



**Philadelphia University
Faculty of Engineering
Department of Mechatronics
Second semester, 2008/2009**

Course Syllabus

Course Title: Automatic Control Systems	Course code: 640451
Course Level: 4th year	Course prerequisite (s) and/or corequisite (s): Engineering Analysis1, Sensor and actuators.
Lecture Time: 10:00-11:00	Credit hours:3

Academic Staff Specifics

Name	Rank	Office Number and Location	Office Hours	E-mail Address
Dr. Ashraf Saleem	Assistant Professor	C607, Mechatronics Dep.	10-11 STT	asaleem@philadelphia.edu.jo

Course module description:

To teach students how to model mechatronic systems, analyze system response, test the stability using different techniques, and design different control systems. Moreover, to teach students how to use simulation tools such as MATLAB in order to perform all required analysis and design issues.

Course module objectives:

At completing this module the student should be able to:

- Understand how to model different types of systems.
- Understand the analysis of systems response and their stability.
- Understand the concepts of controllers and their tuning parameters
- Analyze and design controllers for mechatronic systems.

Course/ module components

- **Books (title , author (s), publisher, year of publication)**
 1. Modern Control Engineering, By: K. Ogata, 4th edition
 2. Automatic Control systems By: Benjamin C. Kuo, 3rd editions

Teaching methods:

Lectures, tutorials, and problem solving.

Learning outcomes:

- Knowledge and understanding

It is anticipated that the student will have a good knowledge about Mechatronics systems modeling and control. Furthermore, it is expected that the student will be able to design different types of controllers, namely, PID controllers, Lead-compensators, Lag-compensators, and Lead-lag compensators.

- Cognitive skills (thinking and analysis).

The student should have the capability for analyzing transfer functions of Mechatronic systems that include sensors and actuators in terms of behavior or response to external physical variables. This will give the student the ability to design the appropriate controller to get the desired behavior.

- Practical and subject specific skills (Transferable Skills).

This course should improve the student's skills in system analysis and controller design using simulation tools such as Matlab and Simulink through a small practical project.

Assessment instruments

- Short practical projects
- Home works
- Final examination: 50 marks

<u>Allocation of Marks</u>	
Assessment Instruments	Mark
First exam	20 marks
Second exam	20 marks
Final exam	50 marks
Home works and Projects	10 marks
Total	100 marks

Documentation and academic honesty

- Documentation style (with illustrative examples)
The student is given a power point slides that summarize all course topics
- Protection by copyright
- Avoiding plagiarism.

Course/module academic calendar

week	Basic and support material to be covered	Homework/reports and their due dates
(1)	Introduction and mathematical basic Concepts(control system, open loop, closed loop), Laplace Transform, D. E.,	
(2,3)	Modeling of physical systems (Mechanical, Electrical, Fluid, Thermal)	
(4)	Transfer function and block diagram reduction techniques,	
(5-7)	Time response analysis for 1 st order, 2 nd order and higher order using MATLAB. Rouths stability criterion	
(8,9)	Industrial controllers P, PI, PD, PID.(SIMULINK implementation)	
(10,11)	Root locus analysis	
(11,13)	Controller Design by the root locus method (PID, lead compensators, lag compensators, lead-lag compensators)	
(14,15)	Frequency response analysis	
(16) Final Exam		

Expected workload:

On average students need to spend 2 hours of study and preparation for each 50-minute lecture/tutorial.

Attendance policy:

Absence from lectures 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.

Module references

Books

Automatic Control systems By: Benjamin C. Kuo, 3rd editions