19CE3402 - ENVIRONMENTAL ENGINEERING

Course Category:	Program Core	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	19BS1102-Chemistry of Materials 19MC1301-Environmental Sciences	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

Upon successful completion of the course, the student will be able to:

CO1	**Know** the requirements of water and its sources.	K2
CO2	**Identify** various methods of water treatment.	K1
CO3	**Analyze** with concepts of water distribution.	K4
CO4	**Know** wastewater characteristics and wastewater treatment	K2
CO5	**Demonstrate** the use of different sewage appurtenances.	K2

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3		1		3						1	2	
CO2	2	3		1		3						2	1	
CO3	2	3		2		3						1	2	
CO4	2	3		1		3						2	1	
CO5	2	3		1		3						2	2	
Avg.	2	3		1		**3**						1	2	

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**WATER SOURCES, QUANTITY AND QUALITY**: Protected water supply – Population forecasts, design period – water demand – factors affecting – fluctuations – fire demand – water quality and testing – drinking water standards – Waterborne diseases – Comparison from quality and quantity and other considerations – intakes – infiltration galleries.	**CO1**
UNIT-2	**WATER TREATMENT:** Sedimentation – principles of coagulation-flocculation, clarifier coagulants – Filtration – theory – working of slow and rapid gravity filters disinfection – theory of chlorination, chlorine demand, other disinfection practices-Miscellaneous treatment methods.	**CO2**
UNIT-3	**WATER DISTRIBUTION:** Distribution systems – Gravity system – Pumping system – Dual system – Layout distribution system– Dead End – Grid Iron – Radial systems – Analysis of Pipe networks – Hardy Cross and equivalent pipe, Simple problems. Sluice Valves – Pressure Relief Valves – Check walls – Meters	**CO3**
UNIT-4	**SEWAGE TREATMENT**: Characteristics of sewage – cycles of decay – decomposition of sewage, examination of sewage – B.O.D– C.O.D. equations. Introduction to primary and secondary treatment of waste water, sedimentation tanks biological treatment – trickling filters. Sludge digestion – design of Digestion tank.	**CO4**
UNIT-5	**SEWAGE TREATMENT (Contd.):** Sludge disposal by drying – septic tanks and Imhoff Tanks working principles and design – soak pits, Disposal of Sewage. **SEWAGE APPARTUNANCES:** Sewer appurtenance – inverted siphon – catch basins — sanitary fittings-traps – one pipe and two pipe systems of plumbing. Sewage pipe network	**CO5**

Learning Resources

Text Books	1. P.N.MODI, Water Supply Engineering, Vol-I, Standard Book House, 2016 2. P.N.MODI, Sewage Treatment & Disposal & Waste Water Engg., Vol-II,

	Standard Book House, 2015
Reference Books	1. B.C. Punmia, Ashok Jain & Arun Jain, Laxmi Publications Pvt. Ltd, New Delhi,2010 2. Elements of environmental engineering by K.N. Duggal, S. Chand Publishers,2008
e-Resources& other digital material	1. https://nptel.ac.in/courses/105104102/ 2. https://nptel.ac.in/courses/105105048/