

Asian Institute of Technology
School of Engineering and Technology

AT74.07 Automation Technology 3(2-3)

Semester: August

Course Objective:

With today's industrial development, factories intend to enhance the productivity and profitability through automation. This requires knowledge on control systems, actuators and sensors should be integrated in a holistic way. The course integrates these skills to accomplish industrial automation. The main objective is to impart knowledge and practical experiences in advanced control and programming of automation systems.

Learning Outcomes:

Upon completion of this course, the students should be able to:

- Recommend whether a process of interest should be automated or not based on economic and technical information
- Select appropriate and compatible hardware to carry out the automation
- Program a PLC using relay ladder logic for a given application
- Design and implement an automation system

Prerequisites: None

Course Outline:

- I. Principles of Automation Technology
 1. Automation System Components
 2. Discrete Manufacturing Automation
 3. Continuous Process Automation
 4. Strategy for Automation

- II. Programmable Logic Controllers (PLC)
 1. Industrial Control Overview
 2. Structure of PLC
 3. Introduction to Programming Languages for PLC
 4. Relay Ladder Logic Based Programming
 5. Timers, Counters and Other Functions
 6. Application Examples

- III. Digital Communication
 1. Evolution of Factory Communication
 2. Communication Architectures
 3. Open Systems Interconnection

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4. Communication over Public Networks
5. Description of Selected Automation Buses
6. Intelligent Sensors and Actuators

IV. Feedback Control

1. Continuous and Discrete-Time Control
2. On/Off Control
3. PID Control
4. Distributed System Control (DCS)

V. Man-Machine Communication

1. Human Machine Interfaces
2. Interface Design Principles
3. Supervisory Control and Data Acquisition (SCADA)

VI. Pneumatic and Hydraulic Applications

1. Comparison of Pneumatic and Hydraulic Systems
2. Selection of Components for a Specific Design
3. Design and Representation of Circuits in Standard Notation

Laboratory Sessions:

- Sensors and Actuators in Automation
- Introduction to Controllers (PLCs, Microcontrollers and Standalone Controllers)
- Wiring of PLCs
- Interfacing Switches and other input-output devices
- RLL based PLC programming
- Timers and Counters
- Jump Operations
- Load and Transfer Operations
- Functions, Function Blocks and Data Blocks
- WINCC Introduction
- Application Project

Learning Resources

Textbooks: No designated text book, but class notes and handouts will be provided

Reference Books:

1. W.Bolton, Programmable Logic Controllers, 5th Edition , Elsevier, 2013.
2. S. B. Moriss: Programmable Logic Controllers, Prentice Hall, 2000
3. S. Cetinkunt, Mechatronics, John Wiley & Sons, 2007
4. W. Bolton, Mechatronics - Electronic Control Systems in Mechanical and Electrical Engineering, 4th Edition, Pearson Education, 2013

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Journals and Magazines:

1. Transactions of Automation Science and Engineering, IEEE
2. Transactions of Automatic Control, IEEE
3. Automatica, Elsevier

Teaching and Learning Methods: Methods used are lectures, laboratory work and take home assignments which include presentations and conducting computer simulations.

Time Distribution and Study Load:

Lectures: 30 hours

Laboratory sessions: 45 hours

Self study and assignments: 90 hours

Presentations: 6 hours

Evaluation Scheme: Mid semester (20%) examination, final examination(40%) (both are closed book), laboratory sessions (20%) and assignments (20%).

In the evaluation, an "A" will be awarded if a student demonstrates an excellent level of understanding of the principles and demonstrates excellent capabilities in automation related applications. "B" will be awarded if a student demonstrates an average level of understanding of the principles and demonstrates average capabilities in automation related applications. "C" will be given if a student demonstrates below average level of understanding of the principles and demonstrates below average level of capabilities in automation related applications.

Instructor(s): Dr. A.M. Harsha S. Abeykoon

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