class. Knowing numerical simulation and analysis tools are part of the prerequisites of the class. I will not teach software tools.*

Remember that computer tools are used to help you better understand certain concepts through numerical experimentation. **DO NOT** just learn the software commands, but rather make sure you understand the underlying concepts. Use the software tools to perform What if scenarios.

Additional Reference Material: Modeling, Simulation and Controls related books are available in the engineering library and software resources available on the internet – check also the class web page.

Miscellaneous: If you have a disability, any religious holidays that you need to observe or anything else that might interfere with this class and you would like for me to know about it you must email me the details no later than the beginning of the third class meeting.

Email Communication: Email communication must be from your official UTA issued email account. The email subject line must be: ME5303–SP16: Descriptive Title for example ME5303-SP16: Question on Root Locus
Any email communication not adhering to the above guidelines will be deleted without any further action taken on the content of the email. You should expect a reply to your email within one business day. You must follow proper decorum in all email communication.

Drop Policy: According to university regulations and schedule. After the late registration period, students must see their academic advisor to drop a class or withdraw. 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.**

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. 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 www.uta.edu/resources.

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).** 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.
Counseling and Psychological Services, (CAPS) www.uta.edu/caps/ or calling 817-272-3671.

Only those students who have officially documented a need for an accommodation will have their request honored. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at www.uta.edu/disability or by calling the Office for Students with Disabilities at (817) 272-3364.

Emergency Procedures for Disabled Personnel

If the disabled person cannot safely evacuate the building, one person should stay with the disabled individual while another person reports his/her location to the University Police.

Hearing impaired and visually impaired persons need only one person each to notify them of a fire alarm or guide them to safe escape routes during an evacuation.

After evacuating employees and students have cleared all stairways, disabled persons should be assisted to the stairwell landings to await emergency personnel. All doors to the stairwells must be kept closed during this time.

NOTE: Environmental Health & Safety would like to offer the following reminders to those who are disabled or have special needs:

Take control without depending on others to take the first step.

Don't be afraid to let others know you need assistance.

Don't hesitate to communicate what your special needs are in order to make the evacuation easier and safer for you and for your assistants.
Communicate with those who can help as soon as you are able by dialing 3003 to campus Police.
Plan ahead. Be prepared. Know what you are going to do before an emergency arises. Make a plan and then test it. Determine what your alternatives are.
When you enter an unfamiliar building, look it over and locate the most available telephones, note horizontal exits and ramps, note exit signs and enclosed stairwells determine if landings are large enough), note rooms that would make good areas of refuge, and note the location of fire alarm pull stations.
Never take an elevator in a building on fire.
Don't delay your evacuation or communication to evacuate. Speaking with someone over the telephone will help to keep you calm.

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The sciences do not try to explain, they hardly even try to interpret, they mainly make models. By a model is meant a mathematical construct which, with the addition of certain verbal interpretations, describes observed phenomena. The justification of such a mathematical construct is solely and precisely that is expected to work. John Von Neumann

ME 5303 Tentative Topics (not in a particular order)

System Representation

A. Differential Equations
B. Transfer Functions
C. Block Diagrams
D. State Space - Linearization

System Transient Response Analysis

A. Time Domain Response
B. Frequency Domain Response
C. Stability

Feedback Control Systems

A. Effects of Feedback Control
B. Classical Control Actions (P, I, D)
C. Error Analysis - Controller Design
D. Sensitivity Analysis

Controller Design (Pole-Zero locations)

A. Root Locus Analysis
B. Frequency Response - Bode Plot
C. Compensator Analysis - Lead & Lag
D. Analog Controller Design/Representation

State Variable Feedback Systems

A. Controllability and Observability
B. Estimation
C. Optimal Control
D. Controller Design

Hardware Demonstrations (time permitting)

A. z-Transform and Bilinear Approximation
B. Controller Implementation and Hardware Demonstrations

As the instructor for this course, I reserve the right to adjust this schedule-material in any way that serves the educational needs of the students enrolled in this course. – P. S. Shiakolas

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KEEP FOR YOUR RECORDS

Academic Dishonesty
It is the philosophy of The University of Texas at Arlington that academic dishonesty is a completely unacceptable mode of conduct and will not be tolerated in any form. All persons involved in academic dishonesty will be disciplined in accordance with University regulations and procedures. Discipline may include suspensions or expulsion from the University. "Scholastic dishonesty includes but is not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts." (Regents' Rules and Regulations, Part One, Chapter VI, Section 3, Subsection 3.2, Subdivision 3.22)

Academic Honesty
The college of engineering academic honesty information can be found at
http://www.uta.edu/engineering/current-students/academic-honesty.php

University of Texas at Arlington Honor Code
The University of Texas at Arlington Honor Code can be found at **http://www.uta.edu/conduct/.**

> 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 that I 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.

College of Engineering Ethics
The college of engineering academic honesty information and ethics tutorials can be found at
http://www.uta.edu/engineering/current-students/academic-honesty.php
You are required to go through all the information relating to academic honesty on this web page and once completed and sign and return the attached sheet indicating you carefully went over the material, you understand the implications of the presented material and that you will abide and follow UTA Honor Code in all your course work. You must return this at the second class meeting. You will not be allowed in the class if you do not return this form.

By signing below, I affirmed that I understand the information presented in the College of Engineering Academic Honesty web page and the consequences of not-following the honesty rules.

Name (Block letters)

Student ID

Date

Signature

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SIGN AND TURN IN ON THIRD CLASS MEETING

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