

## PEI103: INDUSTRIAL INSTRUMENTATION AND CONTROL

L	T	P	Cr
3	0	2	4.0

**Course objective:** To understand the concepts of industrial instrumentation and control, to enable select, design and program industrial instrumentation equipment

**Review:** Review of conventional and recent measurement techniques for measurement of Temperature, Pressure, Flow, Level, Shaft power Torque, Speed, Vibrations, Viscosity, pH, Humidity.

**Industrial Instrumentation:** Instrumentation for hazardous areas, Instrumentation for environment monitoring, Instrumentation for energy monitoring and conservation, Multi sensor fusion, Control valves, Characteristics, Sizing and selection, P/I, I/P converter, Valve positioner, Instrumentation Symbols, P-I diagrams

**Programmable Logic Control:** Evolution of PLC, Block diagram, Different components of PLC, PLC Scan cycle, Memory organization and addressing, Advancements in PLCs, PLC Instruction set including NO, NC, Set, Reset, Timer, Counter, Mathematical functions, LIFO, FIFO, Jump, Bit shift instructions etc., PLC selection Process, Estimating program memory and time requirements, Selecting hardware.

**Distributed control system (DCS):** Evolution and advantages of computer control, Configuration of supervisory control, Direct digital control (DDC), Distributed control systems (DCS), Remote terminal units (RTUs), System integration with PLCs, SCADA Systems

**Robotics:** History, Present status, Future trends, Robot anatomy, Robot sensors, Actuators and end effectors, Robot degrees of freedom, Robot joints, Robot Coordinates, Robot reference frames, Robot work space, Matrix representation, Representation of transformations like pure translation, Pure rotation and combined rotation, Forward and reverse kinematics

**Digital communication in Process Control:** Smart transmitters, Hardware and Software protocols, RS232, GPIB, CAN, HART, Foundation of Field bus and other IEEE Standards.

**Laboratory work:** Valve Characteristics, P/I, I/P converter, Valve positioner, PLC, Programming and interfacing, Level and Flow control on basic process rig, Programming robotic arm.

### Minor Project:

1. To investigate recent advancement in sensors
2. To develop PLC programs for various applications on simulators.

**Course learning outcome (CLO):** After the completion of the course the students will be able to

1. Acquire knowledge about industrial instrumentation and control

Programme programmable logic control

Handle DCS system

Programme and analyze robotic system

Interface the hardware and software through buses for process control system

***Recommended Books***

1. *Anand, M.M.S., Electronic Instruments and Instrumentation technology, Prentice–Hall of India (2006).*
2. *Deb S., Robotics technology and flexible automatio, Tata McGraw Hill (2004).*
3. *Doebelin E.O., Measurement systems: applications and design, Tata McGraw Hill (2003) 5th ed.*
4. *Liptak B.G., Process control: Instrument engineers’ Handbook, Butterwirth Heinemann (2003) 4th ed.*

**Evaluation Scheme:**

S.No	Evaluation Elements	Weightage (%)
1.	MST	25
	EST	40
	Sessionals (May include Assignments/ Projects/ Tutorials/ Quizes/ Lab Evaluations)	35