

17ES022 SMART INSTRUMENTATION

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P	WA/RA	SSH/HS	CS	SA	S	BS
45	15	-	15	30	-	5	5	-

Course Objectives:

The evolution from simple pneumatic to sophisticated smart instruments has been driven by user demands for better performance, easier maintenance, and more uptime. Smart instruments have met these demands and more, albeit with increasing complexity. But once smart instruments are understood and deployed, the payoff is less complexity, better performance, and reduced costs throughout the balance of the process control and information system lifecycles. The course is extensively hands on, giving participants considerable practical experience of the devices typically found in industry.

Course Outcomes:

- Identify various sensors, Transducers and their brief Performance specifications.
- Understand principle of working of various types of signal conditioning, processing and transmitter
- Make comparative study of various protocol.
- Understand applications of Instrumentation in Emmebedded system(Real Time Interface)

SKILLS:

- Evaluate the different types of errors
- Understand the design of sensors
- Understand the working and applications of transmitters

ACTIVITIES:

- Designing simple sensors
- Designing Transmitters of different type

UNIT - I

General concepts and terminology of measurement systems, static and dynamic characteristics, errors, standards and calibration.

UNIT - II

Introduction, principle, construction and design of various active and passive transducers. Introduction to semiconductor sensors and its applications, Design of signal conditioning circuits for various Resistive, Capacitive and Inductive transducers and piezoelectric transducer.

UNIT - III

Introduction to transmitters, two wire and four wire transmitters, Smart and intelligent Transmitters. Design of transmitters.

UNIT - IV

Introduction to EMC, interference coupling mechanism, basics of circuit layout and grounding, concept of interfaces, filtering and shielding. Safety: Introduction, electrical hazards, hazardous areas and classification, nonhazardous areas, enclosures – NEMA types, fuses and circuit breakers. Protection methods: Purging, explosion proofing and intrinsic safety.

UNIT - V

Field bus, Mod bus, GPIB, IEEE-488, VME, VXI, Network buses – Ethernet – TCP/IP protocols; CAN bus- basics, Message transfer, Fault confinement.

TEXT BOOKS:

1. John P. Bentley, Principles of Measurement Systems, Third edition, Addison Wesley Longman Ltd., UK, 2000.
2. Doebelin E.O, Measurement Systems - Application and Design, Fourth edition, McGraw-Hill International Edition, New York, 1992.

REFERENCE BOOKS:

1. M. Sze, "Semiconductor sensors", John Wiley & Sons Inc., Singapore, 1994.
2. Noltingk B.E., "Instrumentation Reference Book", 2nd Edition, Butterworth Heinemann, 1995.
3. L.D.Goettsche, "Maintenance of Instruments and Systems – Practical guides for measurements and control", ISA, 1995.
4. Yang Xiao, "Communication and Networking in Smart Grids", CRC Press 1994.