



**JORDAN UNIVERSITY OF SCIENCE & TECHNOLOGY**  
**MECHANICAL ENGINEERING DEPARTMENT**  
**ME 462 Automatic Control**  
**First Semester, 2015/2016.**

---

- Catalog Data- 2007:** 3 Credit hours; This course will introduce undergrad mechanical engineering students to the basic concepts regarding: 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, phase-lead and phase-lag controllers, Introduction and frequency domain analysis, Nyquist criterion, Bode plots and Nicholas charts.
- Text Book(s):** R. C. Dorf and R. H. Bishop, “Modern Control Systems,” 12<sup>th</sup> edition, Prentice Hall, 2011.
- References:** - Franklin & Emami, “Feedback Control of Dynamic Systems”, 2002.  
- Nise, “Control Systems Engineering”, 2<sup>nd</sup> edition, 1995.
- Instructor:** Wafa Batayneh, PhD  
Mechanical Engineering Department;  
Office location: M2-L2, E-mail: [batayw@just.edu.jo](mailto:batayw@just.edu.jo)
- Class Schedule:** Sunday, Tuesday, Thursday : 08:15 am – 09:15 am **E2 113**  
Sunday, Tuesday, Thursday : 09:15 am – 10:15 am **E2 110**
- Office hours:** Sunday : 10:15 am – 11:15am & 11:15 am-12:00 noon  
Tuesday: 10:15am- 11:15 am  
-
- Pre/Co-Requisites:** ME 411 Mechanical Vibration
- outcomes:**
- 1- Identify the mathematical model for a given systems and find the system transfer function, and get the transfer function using block diagram and signal flow graph techniques. [a,e]
  - 2- Identify open loop and closed loop systems characteristics including: transient response, sensitivity, steady state error, disturbance rejection, and stability analysis. [a,e]
  - 3- Identify the time response performance and parameters for first and second order systems. [a,e]
  - 4- Construct the root locus of a given system, determine its time domain characteristics and design appropriate controller for given design specifications. [c]
  - 5- Introduction to systems frequency response, determine its characteristics and design appropriate controller for given design specifications. [a,e]
  - 6- Use Matlab to simulate, analyze and design of feedback control

systems. [k]

**Topics Covered:**

- 1- Introduction to Control Systems.....(1 week)
- 2- Systems Modeling.....(1 week)
- 3- Block Diagrams Models.....(1 week)
- 4- Signal- flow graphs models.....(1 week)
- 5- Characteristics and Performance of Feedback System..(3 weeks)
- 6- System Stability .....(1 week)
- 7- Root Locus Methods.....(2 weeks)
- 8- Frequency Response.....(2 weeks)
- 9- Stability in Frequency Domain .....(1 week)
- 10-Compensator Design.....(2 weeks)

**Computer Usage:** Matlab tool boxes will be used to carry out the simulation parts in the home works and the project.

**Scientific Visit(s):** Control lab visit

**Evaluation:**

(Projects, Attendance, Homework, quizzes & participation)	15%	
1 <sup>st</sup> Exam	22.5%	October 23, 2016
2 <sup>nd</sup> Exam	22.5 %	November 27, 2016
Final Exam	40 %	

**Relationship of the Course to ME Outcomes:**

ABET a – k	√	Level (L, M, H)	Mechanical Eng. Program Outcomes
A	√	H	a. Apply knowledge of mathematics, science, and engineering in practice.
B			b. Design and conduct experiments as well as analyze and interpret data.
C	√	M	c. Design a system, components, or process to meet desired needs.
D			d. Function on multidisciplinary teams.
E	√	H	e. Identify, formulate, and solve engineering problems.
F			f. Understanding of professional and ethical responsibility of an engineer.
G			g. Communicate effectively.
H			h. Broad education to understand the impact of engineering solutions in global and societal context.
I			i. Recognition of the need for, and possess the ability to engage in, lifelong learning.
J			j. Possess knowledge of contemporary issues.
K	√	L	k. Use the techniques, skills, and modern engineering tools necessary for engineering practice.
L			l. Adhere to safety rules and regulations.

**L: Low, M:Medium, H: High**

**ABET Category:**

Engineering Science    3    Credits

Engineering Design 0 Credits

**Prepared By:** Dr. Khaled Hatamleh

**Rules and notes:**

- 1) Never come late to the classroom, you will disturb your mates and your instructor if you do so.
- 2) Turn OFF your cell phones during the class.
- 3) DO Not TALK during the class please, unless you have a question for me.
- 4) Late home works are still accepted with a 35% penalty for every late CALENDAR day.

**Date:** Sep. 30<sup>th</sup> 2015.

- 5) Make up exams are held for carriers of official excuses in accordance to university rules.
- 6) Office hours are the hours I dedicate for you to ask me. If you think they do not suit you, then we can still arrange for a time of our convenience by sending an e-mail to me (you should expect an approval from my side).
- 7) The exams specified on the course syllabus are not subject to negotiations or change once approved by you TODAY.