

UNIVERSITY OF MARYLAND BALTIMORE COUNTY  
Department of Mechanical Engineering

**ENME 403 - Automatic Controls      Summer 2016**

**Lecture:**      MTR 6:00 pm - 8:30 pm, Bldg: Information Technology, Rm: 102

**Instructor:**    **George Piper, Ph.D., P.E.**

Office              ENGR216

Office Hours      Mon- Tues- Thurs      5:00 pm – 5:50 pm

Email              [piper@umbc.edu](mailto:piper@umbc.edu)

Teaching Assistants      Andrew Lee ([alee20@umbc.edu](mailto:alee20@umbc.edu))

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**Course Objectives:**

- (a) Use Laplace transform methods to manipulate and solve models of linear dynamic systems
- (b) Analyze the stability, transient and steady-state behavior of linear dynamic systems
- (c) Design linear feedback controllers using time and frequency domain design procedures to satisfy specific performance specifications.
- (d) Use computer-aided analysis and design tools Matlab and Simulink

**Textbook:** N.S. Nise, *Control Systems Engineering*, 7<sup>th</sup> Edition, Wiley (2015). ISBN 978-1-118-17051-9

**Grading Policy:** The interim and final course grades will be based on the following *approximate* grade weights:

Homework	25%
Hour Exams	45%
Final Exam	30%

Preparation, alertness, participation and performance in the classroom will be subjective factors used by me to arrive at a final grade.

**Exams/Quizzes:** Two one-hour exams and one two-hour final exam will be given in this course. Additionally, announced quizzes may be given. Successful completion of exams and quizzes requires the use of calculators and, possibly, additional supplemental handouts. Neither calculators nor additional required materials may be shared during exams or quizzes. ***NO collaboration is permitted during exams and quizzes.***

### **Homework:**

- (a) Homework and in-class exercises will be assigned periodically, collected, and graded. You are encouraged to seek assistance from any legitimate source in understanding homework including collaboration with other students. The written work, however, must be your own. ***NO late homework submissions will be accepted.***
- (b) All work must be neat, legible and contain the following at the top of the first page: Printed Name, Signature, Assignment, and Due Date. Your signature is your acknowledgment that you have understood and complied with the requirements of this policy statement and that you have acted honorably in the preparation of submitted work. Additional format requirements may be promulgated with specific assignments.
- (c) For computer work, sufficient documentation must be provided to validate and reproduce the results. Typical documentation includes the Matlab m-files or Simulink model, input and parameter data, and results. Source code and scripts should include your name and brief descriptive text. Plots must contain descriptive titles with student name and axis labels.

**Absences/Makeups:** Class attendance is a prerequisite to success. If you anticipate being absent, let me know in advance. It is your responsibility to turn in any course work when due and to obtain notes and announcements from another class member for classes you have missed. No late submissions will be accepted. If there are extenuating circumstances, see me prior to the due date and we will make alternate arrangements. Makeup exams and quizzes must be scheduled within one week of absence - *this is your responsibility.*

**Classroom Decorum:** Be respectful of your instructor and classmates by minimizing distractions during class. All cell phones are to be turned off and out of sight. Please notify me before class if your phone is required to be on. ***Casual coming and going is not permitted.*** An urgent need to use the restroom is an obvious exception.

**Collaboration Policy:** Collaboration of any kind or the use of references and other sources of external information on individual effort assignments, quizzes, and exams is forbidden unless otherwise stated in this policy or as indicated in writing on assignment cover sheets. Selective collaboration on learning assignments (homework, and in-class exercises) can often assist in the learning process. This should be done in moderation, however, since the ultimate measure of this course (and your final grade) is the level of the individual's knowledge, not the collective knowledge of all of his/her associates.

### **Academic Integrity:**

By enrolling in this course, each student assumes full responsibility of as a participant in UMBC's scholarly community in which everyone's academic work and behavior are held to the highest standards of honesty. Cheating, fabrication, plagiarism, and helping others to commit these acts are all forms of academic dishonesty. Academic misconduct could result in disciplinary action that may include, but is not limited to a grade of zero on the particular work, a grade of F in the class, suspension or dismissal. To read the

full Student Academic Conduct Policy, consult the UMBC Student handbook, the Faculty Handbook, or the UMBC Policies section of the UMBC Directory.

**ABET Program Criteria:**

In addition to teaching the subject material, accreditation of the Department of Mechanical Engineering at UMBC by ABET requires the curriculum to meet certain criteria. This course is designed to provide the students with the following ABET originated concepts:

- (a) An ability to apply knowledge of mathematics, science, and engineering
- (b) An ability to design a system, component, or process to meet desired needs
- (c) An ability to function on multi-disciplinary teams
- (d) An ability to identify, formulate, and solve engineering problems
- (e) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

# ENME 403 - Automatic Controls Syllabus

Summer 2016

Week	Lecture Day	Topic	Assigned Reading
5/30	Mon	<b>Memorial Day</b>	
	Tues	Introduction Laplace Transforms	Chap 1 Chap 2.1 -2.2
	Thurs	Transfer Functions Modeling Electrical Systems	Chap 2.3-2.4
6/6	Mon	Modeling Mechanical Systems Time Response Intro First Order Systems	Chap 2.6-2.8 Chap 4.1-4.3
	Tues	Second Order Systems Higher Order Systems & Zeros <i>HWK #1 Due</i>	Chap 4.4-4.8
	Thurs	Reduction of Multiple Subsystems Block Diagram	Chap 5.1-5.3
6/13	Mon	Signal Flow Graphs Mason's Rule <i>HWK #2 Due</i>	Chap 5.4-5.5
	Tues	<b>EXAM #1</b> Stability	Chap 6.1
	Thurs	Steady-State Error	Chap 7.1-7.6
6/20	Mon	Root Locus Intro Root Locus Properties <i>HWK #3 Due</i>	Chap 8.1-8.3
	Tues	Root Locus Sketching	Chap 8.4-8.7
	Thurs	Design via Root Locus Intro	Chap 9.1-9.2
6/27	Mon	PI & PD Compensation <i>HWK #4 Due</i>	Chap 9.3-9.4
	Tues	<b>EXAM #2</b> PID Compensation	
	Thurs	Frequency Response Intro Bode Plots & Stability Margins	Chap 10.1-10.2 Chap 10.7-10.11
7/4	Mon	<b>Independency Day</b>	
	Tues	Frequency Response Properties System Identification <b>REVIEW</b> <i>HWK #5 Due</i>	Chap 10.13
	Thurs	<b>FINAL EXAM</b>	

