CVM UNIVERSITY
Aegis: Charutar Vidya Mandal (Estd.1945)

FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2022-23

Programme: **Bachelor of Technology (Mechanical Engineering)**

Semester: **VI**

Course Code: **202050622**

Course Title: **Industrial Automation**

Course Group: **Open Elective Course - II**

Course Objectives: Automation plays a key role in Industries. Industries rely heavily on automation for economic viability and mass production. It is important for the students to learn the basics of automation, how system works and importance of PLC, SCADA and DCS in automation. This course will provide an opportunity to learn industrial automation techniques.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
				Theory		J/V/P*		Total
Lecture	Tutorial	Practical		Internal	External	Internal	External	
2	0	2	3	50/18	50/17	25/9	25/9	150/53

* **J**: Jury; **V**: Viva; **P**: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	**INTRODUCTION:** Automation review, Requirement of automation systems, Architecture of Industrial automation, Role of Computers in measurement & control	03
2	**Automation Components:** Sensors for temperature, pressure, force, displacement, speed, flow and level. Power Electronics devices: SCR, DIAC, TRIAC, MOSFET & IGBT Introduction to DC & AC servomotors	12

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3	**PLC Basics:** Introduction to Programmable Logic Controllers (PLCs), history of PLCs, Advantages of PLCs, Comparison of PLC based control systems with other conventional control systems, Block diagram of PLC, Internal architecture of PLC, Digital and Analog Input output modules of PLCs, scan cycle and scan time, connections and wiring of various Inputs and Outputs of Plants with the PLC, selection of PLCs, commissioning of PLCs, Overview of various programming languages of PLCs: (1) Ladder diagram, (2) Functional Block Diagram (FBD), (3) Instruction List (IL), (4) Sequential Flow Chart (SFC),Programming of On-Off inputs and outputs, producing Boolean equation from given PLC program, design of PLC program from given Boolean function, Introduction to PLC timers and counters, programming using timers and counters.	**20**
4	**Introduction to SCADA:** Elements of SCADA. Features of SCADA, MTU & functions of MTU, RTU & Functions of RTU, Protocol structure used for communications in SCADA.	**05**
5	**Introduction to DCS:** Overview of DCS, Structure & Architecture of DCS, Features , Applications and advantages of DCS, DCS Communication, DCS integration with PLCs and Computers	**05**

List of Practicals / Tutorials:

1	Measurement And ON-OFF Control Of Temperature Using Resistance Temperature Detector (RTD).
2	Measurement of Linear Displacement Using Linear Variable Differential Transformer(LVDT)
3	Introduction to PLCs and various programming languages to program PLCs.
4	Programming of various digital logic gates using various PLC programming languages.
5	Simulation of water level control in a tank using FBD programming.
6	Simulation of water level control in a tank using ladder diagram and Instruction List.
7	Control of Linear Slide Base operation (Forward and reverse switching of DC motor) using PLC FBD.
8	Control of Linear Slide Base operation (Forward and reverse switching of DC motor) using PLC Ladder diagram and IL.
9	To study various PLC timers.
10	Control of conveyor belt using PLC.
11	Simulation of process control in a paint industry using PLC.
12	To control the flash light operation using PLC.

Reference Books:

1	Programmable Logic Controllers: Fourth Edition, by W. Bolton, Pub: Elsevier Newnes
2	Programmable Controllers An engineer's guide, third edition by E.A.Parr, Pub: Elsevier Newnes
3	Programmable Logic Controllers: Principles and Applications, by John W. Webb and Ronald A. Reis, fifth edition, Pub: Prentice – Hall India
4	SCADA - supervisory control and data acquisition, Stuart A. Boyer, — International Society of Automation Publication, 4th Edition, 2009

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Supplementary learning Material:	
1	NPTEL and Coursera Resources
2	http://www.plcmanual.com/
3	http://www.automation.siemens.com/
4	http://literature.rockwellautomation.com/

Pedagogy:
Direct classroom teaching
Audio Visual presentations/demonstrations
Assignments/Quiz
Continuous assessment
Interactive methods
Seminar/Poster Presentation
Industrial/ Field visits
Course Projects

Internal Evaluation:
The internal evaluation comprised of written exam (40% weightage) along with combination of various components such as Certification courses, Assignments, Mini Project, Simulation, Model making, Case study, Group activity, Seminar, Poster Presentation, Unit test, Quiz, Class Participation, Attendance, Achievements etc. where individual component weightage should not exceed 20%.

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						**R**: Remembering; **U**: Understanding; **A**: Applying; **N**: Analyzing; **E**: Evaluating; **C**: Creating
R	**U**	**A**	**N**	**E**	**C**	
15	20	15	10	05	05	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	To understand the fundamentals of Industrial Automation and various components of industrial automation	**20**
CO-2	Development of programs using standard PLC programming languages	**30**
CO-3	To be able to select, configure, wiring and troubleshooting of PLC	**30**
CO-4	To understand fundamentals of SCADA & DCS	**20**

Curriculum Revision:	
Version:	2
Drafted on (Month-Year):	Jun-2022
Last Reviewed on (Month-Year):	
Next Review on (Month-Year):	June-2025

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