

**CEN 455**  
**First Semester 1429/1430H (Fall 2008)**  
**Introduction to Digital Control**

**Time:** Saturday, Monday, Wednesday: 2:00-2:50 PM @ A 051  
**Instructor:** Dr. Ghulam Muhammad  
**Office:** 2191, Building 31  
**Email:** [ghulam@ccis.ksu.edu.sa](mailto:ghulam@ccis.ksu.edu.sa)  
**Homepage:** <http://faculty.ksu.edu.sa/ghulam>

**Text:** “Control System Engineering”, by Norman S. Nise, 4<sup>th</sup> Edition, 2004 by John Wiley & Sons, Inc.

**References:** “Digital control of dynamic systems”, by G. F. Franklin, J. D. Powell and M. L. Workman Addison-Wesley, 3<sup>rd</sup> Ed.

**Grading:**

Home Work and Quizzes:	10%
Attendance:	10%
2-Midterms	40%
Final	40%

**Course Outline**

	<b>Topic</b>
	<b>Part I: Continuous systems</b>
1	Introduction to Control Systems and Matlab
2	Mathematical representation of systems (Differential equations, transfer function)
3	System analysis in time domains (Time response, steady state error, stability)
4	Root-Locus analysis and compensator design (PID)
	<b>First Midterm Exam 3/12/1429H (December 1, 2008)</b>
	<b>Part II: Discrete systems</b>
5	Digital Control: Introduction, Digitization, effect of Sampling.
6	Discrete models of sampled data systems: Difference equations and z-Transform.
7	Time response and stability analysis.
8	Design of discrete-time control systems (Root-Locus).
	<b>Second Midterm Exam 24/1/1430H (January 21, 2008)</b>
9	Compensator design (Pole placement + Ziegler-Nichols approach).
10	Advanced Topics: - Adaptive and predictive control. - Control of nonlinear systems.

Course Code : CEN 455

Course Title : Introduction to Digital Control

Prerequisites : CEN 340 and MATH 244

Credit Hours : 3 Lecture Hrs: 3 Lab Hrs: 0 Tut. Hrs: 1

*Part I: Continuous Systems:* Review of mathematical representation of systems, transfer functions, system analysis in frequency and time domains, system stability, and compensator design.

*Part II: Discrete Systems:* System Modeling and representation; Difference equations; review of Z transform; Review of sampling and reconstruction; Stability analysis; Design of discrete-time control systems; State-space techniques.

Textbook: Norman S. Nise , "Control System Engineering", John Wiley & Sons.

### **Instructions to the students:**

Please download lecture notes from the following link and bring printed copy of corresponding lectures in the classroom.

<http://faculty.ksu.edu.sa/ghulam>