# GUJARAT TECHNOLOGICAL UNIVERSITY

**Bachelor of Engineering**
**Subject Code: 3161713**
INSTRUMENTATION PROJECT MANAGEMENT
6th SEMESTER

**Type of course:** Core Engineering

**Prerequisite:** Sensor/ transducer, field transmitters, converters, final control element, basic instrumentation symbols, process control modes and techniques, Computer based control system architecture

**Rationale:** For Instrumentation and Control engineer it is very important to know the kind of standard documents available in manufacturing processes along with necessary design, test and calibration procedure. This subject will help student to understand the project procedures and various stages of project like planning, estimation, designing, installation, testing, calibration and commissioning of instruments and systems. Last topic of the syllabus will introduce student with quality manufacturing process.

**Teaching and Examination Scheme:**

| Teaching Scheme | | | Credits | Examination Marks | | | | Total Marks |
|---|---|---|---|---|---|---|---|---|
| | | | | Theory Marks | | Practical Marks | | |
| L | T | P | C | ESE (E) | PA (M) | ESE (V) | PA (I) | |
| 2 | 2 | 0 | 4 | 70 | 30 | 0 | 0 | 100 |

**Content:**

| S. N. | Content | Total Hrs | % Weigh tage |
|---|---|---|---|
| 1 | **Introduction to project management**<br>Definition of project purpose - Scope, time, quality and organization structure. Basic and detailed engineering: Degree of automation, Project S curves, manpower considerations, inter-department and inter-organization interactions, Multi agency interaction. Types of projects and types of contracts e.g. EPC, BOOT etc. | 03 | 11 |
| 2 | **Project management functions**<br>Controlling, directing, project authority, responsibility, accountability, interpersonal influences and standard communication formats, project reviews. project planning and scheduling, life project engineering and management cycle phases, the statement of work (SOW), projects specifications, bar charts, milestones, schedules, work breakdown structures, cost breakdown structures and planning cycle. | 03 | 11 |
| 3 | **Project cost and estimation**<br>Types and estimates, pricing process, salary and other overheads, man-hours, materials and support costs. program evaluation and review techniques (PERT) and critical path method (CPM), estimating activity time and total program time, total PERT/CPM planning crash times, software‘s used in project management. | 03 | 11 |
| 4 | **Instrument Project Control** | 04 | 14 |

| | | | |
|---|---|---|---|
| | **Project engineering documents and drawing:** Process flow sheets, Mechanical flow sheets, Instrument index sheets, loop wiring diagram, panel drawings and specifications, plot plans, installation details, special drawings, purchase requisition, other documents.<br>**Information required:** Process information, Instrument specifications and standards, piping specifications, Electrical specifications, bid documents, Project procedure, project schedule, Equipment Information, Vendor drawing<br>**Work coordination**: Project manager, process engineer, equipment engineer, Piping design supervisor, Structural, architectural and civil, Electrical, purchasing and expediting and others<br>**Planning hints and Project check list** | | |
| 5 | **Engineering Design criteria**<br>**Pneumatic versus electronics system, Control centers, Future and spare capacity**<br>**Specifications for various measurement and control groups:** Flow, Pressure, Level, Temperature, Control valves, Control panels, Analytical instruments<br>**Transmission systems:** Pneumatic & Electronic – Materials, Distribution, Terminations and Identification<br>**Process connections –** Take-offs and Piping, Location of taps, Sealing instruments from process, Manifolds and gage valves<br>**Miscellaneous Design Criteria:** Mounting instruments, Selections of units, charts, ranges; Instrument identification, Winterizing, Material of construction, Package equipment systems<br>**Electrical safety:** NEC code, Purging and pressurization, Enclosures, Intrinsic safety | 08 | 28 |
| 6 | **Construction and Start up**<br>**Organizing:** Documents, schedule, cost control<br>**Ordering and Receiving equipment and Material:** Purchase orders, Material status, storage<br>**Installing instrument systems:** Procedures, Coordination, Good installation practices Calibration<br>**Testing:** Process connections, Pneumatic lines, Electrical<br>**Loop checking:** Flow transmitter , Temperature transmitter, Control valve, Miscellaneous checks<br>**Startup:** Placing instruments in service, Tuning loop controls, evaluating process upsets and disturbances, Repairing or replacing defective equipment, special equipment, Additional control | 04 | 14 |
| 7 | **Introduction to International quality systems - ISO 9000**<br>Quality management practices worldwide, certifying agencies.<br>Quality, customers and ISO 9000<br>ISO 9000- A management overview<br>ISO 9000- Quality system<br>Inspection, Test standards and Calibration | 03 | 11 |

**Suggested Specification table with Marks (Theory):**

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| Distribution of Theory Marks | | | | | |
|---|---|---|---|---|---|
| R Level | U Level | A Level | N Level | E Level | C Level |
| **14** | **14** | **14** | **14** | **14** | **0** |

**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 above table.

**Text Books**


1. Applied Instrumentation in Process Industries by W.G. Andrew and H.B. Williams, *Gulf Professional Publishing, 3rd ed. 2008*, ISBN-13: 978-0872010475.

2. Project management: A systems approach to planning scheduling and controlling by Harlod Kerzner and Van Nostrand, *John Wiley & Sons, 11th ed., 2013*, ISBN: 978-1-118-02227-6.

3. Successful Instrumentation & Control Systems Design, by Michael D. Whitt, 2nd Edition, 2012, *ISA*, ISBN: 978-1-93600-745-5.

4. ISO- 9000 Concepts, Methods & Implementation by Tapan B. Bagchi, *Wheeler pub., 1995.* ISBN-81-85814-24-4

5. ISO- 9000 Guidelines for the chemical & process industries : By ASQC ( American Society of Quality Control ) , ISBN-13: 978-0873893527, www.asq.org


**Reference Books:**


Instrument Engineers Handbook: Process Control by Bela G Liptak, CRC Press, 3rd ed., 1995, ISBN-13: 978-0801982422.


**Course Outcome:** Students will be able to

| Sr. No. | CO statement | Marks % weightage |
|---|---|---|
| CO-1 | Understand the importance of project management from industrial perspective | |
| CO-2 | Estimate cost for implementing various industrial projects | |
| CO-3 | Apply various engineering design criteria for optimized project management | |
| CO-4 | Evaluate and select various sensors and control valve for successful realization of specific project | |
| CO-5 | Follow standard practices as well as procedures for construction and startup of project | |

**List of Tutorial activties:**

1) Study of standards and symbols (ANSI / ISA Std.)
2) Study of specification sheets.
3) Development of Process & Instrument diagram of typical process.

4) Development of Loop Wiring diagram.
5) Cable scheduling.
6) GA and mimic diagram of a control panel.
7) Development of Bar charts for certain project.
8) Prepare the cost estimation sheet for the project under consideration
9) Hands on experience for engineering management software such as MS Project, Primavera, etc.
10) Designing of control valve for liquid/gas/vapor applications as per standard
11) Design of orifice plates for liquid/gas/vapor as per ISO 5167
12) Operating range calculation for transmitters considering different applications.

**Major Equipment:**

Field instruments (includes sensor/ transducers, transmitters, single loop controllers, Converters, control valve, etc.) for flow, level, pressure, temperature parameters.

Test and calibration instruments at least for temperature and pressure parameters.

**List of Open Source Software/learning website:**

http://vlab.co.in/
www.isa.org
http://nptel.ac.in/video.php
http://www.idc-online.com/