Philadelphia University

Faculty of Engineering - Department of Mechanical Engineering
First Semester 2019/2020

Course Information

Title:	**Automatic control** (620443)
Prerequisite:	**Measurements**
Credit Hours:	3 credit hours (16 weeks per semester, approximately 44 contact hours)
Textbook:	Modern Control Engineering by Katsuhiko Ogata, 4th Edition, Prentice Hall, 2002.
References:	• Feedback Control of Dynamic Systems by Gene F. Franklin, J. David Powell and Abbas Emami-Naeini, 4th Edition, Prentice Hall, 2002. • Modern Control Systems by Richard C. Dorf and Robert H. Bishop, 12th edition, PEARSON, 2011.
Catalog Description:	This course object to give the student knowledge about :Linear feedback control theory, Mathematical modeling of physical systems, Transfer functions, Block diagrams, and signal flow graph, Time domain analysis of control systems, Test signals, transient response, time domain specifications, steady state error and stability, Root locus techniques, Time domain design, PID controllers, and phase-lead and phase lag controllers, frequency domain analysis, Nyquist criterion, Bode plots and Nichols charts.
Websites:	http://www.philadelphia.edu.jo/academics/laithb/
Instructors:	Eng. Laith Batarseh **Email**: lbatarseh@philadelphia.edu.jo **Office**: Engineering building, room E61208, ext: 2135 **Office hours**: Sunday and Tuesday 10:00 – 11:00 Monday and Wednesday 11:30 – 12:30

Course Topics

Week	Topic
1	Introduction to Control Systems and Mathematical Foundation 1
2	Linearization and Block Diagrams
3-5	Mathematical Modeling of Systems
6	Time Domain Analysis: 1st Order Systems
7	Time Domain Analysis: 2nd Order Systems and Model Reduction
8+9	Steady-State Error Analysis and Routh Hurwitz Stability Criterion
10+11	Root Locus Technique
12	Frequency Domain Analysis: Nyquist Criterion
13+14	Design of Control Systems: Lead Compensators
15	PID controllers
16	Review, and final exam

Course Learning Outcomes and Relation to ABET Student Outcomes:

Upon successful completion of this course, a student should:

1.	Differ between open and close loop control systems	1
2.	Transfer control system into a mathematical model using transfer functions	1
3.	Use the Block diagrams in analysis and design control systems	1
4.	Perform time domain analysis for 1st and 2nd order system	1
5.	Learn Routh Hurwitz Stability Criterion and how to estimate Steady-State Error	1
6.	Use Root Locus Technique to find the roots of the characteristic equation of a control system	1
7	Perform frequency domain analysis control systems	1
8	Determine the stability of a closed loop system using Nyquist stability criterion	1
9	Design a control system using lead and lag compensators	1
10	Be familiar with the PID controllers concepts	1
11	Be familiar with Nyquist criterion, Bode plots and Nichols charts	1
12	Conduct a project to design a theoretical control system	1,3,5,7

Assessment Instruments:

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

Exams: Two written exams will be given. Each will cover about 3-weeks of lectures

Quizzes: 10-minute quizzes will be given to the students during the semester. These quizzes will cover material discussed during the previous lecture(s).

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

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

Grading policy:

First Exam	20%
Second Exam	20%
Quizzes and Homework	15%
Project	5%
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.