Industrial Automation

Subject Code:	Course Title: Industrial Automation	Total Contact Hours: **40**	**L: 4**	**T: 0**	**P: 0**	**C: 4**
Pre-requisite: Basic Electronics, Electrical Technology, Industrial measurements, Mechatronics.		Year: **4th**	Semester: **Even**			
Type of Course**:** Program Elective (PE)						

***** L → Lectures, T → Tutorials, P → Practical C → Credit***

Learning Objective:

This is an undergraduate Elective course offered to 4th year Mechanical Engineering students. It covers the basic principles of Industrial Automation and all aspects of automation which are playing a key role in Industries for economic viability and mass production. Students will learn basics of automation, material handling, Mam machine interfacing, product identification and use of computers for automation. This course will provide opportunity to learn industrial automation techniques like PLC, SCADA and robots in automation.

Course outcomes (COs):

On completion of this course, the students will have the ability to:		**Bloom's Level**
CO-1	Understand various automation components and systems	**3**
CO-2	Explain architecture of industrial automation system	**3, 4**
CO-3	Design material handling and material storage systems for an automated factory	**3, 4**
CO-4	Automate shop floor controls and part/device identification methods	**4, 5**
CO-5	Use programmable logic controllers for industrial automation	**5, 6**

Course Topics:

S. No.	**Contents**	**Hours**
1	**Introduction:** Principle and Strategies of Automation-Power to Accomplish the Automated Process, program of Instruction, Control System, Advanced automation Functions-safety Monitoring, maintenance and repair Diagnostics, error Detection and Recovery, levels of automations- Five levels of automation and control in manufacturing.	**4**

2	**Automation in Material Handling:** Material Handling systems and Design-Introduction to Material Handling, Material Transport Equipment, analysis of Material Transport Systems, Storage systems- Storage System Performance and Location Strategies, Conventional Storage Methods and Equipment, Automation Storage Systems, Engineering Analysis of Storage Systems.	**6**
3	**Automation identification and Computer aided automation:** Automatic identification methods- Overview of Automatic Identification Methods, Bar Code Technology, Radio Frequency Identification, Other AIDC Technologies. man-machine interface, computer aided process control hardware, process related interfaces, Communication and networking, Industrial communication systems, Data transfer techniques, Computer aided process control software, Computer based data acquisition system, Internet of things (IoT) for plant automation	**11**
4	**Programmable logic controllers:** Programmable controllers, Programmable logic controllers, Analog digital input and output modules, PLC programming, Ladder diagram, Sequential flow chart, PLC Communication and networking, PLC selection, PLC Installation, Advantage of using PLC for Industrial automation, Application of PLC to process control industries.	**8**
5	**Distributed Control System:** Overview of DCS, DCS software configuration, DCS communication, DCS Supervisory Computer Tasks, DCS integration with PLC and Computers, Features of DCS, Advantages of DCS.	**8**
6	**Overview of Industrial automation using Robots:** Basic construction and configuration of robot, Pick and place robot, Welding robot.	**3**

Textbook References:

Text Book:

1. Groover, M.P., *Automation production Systems and Computer Integrated Manufacturing*, Pearson Education, 2003.
2. Krishna Kant, *Computer Based Industrial Control*, Prentice Hall of India, New Delhi, 2000.
3. Tiess Chiu Chang and Richard A.W., *An Introduction to Automated Process planning Systems*, Tata McGraw-Hill Publishing company, New Delhi, 2000.

Reference books:

Industrial Automation

1. F. D. Petruzella, "*Programmable Logic Controllers*", McGraw-Hill Education, 3rd Edition, 2014.
2. S. Mukhopadhyay, S. Sen and A. K. Deb, *Industrial Instrumentation, Control and Automation*, Jaico Publishing House, 2013.
3. Herbert E. Merritt , *Hydraulic Control Systems*, Wiley, 1991.
4. George Stephanopoulos, *Chemical Process Control, An Introduction to Theory and Practice*, Prentice Hall India, 2012.
5. R. Krishnan, *Electric Motor Drives, Modelling, Analysis and Control*, Prentice Hall India, 2002.

Additional Resources:

NPTEL, MIT Video Lectures, Web Resources etc.

Evaluation Method	
Item	**Weightage (%)**
Mid term	20
End term	50
Teacher's assessment (Assignment/ Presentation/ Project/ Quiz)	30

CO and PO Correlation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	1	-	-	-	-	-	-	1	2	1	1
CO2	3	2	2	1	1	-	-	-	-	-	-	1	2	2	1
CO3	3	2	2	1	1	-	-	-	-	-	-	1	3	2	1
CO4	3	3	2	1	2	-	-	-	-	-	-	1	3	3	1
CO5	3	3	2	2	2	-	-	-	-	-	-	1	3	3	1

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Approved by: