20CE4601 D - SANITARY ENGINEERING

Offering Branches	CE		
Course Category:	Professional Elective course	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Prerequisites:	20CE3501 –Environmental Engineering 20MC1301 – Environmental Science	**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	**Asses** the quantity of sewage and Illustrate the types of sewerage appurtenances	K4
CO2	**Analyse** the quality of sewage and understand the characteristics of sewage	K4
CO3	**Design** the treatment units of sewage	K4
CO4	**Interpret** different sewage disposal methods and **design** of septic tank	K4
CO5	**Classify** the sanitary Installations and disposal techniques of the sludge	K3

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	2	2			3	3						2	3
CO2	2	2	2			3	3						2	3
CO3	3	3	3			3	3						3	3
CO4	2	2	2			2	2						2	2
CO5	2	2	2			3	3						2	3
Avg.	**2**	**2**	**2**			**3**	**3**						**2**	**3**

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

Course Content

I	**QUANTITY OF WASTEWATER**: Introduction to Sanitary Engineering: Conservancy and water carriage system; Sewerage systems; Sanitary and storm water sewage; Estimation of their quantities;; **SEWERS, SEWER APPURTENANCES, SEWAGE PUMPING:** sewers, sewer appurtenances, sewage pumping, types of sewers, design of sewers, construction	**CO1**
II	**QUALITY AND CHARACTERISTICS OF SEWAGE**- Decomposition of sewage- Carbon, nitrogen and sulphur cycles of decomposition- BOD- COD- Physical and chemical analysis of sewage.	**CO2**
III	**PRIMARY TREATMENT OF SEWAGE** Primary treatment- theoretical concepts of Screens; Grit chamber; Skimming tanks; design aspects of Sedimentation tanks. **SECONDARY TREATMENT OF SEWAGE**: Trickling filters; high rate trickling filters; Recirculation; Operational problems and remedies; Activated sludge process- Principle of action; Sludge bulking; Sludge volume index	**CO3**
IV	**SEWAGE DISPOSAL & SEPTIC TANKS** Methods; Disposal by dilution; Self-purification process; Oxygen sag; Zones of pollution of river Disposal by irrigation; sewage sickness; Septic tank-Design; effluent disposal	**CO4**
V	**SLUDGE DISPOSAL & Sanitary Installation** : Anaerobic sludge digestion process, factors effecting sludge digestion, sludge digestion tanks, sludge thickening, sludge conditioning, methods of dewatering the sludge, methods of sludge disposal. Basic Sanitary fittings and	**CO5**

	functionalities, plumbing systems, maintenance of sanitary installations.

Learning Resources

Text Books	1. Environmental Engineering Vol. I& II - Water supply engineering by S. K. Garg; Khanna Publishers, New Delhi, 2017. 2. Elements of public health engineering by K. N. Duggal; S. Chand & Company Ltd., NewDelhi, 2014.
Reference Books	1. B.C. Punmia, Ashok Jain & Arun Jain, Laxmi Publications Pvt. Ltd, New Delhi,2010 2. Metcalf and Eddy, Waste water Engineering Collection, Treatment, Disposal and Reuse, McGraw Hill Pub. Co.,1995.
e- Resources & other digital material	1. https://nptel.ac.in/courses/105104102/ 2. https://nptel.ac.in/courses/105105048/