Academic Course Description
King Saud University
Electrical Engineering Department

EE 351: Automatic Control I
First Semester 1426/27 (2005/2006)

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Textbook: - Modern Control Engineering (4th edition) by K. Ogata, 2002.

Prerequisite: EE 301.

Course Objectives: The main objective of the course is to acquire the basic concepts of control systems' analysis; particularly, to learn the basics of control systems representations/modeling and stability analysis (in time and frequency domains).

Topics Covered: System representation, state variable analysis, stability analysis, time domain analysis, root locus, Bode plots, Nyquist plots, modeling, and introduction to basic control design.

Class/Tutorial Schedule: Class is held three times per week (50 min/lecture). In addition, there is a 50-minute weekly tutorial.

Professional Component Contributions: Students in this course acquire the basic skills of dealing with and analyzing some real-life control problems. Students must retrieve and blend tools of mathematics, signals and systems, and circuits in order to analyze a variety of control system scenarios. They also learn how to asses different alternative techniques to solve a set of problems. Moreover, the students acquire necessary evaluation skills and basic knowledge of realistic trade-off scenarios through the quantitative and qualitative performance evaluation of control systems.

Relationship to Program Objectives: This course contributes to the general objectives listed for an Electrical Engineering Department.

Relationship to Program Objectives:
- **Objective A:** Through the extensive use of differential equations, Laplace transforms, Linear algebra, complex variables, and modeling of mechanical systems based on Newton's law, this course supports the objective of producing graduates with a strong foundation in basic science.
- **Objective B:** By teaching students how to model a number of electrical, mechanical, and electromechanical systems, and by studying the basic components of control system, the course helps in the department's production of students with a strong foundation in electrical engineering.
- **Objective C:** By strongly encouraging students to participate in class and occasionally solve problems in teams and by valuing attendance (and on time), this course equips the students with some group dynamics abilities and professional practices which supports the department's objective of producing graduates with good communication skills.

Evaluation:

Attendance and Participation	05%
Homework and Quizzes	15%
Exam 1	20%
Exam 2	20%
Final	40%

Weekly Plan

Week	Topic
1	Introduction to systems and control
2	Review of mathematical material extensively used in the course
3	System representation (block diagrams, transfer function, Signal flow graphs)
4	State variable analysis and state space representations of control systems
5	Stability of linear control systems (BIBO, Routh-Hurwitz test)
6	Time domain analysis of control systems (transient and steady-state)
	EXAM 1
7	Root locus techniques
8-9	Frequency domain analysis (Nyquist plots)
9-10	Frequency domain analysis (Bode plots)
	EXAM 2
11	Modeling of electric and mechanical systems
12	Review and introduction to controller design