

COURSE TITLE	INDUSTRIAL AUTOMATION
COURSE CODE	01EE0718
COURSE CREDITS	3

Objective:

- 1 The course is designed to impart fundamental concepts of industrial automation systems and their components amongst the students. The course specifically focusses on basic components used in automation and PLC architecture and Programming as well as SCADA system.

Course Outcomes: After completion of this course, student will be able to:

- 1 Identify different components of an automation system
- 2 Select various sensors and actuators used in industrial automation.
- 3 Develop PLC ladder logic program for given application
- 4 Distinguish between the discrete and analog I/O devices used in automation
- 5 Perform interfacing of Supervisory Control and Data Acquisition system with PLC

Pre-requisite of course: Basic Electronics, Digital Electronics and Basic Electrical Engineering

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	0	50	30	20	0	0

Contents : Unit	Topics	Contact Hours
1	Introduction to Industrial Automation Need and benefits of automation, Basic components of automation system, Types of automation system: Fixed, Programmable and Flexible, Levels of Automations, Types of Control systems, Overview of different systems for automation: PLC, HMI, SCADA and DCS	7
2	Sensors and Actuators for Automation Working of Sensors used for Temperature, Working of Sensors used for Pressure and Force, Displacement, Speed and Flow sensor, Level, Humidity and pH measurement, Actuators like contactors, process control valves, power electronics switches etc, Introduction of DC and AC servo drives for motion control	10

Contents : Unit	Topics	Contact Hours
3	Programmable Logic Controller (PLC) Parts of PLC: CPU, I/O Modules, Discrete I/O modules and Analog I/O Modules, Memory and Power Supply, PLC Vs Computers, Size of PLC and Application, Memory organisation of PLC, Special I/O Modules, Types of PLC, Advantage of using PLC for Industrial automation, PLC Selection, PLC communication and Networking, PLC Enclosures	8
4	PLC Programming and Application to Process control I/O Addressing, PLC Programming Instructions: Relay type Instructions, Timers, Counters, Arithmetic instructions and logical instructions, Programming languages: Ladder diagram, Sequential flow chart, Functional block diagram, Instruction list and structured text, Ladder logic development for various PLC based Applications, Converting relay schematics in Ladder Programs, Structure Text program development for various PLC based Applications	12
5	Supervisory Control and Data Acquisition (SCADA) Elements of a SCADA system, Types of SCADA Systems, Advantages of SCADA, Need of communication and its protocol, Real time systems and operator interface, Remote terminal units (RTUs), Master terminal units (MTUs), Interfacing SCADA system with PLC, Application of SCADA	7
Total Hours		44

Textbook :

- 1 Programmable Logic Controller, Vijay R. Jadhav, Khanna Publishers, 2008
- 2 Industrial automation and Process Control, Jon Stenerson, PHI Learning, 2002

References:

- 1 Programmable Logic Controller, Programmable Logic Controller, Frank D. Petruzella, McGraw Hill Publication, 2011
- 2 Supervisory Control and Data Acquisition, Supervisory Control and Data Acquisition, Boyar S.A., ISA Publication, 2004
- 3 Programmable Logic Controllers and Industrial Automation: An Introduction, Programmable Logic Controllers and Industrial Automation: An Introduction, Madhuchhanda Mitra and Samarjit Sen Gupta, Penram international publishing (india) pvt. Ltd., 2017

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery
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Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
10.00	20.00	25.00	25.00	10.00	10.00

Instructional Method:

- 1 The course delivery method will depend upon the requirement of content and the needs of students. The teacher, in addition to conventional teaching methods, may also use any tools such as demonstration, role play, Quiz, brainstorming, MOOCs, etc
- 2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and classroom.
- 3 Students will use supplementary resources such as online videos, NPTEL videos, e-courses, and Virtual Laboratory

Supplementary Resources:

- 1 https://onlinecourses.nptel.ac.in/noc20_me39/preview
- 2 <https://www.sanfoundry.com/100-plc-programming-examples/>