

EEL4658 - Elements of Industrial Control

Three Credits, One hour and fifteen minutes, Engineering Topic

Instructor: Dr. Amaury A. Caballero

Textbook: 1.- Bartelt, T., Industrial Automated Systems. Instrumentation and Control, Delmar Publishers, 2011

2.- Groover, M. P., Automation, Production systems, and Computer Integrated Manufacturing (3rd edition), Prentice Hall,2008

Specific Course Information:

The goal of the course is to teach the basic aspects covering the process control: the automation functions, the levels of automation, input and output interfaces to the control system, robots' applications, computer control and programmable logic controllers.

Specific Goals for the Course

a. Specific outcomes of instruction

Upon successful completion of this course, the student will:

The goal of the course is to teach the basic aspects covering the process control. At the end of the course, students should be able:

- 1.to apply the major cutting-edge technologies of production automation,
- 2.to describe different industrial processes from the point of view of the control and instrumentation,
- 3.to use different input and output devices for the control of industrial processes,
- 4.to apply computer techniques in the design of control systems.

b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.

In this course the student will have to show

- (a) an ability to apply knowledge of mathematics, science, and engineering (N/A)
- (b) an ability to design and conduct experiments (simulations), as well as to analyze, interpret data (N/A)
- (c) an ability to design a system, component, or process to meet desired needs (N/A)
- (d) an ability to function in multi-disciplinary teams (N/A)
- (e) an ability to identify, formulate, and solve engineering problems (homework) (N/A)
- (f) an understanding of professional and ethical responsibility (N/A)
- (g) an ability to communicate effectively (through project reports) (N/A)
- (h) the broad education necessary to understand the impact of engineering solutions in a global and societal context (N/A)
- (i) a recognition of the need, and an ability to engage in life-long learning (N/A)
- (j) a knowledge of contemporary issues (N/A)
- (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (N/A)
- (l) a knowledge of probability and statistics (N/A)

Brief list of the topics to be covered

Part I. Process Control

- 1.Introduction to process control
 - 2.Digital controllers
 - 3.Adaptive control
 - 4.Control of different physical variables
 - 5.Interfacing devices: sensors and actuators
 - 6Automatic identification and data capture: bar code technology; radio frequency identification; other AIDC technologies
 - 7.Transducers: bridge circuits; instrumentation amplifiers; inverters; temperature/time converters; Synchros
 - 8.A/D and D/A converters
 - 9.Output devices for discrete data
- Part II. Automation and Control Technologies
- 1.Basic elements of an automated system
 - 2.Advanced automation functions
 - 3.Levels of automation
 - 4.Process industries versus discrete manufacturing industries
 - 5.Continuous versus discrete control
 - 6.Computer process control
 - 7.Robot Control Basic concepts
- Part III. Discrete Control Using Programmable Logic Controllers and Computers
- 1.Programmable Logic Controllers (PLC)
 - 2.Fundamentals of PLC programming
 - 3.Ladder logic diagrams
 - 4.Fundamentals of numerical control (NC) technology
 - 5.Computer numerical control
 - 6.Distributed numerical control
 - 7.Hierarchical control
 - 8.Applications of numerical control
 - 9.Use of INTERNET

GRADING:

Course Requirements	Weight
Test # 1	30%
Test # 2	30%
Homework and quizzes	10%
<u>Final Project</u>	<u>30%</u>
Overall Grade	100%

Conversion of Numerical Grade to Letter Grade

95<=A<=100	83<=B<85	70<=C<75
90<=A-<94	80<=B-<82	60<=D<69
86<=B+<89	76<=C+<79	F: Below 60