SYLLABUS
MENG 4253-201: CONTROL SYSTEMS
(Required Course)
Spring 2020

Instructor: Dr. Zeki Ilhan

Office: McCoy Hall 219E

Office Phone: (940) 397-4004

E-mail: zeki.ilhan@msutexas.edu

Office Hours: Monday, Wednesday & Friday: 10:00 am – 12:00 pm
Tuesday & Thursday: 3:00 pm – 5:00 pm

Teacher Assistant: Mr. MamGoree Sock (mamgoreesock@yahoo.co.uk)

Course Schedule: Tuesday and Thursday: 11:00 am – 12:20 pm

Class Location: McCoy Hall 207

COURSE DESCRIPTION
Feedback control of mechanical systems. Emphasis on thermal, fluid, and motion systems under feedback control. Topics include programmable logic controllers, PID control, Laplace transforms, system modeling and performance analysis, stability theory, s-plane, and root locus and/or frequency-based design. Design and computer problems.

COURSE PRE-REQUISITES
MENG 4123 – Mathematical Methods for Engineers
MENG 4203 – Mechanical Engineering Analysis (co-requisite)

REQUIRED TEXTBOOK
Schaum's Outline of Feedback and Control Systems, by J. DiStefano, McGraw-Hill, 2013.

TOPICS COVERED
- Control-oriented system modeling
- Laplace transform methods
- Block diagram algebra
- Final value theorem
- Stability analysis
- Time response of first order systems
- Time response of second order systems
- Proportional control
- Integral control
- Derivative control

Additional material may be covered as time permits.

GRADING
The overall grade for the course will be based on the scores earned on the homework assignments, exams, and the attendance. The homework assignments account for 10% of the course grade, exams account for 80% of the course grade, and attendance accounts for 10%. The overall score for the course is determined as follows.

Table 1: Percentage contribution of each assignment.

Assignments	Contribution
Test 1	25%
Test 2	25%
Final Exam	30%
Attendance	10%
Homework	10%
TOTAL	100%

FINAL EXAM
Tuesday, May 12, 1:00 pm – 3:00 pm

COURSE ORGANIZATION AND ASSESMENT

- **Course Format:**
  This course consists of two 80-minute sessions each week. Class meetings will contain lecture sessions that cover the relevant topics for that particular class. Not all material can be covered during the class session. Expect to spend an appropriate amount of time outside of class on assignments and projects.

- **Class Attendance:**
  You are expected to attend class regularly and are responsible for notes, homework assignments, and exams missed while absent. Attendance (or lack thereof) directly affects the course grade. ***Attendance is considered very important in this course, and counts for 10% of the grade.***

- **Student Attitude:**
  Once class starts, the use of cell phones, reading of newspapers, conducting private discussions, using the computer (unless requested by the instructor), working on anything that is not directly related to the course, and making derogatory remarks about your classmates or instructor will not be accepted and may result in your dismissal from the class. Poor attitude directly affects the course grade.

- **Homework Evaluation Method:**
  Your performance will be tested regularly throughout the semester by homework assignments. While several homework problems may be assigned as part of a homework assignment, it may be the case that only a subset of problems will be graded. However, you must attempt all problems. ***Do not try to guess which (if any) problems will not be graded.***

- **Late Assignments:**
  Homework assignments must be turned in ***on the due date, at the beginning of class.*** Once class starts, late assignments will ***NOT*** be accepted. However, depending on the overall class progress, ***one (or two) of the lowest graded homework assignments may not be included in the final grade.***

- **Pop-Quizzes:**
  There ***MIGHT*** be a few pop-quizzes throughout the semester that are related to the specific homework problems assigned to distinguish those who work by themselves from those who copied others' works, or the solution manual.

- **Exam Make-up:**
  You are expected to take all exams on the scheduled date and time. However, if for some acceptable reason you are not able to do so, then you must inform the instructor in advance. The instructor will then decide whether you will be allowed to take a make-up exam, depending on the validity of your excuse.

- **General Study Guidelines:**
  Plan on spending few hours outside of class each week to study the material and to work on homework assignments. Do not wait until the last day to start the homework or to prepare for exams. Utilize office hours throughout the semester whenever you need help about the assignments or the course material.

GENERAL EDUCATION STATEMENT
Students in this course must demonstrate their proficiency in oral and written communication through written homework assignments and exams.

ACADEMIC INTEGRITY POLICY
Scholastic dishonesty will not be tolerated and will be prosecuted to the fullest extent. You are expected to have read and understood the current issue of the student handbook regarding student responsibilities & rights, and the intellectual property policy information about procedures and what constitutes acceptable on-campus behavior.

DISABILITY SUPPORT SERVICES
If you have a documented disability that will impact your work in this class, please contact me to discuss your needs.

DISCLAIMER STATEMENT
Information contained in this syllabus, other than grading policies, may be subject to change with advance notice, as deemed appropriate by the instructor.

Senate Bill 11 passed by the 84th Texas Legislature allows licensed handgun holders to carry concealed handguns on campus, effective August 1, 2016. Areas excluded from concealed carry are appropriately marked, in accordance with state law. For more information, please refer to https://mwsu.edu/campus-carry/rules-policies

COURSE LEARNING OBJECTIVES AND RELATIONSHIP TO STUDENT OUTCOMES

Table 2: Course learning objectives related to the ABET criteria (1-7)

COURSE OBJECTIVES	1	2	3	4	5	6	7
Students should be able to apply first-principles modeling techniques and Laplace transforms to generate open-loop transfer functions for various (mechanical, fluid, thermal, electrical, and aerodynamic) systems.	X						X
Given a feedback loop, students should be able to apply block diagram reduction techniques to generate the overall (closed-loop) transfer function.	X						
Given a transfer function, students should be able to apply Routh-Hurwitz stability theory to determine the necessary conditions for stability.	X						
Given the transient response plot of a system, students should be able to extract an appropriate first or second order open-loop transfer functions.	X						
Given a plant under feedback control, and a set of performance specifications, students should be able to design and tune appropriate P, PI, PD, or PID controllers.	X	X					
Students should be able to use MATLAB/SIMULINK platform to test the performance of the proposed P, PI, PD and/or PID control algorithms.	X					X	

Table 3: Detailed interpretations of the ABET criteria (1-7) listed in Table 2.

ABET Criteria	Interpretation
1	an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2	an ability to apply engineering design to produce solutions that meets specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3	an ability to communicate effectively with a range of audiences.
4	an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5	an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6	an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7	an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Prepared by Zeki O. Ilhan, January 2020.