



# GUJARAT TECHNOLOGICAL UNIVERSITY

**Bachelor of Engineering**  
**Subject Code: 3150616**  
**Semester –V**  
**Subject Name: Pipeline Engineering**

**Type of course: Professional Elective**

**Prerequisite: Basic course in Hydraulic Engineering**

**Rationale:** Any water supply project requires hydraulic as well as structural design of pipeline and major capital cost is involved in water conveyance and distribution system. To make the project economical proper planning and designing is required.

**Teaching and Examination Scheme:**

| Teaching Scheme |   |   | Credits<br>C | Examination Marks |        |                 |        | Total<br>Marks |
|-----------------|---|---|--------------|-------------------|--------|-----------------|--------|----------------|
| L               | T | P |              | Theory Marks      |        | Practical Marks |        |                |
|                 |   |   |              | ESE (E)           | PA (M) | ESE (V)         | PA (I) |                |
| 3               | 0 | 2 | 4            | 70                | 30     | 30              | 20     | 150            |

**Content:**

| Sr. No. | Content                                                                                                                                                                                                                                                                                                                                                      | Total<br>Hrs |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| 1       | Hydraulic design of transmission main<br>Design flow, Hydraulic design Formula, head losses in pipes, Minimum pressure in Distribution system, Limiting Velocities, Design of rising main, Design of transmission main (pump and gravity), Types of Pumps and its selection. Techno economic analysis of rising main.                                        | 6            |
| 2       | Water distribution system<br>ESR Mass balance, Peak factor, Continuous and intermittent water supply, Analysis of flow in water distribution systems (pump and gravity), analysis of pipe network by various methods, Software used for design of water distribution system - EPANET, Extended period simulation. Design of pipe wall thickness and orifice. | 8            |
| 3       | Rehabilitation and Water auditing<br>Rehabilitation of pipeline, Water audit, Online monitoring and control system, leak detection in pipeline, burst detection techniques                                                                                                                                                                                   | 5            |
| 4       | Pressure transient<br>Water hammer, Surge analysis, surge pressure and its calculation, Remedial measures for water hammer and devices used to control water hammer, Use of Thrust block.                                                                                                                                                                    | 6            |
| 5       | Pipes and Appurtenances<br>Selection of pipe material, Factors to consider selection of pipe material, Types of pipe, corrosion, lining and coating, Types of valves and its usage, horizontal and vertical bends, design of miter bends, Flow meters                                                                                                        | 6            |



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|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| 6 | Pipe Laying, Jointing and Testing<br>System test pressure, Excavation, bedding, lowering and handling of pipes, Types of joints, Testing of Pressure Pipes and Non pressure pipes. Welding techniques, design and procedure qualifications. Testing of welded joints by Non destructive testing methods. | 6 |
| 7 | Structural design of pipes<br>Structural design for buried and surface mounted pipes (MS Pipe), Pedestal for pipes, anchors, pipe supports for above ground pipes, design of thrust block, encasing, valve chambers, for underground pipes.                                                              | 5 |

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

| Distribution of Theory Marks |         |         |         |         |         |
|------------------------------|---------|---------|---------|---------|---------|
| R Level                      | U Level | A Level | N Level | E Level | C Level |
| 10 %                         | 20%     | 30%     | 20%     | 10%     | 10%     |

**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.

### Reference Books:

1. CPHEEO Manual on water supply and treatment
2. IWWA Manual on Design and Selection of pipes for water supply
3. Analysis of Water Distribution Network by P. R. Bhavé and R. Gupta
4. Water supply and sanitary engineering by G.S. Birdie and J.S. Birdie
5. Environmental engineering by H.S. Peavy, D.R. Row & G. Tchobanoglous
6. ASME section IX
7. API 1104
8. IS 3589 latest edition
9. IS 5504 latest edition
10. Pipe and Pipelines by JAICO publishers

### Course Outcomes:

| Sr. No. | CO statement                                                                                                | Marks % weightage |
|---------|-------------------------------------------------------------------------------------------------------------|-------------------|
| CO-1    | Design rising main, find out economic diameter and compute power requirement                                | 20                |
| CO-2    | Calculate capacity of ESR and analyze and Design water distributions system using EPANET/WATER GEMS         | 20                |
| CO-3    | Explain Rehabilitation of pipeline, requirements of water audit and control system for distribution system. | 15                |



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|       |                                                                                                                                    |    |
|-------|------------------------------------------------------------------------------------------------------------------------------------|----|
| CO -4 | Analyse water hammer pressure and select appropriate surge protection devices.                                                     | 15 |
| CO-5  | Describe different types of materials used for pipe, lining and coating requirements, different types of valves used and its usage | 15 |
| CO-6  | Explain pipe laying, jointing and testing of pressure and non-pressure pipe. Design buried and surface mounted pipe.               | 15 |

### List of Tutorial:

1. Design of rising main based on given data and calculation of power requirement
2. Calculate capacity of ESR using mass balance method
3. Design of water distribution system using data given for an area of city using EPANET for extended period simulation.
4. List and Explain leak detection system and burst detection system in pipe line.
5. Calculate water hammer pressure using given data suggest appropriate water hammer control device
6. Calculate the size of thrust block required on pipeline based on given data
7. List different types of pipes and its jointing methods
8. Requirement of coating and lining in the pipe line
9. Differentiate the testing procedure for pressure and non-pressure pipes
10. Structural design of buried pipe and surface pipe (MS Pipe) based on given data. (Find out the minimum thickness required. Used IWWA Manual on Design and Selection of pipes for Water supply)