UNIVERSITY OF JORDAN

COLLEGE OF ENGINEERING
DEPARTMENT OF MECHANICAL ENGINEERING

COURSE OUTLINE

ABET Unit Classification:	Engineering Topic

Compliant Catalogue:	2002/2003
Course Code:	MECH 0904580
Course Title:	Modern Control Systems
Credit Hours:	3

Class Schedule:	Three fifty (50) minute sessions per week
Laboratory Schedule:	None
Tutorial Schedule:	One fifty (50) minute sessions per week
Duration:	Fourteen (14) weeks.

Course Coordinator:	Musa Abdalla
Prepared by:	Musa Abdalla
Date of Outline Preparation:	February 15, 2004
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Checked by:	
Approved by HOD:	HOD

University of Jordan
Mechanical Engineering Department

COURSE OUTLINE

I. Course Description

MECH 0904580: Modern Control Systems [3]
This course demonstrates the basics of modern control theory. It mainly deals with time domain analysis and design. Stability advance techniques based on Lyapunov stability theorems are fully demonstrated. Even though LTI systems are emphasized nonlinear systems are also introduced. Finally, and introduction to digital control theory is provided in this course.

II. Required Background or Experience

Prerequisites by course:

MECH 0301302: Engineering Math II
MECH 0904222: Dynamics
MECH 0904418: System Dynamics and Control

Prerequisites by topic:

1.Matrix theory basic concepts
2.Engineering numerical nethods

Post requisites:

1.MECH 0904582 Vibration and Noise Control
2.MECH 0904588 Fluid Power Control
3.Control oriented senior graduation projects

III. Course Objectives

The following basic course objectives are expected to be achieved during the course

1. Build engineering common sense and insight in dealing with dynamical systems in time domain.
2. Expand on stability analysis.
3. Investigate modern controller design theories.
4. Introduce nonlinear system's control.
5. Introduce digital control systems.

III. Expected Outcomes

Students will be expected to develop the following skills/understanding upon the successful completion of MECH 0904580:

1. Model systems and present them in state space notation.
2. Use Lyapunov stability theorems to investigate system's stability.
3. Realize or synthesize different types of feedback controllers.
4. Linearize nonlinear models.

5.Deal with difference equations.

IV. Textbook(s) and Readings

1.R. Dorf and R. Bishop (2001), Modern Control Systems, (9th edition). Prentice Hall. [Textbook].
2.K. Ogata (2002), Modern Control Engineering, (4th edition). Prentice Hall [Reference].
3.B. Kuo (1995), Automatic Control Systems, (7th edition). Wiley. [Reference].

V. Minimum Student Materials

Texts, class handouts, engineering calculator, and an access to Personal Computer.

VI. Minimum College Facilities

Classroom with whiteboard and projection facilities; library; computer facilities, and control laboratory.

VII. Course Outline

The following is short course outline

- System modeling using Euler-Lagrange method.
- State space representation and signal flows with applications.
- Lyapunov methods of stability and Lyapunov Algebraic Matrix Equation.
- Controllability and observability concepts.
- Pole placement using state feedback.
- Theory of full order observers.
- Introduction to nonlinear control and feedback linearization.
- Introduction to digital control: Z-transform, difference equations, and system simulation.
- Stability analysis in digital control (Optional).

VIII. Instructional Methods

1.Lecture/Problem solving sessions.
2.Matlab Projects.
3.Homework and quizzes.
4.Computer aided design and simulation in control theory.

IX. Evaluation of Outcomes

Evaluation will be done based on the following (percentages are up to the instructor):

1. Class Attendance & Participation : 00%
2. Quizzes and Home-works : 15%
3. First and Second Exams : 35%
4. Mat lab control design project : 10%
5. Final Exam : 40%

X. Professional Component Contribution

The student will feel the importance of previously studied courses because this course integrates the knowledge gained in other courses and emphasizes a system concept rather than discrete components.