

# 16CE207 ENVIRONMENTAL ENGINEERING - I

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P	WA/RA	SSH/HSB	CS	SA	S	BS
45	15	-	20	48	6	12	3	5

## Course Description and Objectives:

This course offers fundamental concepts on various types of water sources, estimation of quantity requirements of water, treatment of water to the desired degree. It also includes design concepts of various water treatment methods. The objective of this course is to provide knowledge about sedimentation, filtration and disinfection methods in water treatment process. It also provides basic understanding of various appurtenances in the water distribution system.

## Course Outcomes:

The students will be able to:

- estimate water requirements for a given city.
- analyze characteristics of water and wastewater.
- estimate the quantity of wastewater generated from different uses
- design components of water supply systems.

## SKILLS:

- ✓ Evaluate the contamination level of water bodies.
- ✓ Design a filter medium.
- ✓ Design of Water softening models.
- ✓ Prepare, review, and update environmental investigation and recommendation reports.
- ✓ Design a water distribution system for a given city.

**UNIT – 1****L-9, T-3**

**INTRODUCTION TO WATER SUPPLY ENGINEERING:** Need for protected water supplies, Objectives of water supply systems, Role of environmental engineers.

**QUANTITY OF WATER:** Estimating requirements, Design period, Per capita consumption, Factors affecting per capita consumption, Fire demand, Fluctuations in demand, Prediction of population.

**UNIT - 2****L-9, T-3**

**SOURCES & INTAKE WORKS:** Classification of sources of water supply, Choice of source, Suitability with regard to quality and quantity, Lake, River, Reservoir and canal intakes.

**TRANSPORTATION AND PUMPING OF WATER:** Types of conduits, Capacity and design, Materials for pipes, Laying and Jointing of pipes, Testing of pipe line, Classification of pumps, Efficiency and choice of pumps.

**UNIT – 3****L-9, T-3**

**QUALITY OF WATER:** Impurities in water, Routine water analysis, Physical, Chemical and bacteriological tests, BIS Standards for drinking water, Water borne diseases.

**Purification of Water:** Methods of purification of water, Sequence of treatment.

**PLAIN SEDIMENTATION AND COAGULATION:** Theory of sedimentation, Stoke's law, Sedimentation tanks, Design aspects, Principle of coagulation, Chemicals used for coagulation, Units of coagulation plant, Optimum dose of coagulant.

**UNIT – 4****L-9, T-3**

**FILTRATION OF WATER:** Theory of filtration, Filter materials, Slow and rapid sand filters, Construction operation and design, Under drainage system design in rapid sand filters, Troubles in rapid sand filters, Pressure filters.

**DISINFECTION OF WATER:** Different methods of disinfection, Chlorination, Types of chlorination.

**OTHER TREATMENT METHODS:** Water softening, Methods of removing temporary hardness, Methods of removing permanent hardness, Removal of color, Odour and taste from water, De-fluoridation, Reverse osmosis.

**UNIT – 5****L-9, T-3**

**DISTRIBUTION SYSTEM:** General requirements, Classification, Methods of supply, Available pressure in the distribution system, Layouts of distribution networks, Distribution reservoirs, Functions, Types, Capacity of balancing tank, Analysis of distribution system, Methods of analysis, Design of Pipe network

**PIPE APPURTENANCES:** Appurtenances in the distribution system, Service connection, Sluice valves, Check valve, Air valve, Drain valve, Hydrants, Meters.

**TEXT BOOKS:**

1. B. C. Punmia, "Environmental Engineering", Vol.1, 2<sup>nd</sup> edition, Laxmi Publishers, 2009.
2. S. K. Garg, "Environmental Engineering", Vol.1, 10<sup>th</sup> edition, Khanna Publishers, Delhi, 2005.

**REFERENCE BOOKS:**

1. S. Peavy and Rowe, "Environmental Engineering", 7<sup>th</sup> edition, Tata Mc Graw-Hill, New York, 2013.
2. E. W. Steel and Terrance J, "Water Supply and Sewerage", 6<sup>th</sup> edition, Tata Mc Graw-Hill, Singapore, 2001.

**ACTIVITIES:**

- o Estimate water requirement for Guntur city.
- o Study the suitability of sources of water around campus.
- o Visit a water purification plant and make a report covering all water purification methods involved.
- o Design layouts of distribution networks suitable for a city.