GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3160316
Semester – VI
Industrial Automation

Type of course: Open elective - II

Prerequisite: Knowledge of Basic transducers, Advanced Electronics, Digital Electronics,

Rationale: Provides the student with basic knowledge of the industrial automation Systems design, installation, modification, maintenance, and repair.

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)**	
3	0	0	3	70	30	-	-	100

Content:

Sr. No.	Content	Total Hrs	Weightage %
1	**Introduction to Industrial automation and Measurement systems for different process parameters.** Automation overview, Requirement of automation systems, Architecture of industrial automation systems, measurement techniques of temperature, pressure, force, displacement, speed, flow, level, humidity, pH, Signal conditioning and processing, Actuators, process control elements.	09	20%
2	**Process Control techniques** Feedback & Feed forward Control, PID design and tuning, Cascade Control, Selective control loops, Ratio Control, Control systems with Inverse response, Cascade control.	09	25%
3	**Computer aided measurement and control systems:** Role of computers in measurement and control, Elements of computer aided measurement and control, 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, and Computer based data acquisition system. Internet of things (IoT) for plant automation.	07	15%
4	**Programmable logic controllers:** Programmable controllers, Programmable logic controllers, Analog digital input and output	14	30%

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	modules, PLC programming, Ladder diagram, Sequential flow chart, PLC Communication and networking, Advantage of using PLC for Industrial automation, Applications of PLC in process control industries. Industrial bus systems: Modbus& profibus Introduction to Supervisory Control and Data Acquisition (SCADA) systems and Distributed Control Systems (DCS). Industrial bus systems.		
5	Introduction to safety, electrical hazards, hazardous areas and their classification, non-hazardous areas, enclosures-National Electrical Manufacturers Association (NEMA) types, fuses and circuit breakers. Protection methods: Purging, explosion proofing and intrinsic safety.	06	10%
		45	**100%**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	20	20	20	20	10

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 the above table.

Reference Books:

1. S.K. Singh ,"Industrial Instrumentation and Control", McGraw Hill
2. C.D. Johnson, "Process Control Instrumentation Technology", PHI publication
3. E. A. Parr, "Industrial control handbook", Newnem publication
4. Jon Stenerson, Industrial Automation and Process Control, Prentice Hall
5. Peng Zhang, "Advanced Industrial Control Technology", Elsevier
6. KokKiong Tan, Andi Sudjana Putra," Drives and Control for Industrial Automation", Springer

Course Outcomes:

At the end of this course students will be able to

Sr. No.	CO statement	Marks % weightage
CO-1	Comprehend industrial automation systems architecture, sensors and measurement systems for process control.	20%
CO-2	Describe various Process Control techniques	25%

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CO-3	Explain Computer aided measurement and control systems.	15%
CO-4	Implement various industrial applications using Programmable logic controller	30%
CO-5	Understand various hazardous and safety measures for an industrial automation.	10%