

Course Type	Course Code	Name of Course	L	T	P	Credit
OE	ECO303	Process Instrumentation and Control	3	0	0	9

Course Objective

To develop an understanding on the measurement and control system of any process industry, concepts of different transducers, measuring instruments, controllers along with their operational is essential. This course will enable the future engineers to make the best use of the different measuring and controlling instruments available at present as well as help them to design better instrumentation systems for the modern process industries

Learning Outcomes

Provide adequate knowledge to students about the measurement and control systems used in industry. Starting with measurement techniques for different important process variables like flow, level, pressure, temperature etc. to different conventional and advanced digital control technique will be discussed. Modern industrial control, programmable controller, distributed control system and SCADA system etc. will also discussed in this course.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Characteristics of Instruments: Static and dynamic; Concept of dynamic response, linear systems, First, second and higher order system, systems with dead time; Principle of Transducers; Measurement of temperature, pressure, flow rate and level.	10	Develop the understanding on the characteristics of instruments and the working of different industrial instruments for the measurement of different variables like flow, level, pressure and temperature.
2	Introduction to process control: closed loop and open loop control, feedback and feed forward configurations, set point, disturbance; Types of controllers including ON-OFF, P, PI, PD and PID control; Design of controllers using open loop response, Zigler-Nichols approach.	9	Develop the understanding about the controller and their tuning methods. Acquire ability to design controller.
3	Advanced Control: Cascade Control, Feed forward Control, Ratio control, Split Range Control, Auctioneering Control and Multivariable Control	5	Develop the understanding about the different advanced controller used in industry.
4	Programmable Logic Controller (PLC): Introduction, Application, Physical and functional components, Timers, Counters, Ladder Diagram, PLC Programming, Interfacing with sensors and actuators. Advanced PLCs, analog input output, HMI, Communication protocols, PID control through PLC	9	Understanding of the architecture of PLC. Design of process control system using PLC.
5	Digital Control Loop with computer as controller. Loop structure with continuous process and digital controller. DCS- Evolution, Different architectures, Local control unit, Operator Interface. SCADA- Hardware and software, Remote terminal units, Master station, Communication architectures and Open SCADA protocols	9	Develop the understanding about the control strategy using Distributed control system and SCADA used in industry.

Text Book:

1. D. M. Considine and G. D. Considine (Eds.) Process Instruments and controls Handbook, Mc Graw Hill, New York.
2. B. G. Liptak, Instrument Engineers Handbook, vol-I and vol-II, Chilton Book Co. Philadelphia

Reference Books:

1. D. Patranabis, Principles of industrial Instrumentation, TMH, New Delhi, 2nd Ed.
2. Process dynamics and control by D. E. Seborg, T. F. Edgar and D. A. Mellichamp
3. D. R. Coughanowr, B. K. Lowell, Process systems analysis and control, 2nd Ed. McGraw-Hill,