

IV Semester

PUBLIC HEALTH ENGINEERING			
Course Code	21CV43	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2+2+2+0	SEE Marks	50
Total Hours of Pedagogy	50	Total Marks	100
Credits	4	Exam Hours	3
Course objectives: <ol style="list-style-type: none"> 1. Analyze the variation of water demand and to estimate water requirement for a community. 2. Study drinking water quality standards and to illustrate qualitative analysis of water. 3. Analysis of physical and chemical characteristics of water and wastewater. 4. Understand and design of different unit operations and unit process involved in water and wastewater treatment process 			
Teaching-Learning Process (General Instructions) These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes. <ol style="list-style-type: none"> 1. Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adopted so that the delivered lesson can progress the students in theoretical, applied and practical skills. 2. Arrange field visits to give brief information about the water and wastewater treatment plant. 3. Encourage collaborative (Group Learning) Learning in the class. 4. Ask at least three HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking and enhance the knowledge of treatment processes. 5. Adopt Problem Based Learning (PBL), which fosters students, Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it. 6. Seminars, surprise tests and Quizzes may be arranged for students in respective subjects to develop skills. 			
Module-1			
Introduction: Water: Need for protected water supply, Demand of Water: Types of water demands - domestic demand, industrial, institutional and commercial demand, public use and fire demand estimation, factors affecting per capita demand, Variations in demand of water, Peak factor. Design period and factors governing design period. Methods of population forecasting and numerical problems. Physico chemical characteristics of water(Analysis to be conducted in laboratory session). Sampling.			
8hours			
Teaching-Learning Process	Chalk and talk, powerpoint presentation, demonstration and analysis in laboratory		

Module-2	
Water Treatment: Objectives, Unit flow diagrams – significance of each unit, Aeration process- Limitations and types, Sedimentation - Theory, settling tanks, types and design with numericals, Coagulation and flocculation, types of coagulants, (Optimisation of coagulant to be carried out in the laboratory), Filtration: mechanism, theory of filtration, types of filters: slow sand, rapid sand and pressure filters. Operation and cleaning. Design of slow and rapid sand filter without under drainage system (numericals)	
8hours	
Teaching-Learning Process	Chalk and talk, videos, PowerPoint Presentation, animations and visit to in around water treatment plant
Module-3	
Disinfection: Methods of disinfection with merits and demerits. Breakpoint of chlorination (Analysis to be conducted in laboratory session) Softening: Lime soda and Zeolite process.	
Wastewater: Introduction: Need for sanitation, methods of sewage disposal, types of sewerage systems, Treatment of municipal waste water: Waste water characteristics(Analysis to be conducted in laboratory session): sampling, significance and techniques, physical, chemical and biological characteristics, Numericals on BOD,	
8hours	
Teaching-Learning Process	Chalk and talk, videos, PowerPoint Presentation, animations
Module-4	
Treatment Process: flow diagram for municipal waste water Treatment unit operations and process, Screens: types, disposal. Grit chamber, oil and grease removal. primary and secondary settling tanks (no numericals), Suspended growth system - conventional activated sludge process and its modifications.	
8hours	
Teaching-Learning Process	Chalk and talk, videos, PowerPoint Presentation,, animations, and visit to in around waste water treatment plant
Module-5	
Attached growth system – trickling filter, numericals on Trickling filters, bio-towers and rotating biological contactors. Principle of stabilization ponds, oxidation ditch, Sludge digesters(aerobic and anaerobic), Equalization., thickeners and drying beds.	
10hours	
Teaching-Learning Process	Chalk and talk, videos, PowerPoint Presentation, animations

EXPERIMENTS

Experiments to be carried out are:

1. Determination of pH, Conductivity, TDS and Turbidity.
2. Determination of Acidity and Alkalinity
3. Determination of Calcium, Magnesium and Total Hardness.
4. Determination of Dissolved Oxygen
5. Determination of BOD.
6. Determination of Chlorides
7. Determination of percentage of % of available chlorine in bleaching powder sample, Determination of Residual Chlorine and chlorine demand.
8. Determination of Solids in Sewage: (i) Total Solids, (ii) Suspended Solids, (iii) Dissolved Solids, (iv) Volatile Solids, Fixed Solids (v) Settleable Solids.
9. Determination of optimum coagulant dosage using Jar test apparatus.
10. Determination Nitrates and Iron by spectrophotometer
11. Determination of COD (Demonstration)
12. 13. Air Quality Monitoring (Demonstration)

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

- Estimate average and peak water demand for a community.
- Evaluate water quality and environmental significance of various parameters and plan suitable treatment system.
- Design the different units of water treatment plant
- Understand and design the various units of wastewater treatment plant
- Acquire capability to conduct experiments and estimate the concentration of different parameters and compare the obtained results with the concerned guidelines and regulations..

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination(SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation:

Three Unit Tests each of 20 Marks (duration 01 hour)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

Two assignments each of 10 Marks

4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for 20 Marks (duration 01 hours)

6. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be scaled down to 50 marks

(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

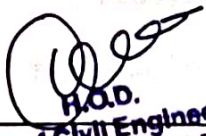
Semester End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (duration 03 hours)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.

The students have to answer 5 full questions, selecting one full question from each module

- Howard S. Peavy, Donald R. Rowe, George T, "Environmental Engineering" - Tata McGraw Hill, New York, Indian Edition, 2013
- S. K. Garg, Environmental Engineering vol-I, Water supply Engineering – M/s Khanna Publishers, New Delhi 2010
- B.C. Punmia and Ashok Jain, Environmental Engineering I-Water Supply Engineering, Laxmi Publications (P) Ltd., New Delhi 2010.
- B C Punmia, "Environmental Engineering vol-II", Laxmi Publications 2nd, 2016
- Karia G.L., and Christian R.A, "Wastewater Treatment Concepts and Design Approach", Prentice Hall of India Pvt. Ltd., New Delhi. 3rd, Edition, 2017
- S.K.Garg, "Environmental Engineering vol-II, Water supply Engineering", Khanna Publishers, – New Delhi, 28th edition and 2017
- CPHEEO Manual on water supply and treatment engineering, Ministry of Urban Development, Government of India, New Delhi.
- Mark.J Hammer, Water & Waste Water Technology, John Wiley & Sons Inc., New York, 2008.


H.O.D.
Dept. of Civil Engineering
Alva's Institute of Engg. & Technology
Mijer, Moodbidri - 574 225