



Course Title: ENVIRONMENTAL ENGINEERING

Credit Units: 05

Course Level:UG

Course Code: CEE309

L	T	P/S	SW/FW	TOTAL CREDIT UNITS
4	-	2	-	5

Course Objectives: This course deals with advanced environmental engineering concepts. It explains the design of various plumbing, treatment plant and solid waste management. It will be supported with experiments related to testing of physical, chemical and biological properties of water and its analysis.

Pre-requisites: NIL

Course Contents/Syllabus:

	Weightage (%)
Module I	20
Scope of Environmental Engineering Water Supply Engineering. Quantity of water. Types of water demand. Fluctuation in demand. Factors affecting consumption. Forecasting population. Surface water sources. Intakes. Quality of water. Drinking water standards – Water quality parameters- effects on human health- Methods of Physical, Chemical and Bacteriological analysis of water.	
Module II	20
Treatment of water and water supply schemes Process details and design considerations. Aeration. Coagulation. Flocculation. Sedimentation. Filtration. Disinfection. Fluoridation and defluoridation. Water Softening. Desalination. Membrane filtration. Gravitational, pumping and combined schemes. Transmission of water. Design of gravity and pumping main. Distribution systems. Different layout of pipe networks. House connection from main, different valves, meters and hydrants, Storage reservoirs. Balancing reservoir. Maintenance of distribution systems.	
Module III	20
Sanitary equipment and waste water disposal Sanitary plumbing, sanitary fixtures, systems of piping, house drainage, connection of house drains and street sewers, Systems of sewerage, Dry weather flow and wet weather flow, sewers and sewer appurtenances, sewage pumping, maintenance of sewers, Waste water, Characteristics, sampling, population equivalent, preliminary treatment of waste water, screens, grit chamber, detritus tank, Sedimentation tank.	
Module IV	20

Aerobic and anaerobic treatment of waste water Biological treatment (process details and design considerations), Aerobic- Activated Sludge Process- Trickling Filter- Oxidation Ponds, Anaerobic treatment- Anaerobic digesters- Septic Tanks- Soak pits Waste water disposal – disposal into stream –fundamentals of stream sanitation- disposal by irrigation – sludge treatment and disposal	
Module V	20
Solid waste management and air pollution Solid waste management: Generation- on site handling and storage, transfer and transport processing, resource recovery, treatment and disposal. Air pollution and control, sources, pollutants and their health effects, particulate and gaseous pollution control devices (fundamentals), Settling chambers, Electrostatic precipitators, Cyclones, Wet Collectors, Gas absorption by tray and packed towers	

Student Learning Outcomes:

1. An understanding of concepts for requirement, procurement, treatment of water, its distribution to consumers.
2. An understanding of sewage and further its disposal and treatment.
3. A brief understanding of solid waste management and air pollution.
4. The students will be able to determine the physical, chemical and biological characteristics of water/ waste water.

Pedagogy for Course Delivery:

1. Class room teaching supported with presentation for enabling better understanding of the subject.
2. Application oriented assignments.
3. Class room lectures will be supplemented with field related examples.

List of Experiments:

1. Determination of solids (total, dissolved, organic, inorganic and settleable) in water
2. Determination of turbidity and the optimum coagulant dose
3. Determination of alkalinity and pH of water
4. Determination of hardness and chlorides in water
5. Determination of iron and manganese in water
6. Determination of sulphates and sulphides in water
7. Determination of D.O and B.O.D of waste water
8. Determination of available chlorine in bleaching powder and the chlorine dose required to treat the given water sample
9. Determination of coliforms in water
10. Demonstration of Instrumental methods of pollutant analysis

Assessment/ Examination Scheme:

Theory L/T (%)	Lab/Practical/Studio (%)	TOTAL
75	25	100

Theory Assessment (L&T):

Continuous Assessment/Internal Assessment					End Term Examination
Components (Drop down)	A	S/V/Q	CT	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Lab/ Practical/ Studio Assessment:

Continuous Assessment/Internal Assessment					End Term Examination		
Components (Drop down)	A	PR	LR	V	PR	V	Total
Weightage (%)	5	10	10	5	35	35	70

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text & References:

- Garg S. K, Environmental Engineering, Vol. I, Khanna Publications, 2001, New Delhi.
- Garg S.K, Environmental Engineering Vol. II, Khanna Publications (2001) New Delhi
- Birdie G.S & Birdie J.S, Water Supply and Sanitary Engineering, Dhanpat Rai & Sons, 1998, New Delhi.
- Duggal, K.N., Elements of Environmental Engineering, S Chand & Co. Ltd., 2000, New Delhi.
- Mark J. Hammer & Mark J. Hammer Jr., Water and Waste Water Technology, Prentice Hall of India Pvt. Ltd., 1998, New Delhi.
- Fair, Geyer & Okun, Water & Waste Water Engineering, John Wiley, 1966, New York.
- Ernest W. Steel & Terence J. Mc Ghee, Water Supply & Sewage, McGraw Hill, 1990, New York.
- Relevant BIS Codes.
- Ehlers VM & Steel EW, Municipal & Rural Sanitation, 6th Edn.(1965)McGraw Hill.
- Sawyer and McCarte, Chemistry for Environmental Engineering, Tata McGraw-Hill, (2003) New Delhi,.
- Fair, Geyer & Okun, Water and Waste water Engineering, John Wiley & sons, Inc (1966)
- Metcalf & Eddy, Waste Water Engineering Treatment, Disposal & Reuse, Tata McGraw Hill (1979)
- Standard method for the examination of water and waste water, 2005, APHA, AWWA, WPCF Publication