GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering (Part Time)
Subject Code: 2970909
Semester – VII
Subject Name: Industrial Automation

Type of course: Open Elective Subject

Prerequisite: Knowledge of Basic Electrical Engineering, Basic Electronics, Digital Electronics, Electronics Measurement and Instruments

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

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
2	0	2	3	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1	**Introduction:** Automation overview, Requirement of automation systems, Architecture of Industrial Automation system, Introduction of PLC and supervisory control and data acquisition (SCADA). Industrial bus systems: modbus & profibus. Role of computers in measurement and control.	4
2	**Automation components**: Sensors for temperature, pressure, force, displacement, speed, flow, level, humidity and pH measurement. Actuators, process control valves, power electronics devices DIAC, TRIAC, power MOSFET and IGBT. Introduction of DC and AC servo drives for motion control.	6
3	**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.	7
4	**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.	7

5	**Overview of Industrial automation using robots:** Basic construction and configuration of robot**,** Pick and place robot, Welding robot. Internet of things for plant automation and overview of Industry 4.0	**6**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
5	**15**	**25**	**10**	**10**	**5**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

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.

Reference Books:

[1] Industrial Instrumentation and Control By. S.K. Singh The McGraw Hill Companies

[2] Process Control Instrumentation Technology By. C.D. Johnson, PHI

[3] Industrial control handbook, Parr, Newnem

[4] Programmable logic controller, Dunning, Delmar

Course Outcomes:

Sr. No.	**CO statement**	**Marks % weightage**
CO-1	Explain automation components and systems application	25
CO-2	Identify suitable industrial automation hardware for given application	30
CO-3	Measure industrial parameters like temperature, pressure, force, displacement, speed, flow, level, humidity and pH.	25
CO-4	Integrate SCADA with PLC Systems	20

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List of Experiments:

(General guidelines.. Institute may change list of experiments based on laboratory set up available)

- Use industrial grade sensors and transducer introduction and characteristics like proximity detector, linear encoder, rotary encoder, touch sensor, force sensor, accelerometer, RTDs, loadcells and LVDT for measurement
- Use Various actuators such as relay, solenoid valve, process control valve and motors for control applications
- Simulate analog and digital function blocks
- Relay logic diagram and ladder logic diagram
- Understand and perform experiments on timers and counters
- Logic implementation for traffic Control Application
- Logic implementation for Bottle Filling Application
- Tune PID controller for heat exchanger using DCS
- FBD for autoclavable laboratory fermentor
- Develop graphical user interface for the plant visited by you
- Industrial visit report

There may be separate list of experiment where laboratory setup is developed by Siemens under Centre of Excellence.

Major Equipment:

1. ADC, DAC and Controller, Switches, LEDs, Solenoid valves
2. Relay, motor
3. PLC with software
4. MATLAB® or LABView®
5. AC Servo drives and DC Servo drives
6. Zeegbee and Bluetooth based short range automation system.
7. IoT boards.
8. Robot for demonstration