Philadelphia University

Faculty of Engineering & Technology

Department of Mechatronics Engineering

Course Title:	Automatic Control Systems (640344)
Prerequisite:	Modeling and Simulation (640327)
Credit Hours:	3 credit hours (16 weeks per semester, approximately 45 contact hours)
Textbook:	'Modern Control Engineering, by Katsuhiko OGATA, Pearson Education, 2012
References:	- Automatic Control Systems, F. Golnaraghi, John Wiley, 2010. - Control System Engineering, by S. Sivanagaraja and L. Devi, New Age International publishers, 2008
Description:	The course is a requirement for level 4 of electric engineering students. It introduces the basic principles and analysis of control feedback systems.
Instructor:	Dr. Mohammed Mahdi Website: http://www.philadelphia.edu.jo/academics/m_salman/ Email: m_selman@philadelphia.edu.jo

Course Outlines:

Week	Topic
1,2	Revision of basic and required mathematics for the course, types of roots and Laplace transformation.
3, 4	Mathematical modeling of physical, electrical and mechanical systems. Differential equation derivation.
5	Definition of control systems and their types. Concepts of open-loop and closed-loop systems. (Assignment 10 %)
6, 7	Definition of transfer function, zeros and poles real, multiple and complex. Laplace transform of differential equations. Time response determination for different inputs. Partial fraction expansion and inverse Laplace transformation.
8	Block diagram representation, block diagrams manipulation, block diagram reduction.
(Mid Exam. Period 30 %)	
9, 10	Mason's Gain Formula. Stability concept and analysis of control system. Routh's stability criterion using Matlab workspace
11, 12	Root locus method, concept, rules of sketching and analysis using Matlab workspace. (Quiz 10 %)
13	PID controllers: Concept, PID possible combinations, methods of tuning.
14	Model matching PID design method. (Group Project 10 %)
15	Revision based on examples on control of some engineering problems using Matlab.
16	(Final Exam. Period 40 %)

Course Learning Outcomes with reference to ABET Student Outcomes:

Upon successful completion of this course, student should:

1.	Operate with the concept of physical systems	1
2.	Carry out mathematical modeling of physical systems	1, 2
3.	Know the meaning and application of transfer function, zeros and poles	1, 2
4.	Apply the concept of block diagram, manipulation and reduction of block diagrams	1, 2
5.	Determine time response and its evaluation, PID applications.	1, 2
6.	Implement the concept of system stability and root-locus method	1, 2
7	Use root-locus for control system analysis	1

Assessment Guidance:

Evaluation of the student performance during the semester (total final mark) will be conducted according to the following activities:

Sub-Exam:	The students will be subjected to schedule mid exam. of 30 % weight. The mid exam will cover materials given in lectures in the first 8 weeks.
Quizzes:	One assignment, (1) quiz of (10-15) minutes will be conducted during the semester, and one group project.
Homework and projects:	Tutorials sheets will be handed out to the students and homework should be solved individually and submitted before or on a set agreed date. Student may be assigned to present project(s). Cheating by copying homework from others is strictly forbidden and punishable by awarding the work with zero mark.
Final Exam:	The students will undergo a scheduled final exam of 50% weight at the end of the semester covering the whole materials taught in the course.

Grading policy:

Mid Exam	30%
Quizzes	30%
Final Exam	40%
Total:	100%

Attendance Regulation:

The semester has in total 45 credit hours. Total absence hours from classes and tutorials must not exceed 15% of the total credit hours. Exceeding this limit without a medical or emergency excuse approved by the deanship will prohibit the student from sitting the final exam and a zero mark will be recorded for the course. If the excuse is approved by the deanship the student will be considered withdrawn from the course.