

**Nirma University**  
**School of Technology, Institute of Technology**  
**B. Tech (Instrumentation and Control Engineering)**  
**Semester: VI**

L	T	P	C
3	0	2	4

<b>Course Code</b>	<b>2IC602</b>
<b>Course Title</b>	<b>Industrial Instrumentation</b>

**Course Learning Outcome:**

At the end of the course, students will be able to -

- illustrate the fundamental principles of instruments and actuators used in industry.
- select the appropriate control valves for different applications.
- analyze and design the instrumentation system documents and drawings.
- realize the role of safety standards.

**Syllabus**

**Teaching  
Hours**

**UNIT 1: Introduction**

**06**

Introduction of Industrial automation, overview of PLC, SCADA, DCS and smart instrumentations.

**UNIT 2: Field devices for industry**

**06**

I to P and P to I Converter, Pneumatic transmitter, Electronic transmitter, Smart transmitter, Thumb rules of wiring and tagging.

**UNIT 3: Control Valve , Actuators and Positioners**

**06**

Control valve parameters, Role of control valves in industries, Basic Parts of Control Valve, Flow characteristics of control valve, Calibration procedure of different valves, Basic of valve actuators, Type of actuators, Calibration of Actuators.

**UNIT 4: Instrumentations Documentations**

**06**

Introduction of different documentations Need of documentations, Overview of ISA standards documentations, Piping and instrumentation diagram (P&ID, Symbols for P&ID, Software packages for documentations, Case study of P&ID.

**UNIT 5 : Selection, Calibration, Installation and Maintenance of Field Devices**

**08**

Selection criteria for flow, temperature, level and pressure instruments, Range

selection, Instrument calibration, Traceability with standard laboratories, Installation guidelines for various field instruments, Importance of maintenance, different approaches of maintenance.

**UNIT 6: Safety Systems Standards** **08**

Introduction to process safety, safety interlocks, risk terminologies, Process Hazard Analysis (PHA), Hazard and operability study (HaZOp), Safety Integrity Level (SIL), IEC, IP and NEMA standard.

**UNIT 7: Industrial Internet of Things** **05**

History of IOT, Definition, Architecture. Industry revolutions, Industry Revolution 4.0 –technology, opportunities and challenges, Hardware required: Sensors, Actuators, Routers, Switches, platforms for IOT.

**Self Study:**

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

**Laboratory Work:**

Laboratory work will consist of minimum 10 experiments based on the above syllabus.

**References:**

1. W. G. Andrew & H. B. William, Applied Instrumentation In The Process Industries, Gulf Professional Publishing.
2. M. D. Desai, Control System Components, PHI Publication.
3. Frederick Meier and Clifford Meier, Instrumentation and Control Systems Documentation, ISA Publication.
4. J.E. Gibson and F.B. Tuteur, Control System Components, McGraw Hill, 2013.
5. Instrumentation, Automation, IoT and Emerging Technologies for Engineers: Handbook, Kindele publication.