Lok Jagruti Kendra University
University with a Difference

# Diploma in Civil Engineering

LJ Polytechnic

## Course Code:025050502

## Water Supply and Sanitary Engineering

| **Programme / Branch Name** | Diploma in Civil Engineering | | | | | |
|---|---|---|---|---|---|---|
| **Course Name** | Water Supply and Sanitary Engineering | | | | **Course Code** | 025050502 |
| **Course Type** | HSSC | BSC | ESC | PCC | OEC | PEC |

**Legends:** HSSC: Humanities and Social Sciences Courses BSC: Basic Science Courses
ESC: Engineering Science Courses PCC: Program Core Courses
OEC: Open Elective Courses PEC: Program Elective Courses

## 1. Teaching and Evaluation Scheme

| **Teaching Hours / Week** | | | | **Evaluation Scheme** | | | |
|---|---|---|---|---|---|---|---|
| **L** | **T** | **P** | **Total Credit** | **CCE** | **SEE (Th)** | **SEE (Pr)** | **TOTAL** |
| 3 | 0 | 2 | 4 | 50 | 50 | 50 | 150 |

**Legends:**
L: Lectures T: Tutorial P: Practical
CCE: Continuous & Comprehensive Evaluation
SEE (Th): Semester End Evaluation (Theory)
SEE (Pr): Semester End Evaluation (Practical)

## 2. Prerequisites

- ✓ Basic Knowledge of Water Resources

## 3. Rationale

Water is the basic requirement of human and it should be available in pure and potable form to keep the community away from water borne diseases. If society wants to make remarkable growth, the mental as well as social health play vital role. For that purpose and to maintain the hygiene, pure and potable water needs to be treatment of a water and supplied pure water to the society. Water must be collected and disposed off in nature by giving proper treatment, so the natural flora and fauna will not get affected by sewage disposal. This course is created to gain knowledge about sources of water, quality and quantity of water for a domestic purpose, water distribution, valves and fittings. In sanitary engineering, student get knowledge about sewage collection methods, house drainage plan and waste water treatment plant. Also, students can develop their skill in laboratory experiments for a water and waste water.

## 4. Objectives

- ✓ To knowledge of the quality of the water and waste water.
- ✓ To estimate the water demand for a future population.
- ✓ To understand the process of the water treatment plant.
- ✓ To apply principles of planning and executive of the water conveyance of pipe line.
- ✓ To understand the terms related waste water engineering.
- ✓ To understand the process of the sewage treatment plant.
- ✓ To know the collection process of waste water, sewer section and sewer joints.
- ✓ To prepare a house plumbing system.

## 5. Contents

| Unit No. | Unit Name | Topics | Learning Outcomes | % Weightage | Hours |
|---|---|---|---|---|---|
| 1. | **Water Sources, Quality and Quantity of Water Demand** | 1.1. Importance and Necessity of Water Supply Schemes<br>1.2. Essentials of Water Supply Engineering<br>1.3. Duties of Water Works Engineers<br>1.4. Sources of Water<br>1.5. Choice of Source of Water Supply<br>1.6. Quantity of Water- General<br>1.7. Types of Demands<br>1.8. Domestic Water Demand<br>1.9. Per Capita Demand<br>1.10. Design Period<br>1.11. Forecasting Population<br>1.12. Arithmetical Increase Method<br>1.13. Geometrical Increase Method<br>1.14. Incremental Increase Method<br>1.15. Fluctuation in Demand of Water<br>1.16. Factors affecting the Water Demand<br>1.17. Wholesome Water<br>1.18. Impurities in Water<br>1.19. Physical Tests<br>1.20. Chemical Tests<br>1.21. Biological Tests<br>1.22. Standards of Water Quality<br>1.23. Numerical Based on Population Forecasting Method | • Understand the Sources of Water.<br>• To know the Quality and Quantity of Water Required for a Domestic Purpose. | 20 | 9 |
| 2. | **Water Treatment Plant** | 2.1. Water Treatment Processes - General<br>2.2. Location of Treatment Plants<br>2.3. Treatment Processes<br>2.4. Layout of Treatment Plant<br>2.5. Plain Sedimentation - Process | • To Understand the Criteria Required for a Location of a Water Treatment Plant.<br>• To Gain the Knowledge about Process of Water | 25 | 11 |

| | | | | | |
|---|---|---|---|---|---|
| | | 2.6. Types of Sedimentation Tanks<br>2.7. Sedimentation with Coagulation - Necessity and Process<br>2.8. Chemical Coagulants<br>2.9. Mixing Devices<br>2.10. Floculation<br>2.11. Clarifiers<br>2.12. Classification of Filter<br>2.13. Construction of Slow Sand Filters<br>2.14. Operation of Filter<br>2.15. Construction of Rapid Sand Filter<br>2.16. Operation of Filter<br>2.17. Requirements of Good Disinfectans<br>2.18. Methods of Disinfection<br>2.19. Necessity of Water Softening<br>2.20. Removal of Temporary Hardness<br>2.21. Removal of Permentant Hardness<br>2.22. Aeration | Treatment Plant. | | |
| **3.** | **Water Distribution, Valves and Fittings** | 3.1. Distribution System<br>3.2. Gravity System<br>3.3. Pumping System<br>3.4. Dual System<br>3.5. Layout of Distribution System<br>3.6. Methods of Supplying Water<br>3.7. Distribution Reservoirs<br>3.8. Valves and Fittings - General<br>3.9. Sluice-Valves<br>3.10. Pressure Relife Valves<br>3.11. Check-Valves<br>3.12. Air-Relife Valves<br>3.13. Drain-Valves<br>3.14. Hydrants<br>3.15. Advantages and Disadvantages of Metering<br>3.16. Pipe Fittings | • To Understand the Concept and methods of Water Distribution System.<br>• To Gain the Knowledge of types of Valve and Fitting required for a Pipe Line System. | 15 | 7 |

| | | | | | |
|---|---|---|---|---|---|
| **4.** | **Sanitary System** | 4.1. General<br>4.2. Definitions of Some Common Terms, Used in Sanitary Engineering<br>4.3. Sanitary Works<br>4.4. Aims and objectives of Sewage-Disposal<br>4.5. Site for Sewage Treatment Works<br>4.6. Methods of Collection<br>4.7. Conservancy System<br>4.8. Water-Carriage System<br>4.9. Open Drains<br>4.10. Drain Sections<br>4.11. Sewer Sections<br>4.12. Sewer Joints<br>4.13. Charateristics of Sewage<br>4.14. Physical Characteristics<br>4.15. Chemical Charateristics<br>4.16. Biological Characteristics<br>4.17. BOD<br>4.18. B.O.D. Test<br>4.19. Chemical Oxygen Demand<br>4.20. House Drainage Plans | • Students will Learn about the General Terminology for a Sanitary Engineering.<br>• Students will Understand the Collection Methods for a Sewage.<br>• Students will Know the Charateristics of a Sewage.<br>• Students Gain the Practical Knowledge of a BOD and COD Test. | 25 | 9 |
| **5.** | **Waste Water Treatment Plant** | 5.1. STP-General<br>5.2. Object of Treatment<br>5.3. Types of Treatments<br>5.4. Location of Treatment Plants<br>5.5. Treatment Processes<br>5.6. Layout of Treatment Plants<br>5.7. Purpose of Screening<br>5.8. Skimming Tanks<br>5.9. Principle of Biological Treatment<br>5.10. Contact Beds<br>5.11. Trickling Filters<br>5.12. The Activated Sludge Process<br>5.13. Sludge Digestion | • To Understand the Criteria required for a Location of a Waste Water Treatment Plant.<br>• Students will Gain Knowledge about Process of Waste Water Treatment Plant. | 15 | 6 |
| | | | | **Total Hours** | **42** |

## 6. List of Practicals / Exercises

The practicals/exercises have been properly designed and implemented in an attempt to develop different types of skills so that students can acquire the competencies/programme outcomes. Following is the list of practicals/exercises.

| Sr. No. | Practical / Exercises | Key Competency | Hours |
|---|---|---|---|
| 1. | **Sketch Work:** Turbidity meter, layout of water treatment plant, sedimentation, mixing divices, flocculation, clarifiers, filters, aeration, valves, fittings, layout of sewage treatment plant, skimming tank. | Develop their Drawing Skill. | 6 |
| 2. | Determine pH of a given sample. | Laboratory Test of Water. | 2 |
| 3. | Determine hardness of a given sample. | Laboratory Test of Water. | 2 |
| 4. | Determine turbidity of a given water sample. | Laboratory Test of Water. | 2 |
| 5. | Determine B.O.D. of waste water sample. | B.O.D. Value of Waste Water. | 4 |
| 6. | Determine C.O.D. of wastewater sample. | C.O.D. Value of Waste Water. | 4 |
| 7. | Prepare a report on water treatment plant available in a Gujarat district. | To Gain Knowledge of Water Treatment Plant and their Microsoft Word Skill. | 2 |
| 8. | Prepare a report on waste water treatment plant available in a Gujarat district. | To Gain Knowledge of Water Treatment Plant and their Microsoft Word Skill. | 2 |
| 9. | Visit a nearby water treatment plant and prepare a report on it. | Practical Knowledge of Water Treatment Process. | 4 |
| | | **Total Hours** | **28** |

## 7. Suggested Specification Table for Evaluation Scheme

| Unit No. | Unit Name | Distribution of Topics According to Bloom's Taxonomy | | | | | |
|---|---|---|---|---|---|---|---|
| | | R % | U % | App % | C % | E % | An % |
| 1. | Water Sources, Quality and Quantity of Water Demand | 40 | 32 | 10 | 0 | 3 | 15 |
| 2. | Water Treatment Plant | 20 | 44 | 25 | 4 | 4 | 3 |
| 3. | Water Distribution, Valves and Fittings | 30 | 45 | 25 | 0 | 0 | 0 |
| 4. | Sanitary System | 25 | 40 | 24 | 0 | 5 | 6 |
| 5. | Waste Water Treatment Plant | 40 | 43 | 12 | 0 | 0 | 5 |

**Legends:** R: Remembering U: Understanding
App: Applying C: Creating
E: Evaluating An: Analyzing

## 8. Textbook

1) Water Supply and Sanitary Engineering by G.S.Birdie and J.S. Birdie, Dhanpat Rai Publishing Compony Pvt. Ltd.

## 9. Reference Books

1) Water Supply and Sanitary Engineering by S.C. Rangwala, Charotar Publishing House Pvt. Ltd.
2) Water Supply Engineering by Santosh Kumar Garg, Khana Publishers.

## 10. Open Sources (Website, Video, Movie)

1) www.nptel.ac.in
2) LJP-Civil-Water Supply and Sanitary Engineering (YouTube)