Philadelphia University

Faculty of Engineering and Technology
Department of Mechanical Engineering

Course Information

Course Title: Automatic control (620443)

Prerequisite: Engineering measurements

Credit Hours: 3 credit hours (16 weeks per semester, approximately 44 contact hours)

Textbook: Modern Control Engineering by Katsuhiko Ogata, 5th Edition, Prentice Hall, 2010.

References:
- Automatic control system by Farid Golnaraghi, Benjamin C. Kuo, Kunche Sridhar.
- Modern Control Systems by Richard C. Dorf and Robert H. Bishop, 12thedition, PEARSON, 2011.

Course Description: In automatic control course we will model physical system mathematically, transfer it into block diagrams or signal flow graphs and control the system using controller such as PID and phase-lead and phase lag controllers based on time response requirements such as steady state error, settling time, maximum overshot and stability.

Course requirements: Computer, internet connection and webcam

Instructor: Laith R. Batarseh, MSc
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Course Topics:

Week	Topic
1	Introduction to Control Systems and Mathematical Foundation
2-3	Block Diagrams and signal flow graphs
4-5	Mathematical Modeling of mechanical and electrical Systems
6-7	Mathematical Modeling of fluid and thermal Systems
8	Time Domain Analysis
9	Steady-State Error Analysis and Routh Hurwitz Stability Criterion
11	Root Locus Technique
12	Frequency Domain Analysis: Nyquist Criterion
13	Design of Control Systems: Lead and lag Compensators
14-15	PID controllers
16	Review, and final exam

ABET Student Outcomes (SOs)

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 meet 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 judgments, 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

Course Learning Outcomes and Relation to ABET Student Outcomes:

Upon successful completion of this course, a student should be able to:

1.	Transfer physical system into a mathematical model using Laplace transfer functions	1
2.	Use block diagram and signal flow graph drawing and reduction to represent the mathematical model	1
3.	Determine the time response for a system	1
4.	Understand the system stability	1
5.	Controller the system to obtain the desired time response.	2
6.	Use a software to simulate the control process	3,5

Teaching methodology: Online, Blended or both

Electronic platform: Microsoft-teams

Evaluation methods:

Evaluation of student's performance (final grade) will be based on the following categories:

Mid-term exam: Shall be given at the end of the seventh week of the course in the form of multiple choice questions and (or) specific problems to be solved and uploaded by the student using the University electronic platform.

Quizzes: A number of 10-minute quizzes in the form of multiple choice questions or an assignment using the University electronic platform. will be given to the students during the semester. These quizzes will cover material discussed during the previous lecture(s).

Homework: Problem sets will be given to students in the form of assignments using the University Electronic platform. Homework should be solved by each student individually and submitted using the platform before the due date.

Copying homework is forbidden, any student caught copying the homework or any part of the homework will receive zero mark for that homework

Participation: Questions will be asked during the online session (lecture) and the student is assessed based on his/her response

Project: One project will be assigned after the midterm exam where teams of students will be asked to choose one physical problem, simulate the control process using MATLAB Simulink software and share the results with other teams by the means of oral presentation.

Final Exam: The final exam will cover all the class material.

Grading policy:

Mid-term Exam.	30%
Home works, Quizzes and participation	30%
Final Exam	40%
Total:	100%

Attendance policy:

Absence from classes and/or tutorials shall not exceed 15%. Students who exceed the 15% limit without a medical or emergency excuse, acceptable to and approved by the Dean of the relevant college/faculty, shall not be allowed to take the final examination and shall receive a mark of zero for the course. If the excuse is approved by the Dean, the student shall be considered to have withdrawn from the course.

March 2021