

CISE 318: Computer Control Systems

February 2010

2006-2009 Catalog Description: CISE 318: Computer Control Systems (Required) (2-3-3), Credits 3.

Elements of Computer Control Systems, A/D and D/A, Sampling theorem, signal conditioning, anti-alias filters, sensors, actuators. Discrete time systems, digital control design, digital PID control. Programmable logic controllers, computer control technology including distributed computer control, Fieldbus technology, and OLE for process control.

Prerequisite: CISE 302.

Text Book: Phillips & Nagle **Digital Control System Analysis and Design**. 3rd Ed., Prentice Hall, 1995

References:

1. Paul Katz, Digital Control using Microprocessors, Prentice-Hall, 1981.
2. I.G. Warnock, Programmable Logic Controllers, Prentice-Hall Inc., 1988.
3. J.R. Leigh, Applied Digital Control, 2nd Ed., Prentice Hall Inc

Course learning objectives: To introduce students to basic concepts in computer control systems from the different aspects of design and implementation. The course aims to introduce students to the application of computer control in industrial systems to a achieve high performance operation. This course is an integration course that demonstrates complete closed loop functionality. The course also introduces some important computer control technology used in modern industry.

Course learning outcomes:

#	Course outcomes	Program Outcomes										
		a	b	c	d	e	f	g	h	i	j	k
1	Identify the importance of computer control in industry					L			L			
2	Understand the concept of discrete-time system modeling using shift operator.	H				M						
3	Represent systems through discrete-time equations and transfer functions.	H				H						
4	Design digital controllers for different systems.	H	H			H		M	L	L		H
5	Interface computers to processes and sensors.		M			M		M	L	M		H
6	Program and use Programmable Logic Controllers (PLCs), and identify their applications.	L				M				L		M
7	Understand a DCS structure and its implementation.	L				L				L		L
8	Recognize Fieldbus technology and how is it used in industrial networks	L	L			L		L	M	M		M
9	Recognize the need for OLE for Process Control (OPC) and how it is utilized to gather data.	L	L	L		L		L	M	M		M

Topics:

- i. Introduction to Computer Control (2 classes)
- ii. Sampling and Reconstruction (1 class)
- iii. Z-transform (2 classes)
- iv. Discretization and Closed Loop Systems (4 classes)
- v. Design of digital controllers (5 classes)
- vi. A/D and D/A Conversion, Sensors, and Signal Conditioning (4 classes)
- vii. Introduction to Programmable Logic Controllers (PLCs) (2 classes)
- viii. Computer Control Technology (Handout)
 - a) Distributed Control Systems (DCS) (4 classes)
 - b) Fieldbus Networks (2 Classes)
 - c) OLE for Process Control (OPC) (2 Classes)
- ix. Case studies (2 Classes)

Computer usage: The LABVIEW software package is extensively used in the lab. MATLAB with SIMULINK is also used in simulating, analyzing and design of digital control systems..

Laboratory projects: Lab experiments covers the basics of ADC, DAC, sampling in addition to using LABVIEW

Dr. Amar Khoukhi, February 2010