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1	Course No.	CVL311	
2	Course Title	ENVIRONMENTAL ENGINEERING-I	
3	Credits	4	
4	Contact Hours (L-T-P)	3-0-2	
5	Course Objective	This course is aimed at teaching students about the various unit operations involved in municipal water treatment with the intention of supplying drinking water (which conforms to the applicable regulatory norms or standards) to consumers. The course also encompasses the design of conveyance network and house connections. This course covers everything from the selection of the raw water source all the way down to the clean drinking water at consumer end.	
6	Course Outcomes	After successful completion of this course, the students should be able to 1. Characterize, compare and select the *water sources* (surface and subsurface) for fulfilling the *water demand* of a given city, over an appropriate *design period*. 2. Define and examine the various key *characteristics* (*physical*, *chemical* and *biological*) of drinking water. They should also demonstrate knowledge of applicable *drinking water standards* (IS10500 and IS1172). Students should be able to compute and *forecast population* and water demands. 3. Formulate the treatment scheme and d*esign* the various *unit operations* involved in conventional *municipal water treatment* process. They should be able to describe *advanced treatment techniques*, *recent advances* and *domestic water purification*. 4. Design the water *conveyance* network and pipe layouts. Students should also be able to design a *house connection* and identify its components as well as various plumbing fixtures and valves. 5. Describe the basic principles and operation of a *Rain Water Harvesting* System and propose a RWH system for residential units. Formulate a water supply scheme for a rural community. 6. Evaluate the key water characteristics using laboratory experimentation and interpret the experimental results.	
7	Outline syllabus:		
7.01	CVL311.A	Unit A	**Introduction**
7.02	CVL311.A1	Unit A Topic 1	Introduction to planned water supply
7.03	CVL311.A2	Unit A Topic 2	Sources of Water Supply
7.04	CVL311.A3	Unit A Topic 3	Water Collection- Intake Structures
7.05	CVL311.B	Unit B	**Water Quality and Demand**
7.06	CVL311.B1	Unit B Topic 1	Physical, chemical & Biological characteristics
7.07	CVL311.B2	Unit B Topic 2	Water demands, factors affecting demand
7.08	CVL311.B3	Unit B Topic 3	Population Forecasting, design flows
7.09	CVL311.C	Unit C	**Water Treatment**
7.10	CVL311.C1	Unit C Topic 1	Conventional treatment process design.
7.11	CVL311.C2	Unit C Topic 2	Advanced water treatment processes
7.12	CVL311.C3	Unit C Topic 3	Domestic water purification
7.13	CVL311.D	Unit D	**Water Transportation**
7.14	CVL311.D1	Unit D Topic 1	Pipe materials, head loss
7.15	CVL311.D2	Unit D Topic 2	Distribution Network, Layout
7.16	CVL311.D3	Unit D Topic 3	Service connection and appurtenances
7.17	CVL311.E	Unit E	**Water Conservation**
.18	CVL311.E1	Unit E Topic 1	Rainwater harvesting
7.19	CVL311.E2	Unit E Topic 2	Collection, filtration and Storage
7.20	CVL311.E3	Unit E Topic 3	Small community supply sources and treatment
7.21	CVL311.L01	Lab expt 1	To find the turbidity and colour of a given sample of water.
7.22	CVL311.L02	Lab expt 2	To determine the pH value of a given sample of water.
7.23	CVL311.L03	Lab expt 3	To find out total dissolved solid, settleable solids and suspended solids of the given sample.
7.24	CVL311.L04	Lab expt 4	To find out the concentration of chlorides in the given sample of water.

7.25	CVL311.L05	Lab expt 5	To estimate the hardness of the given sample of water by standard EDTA method
7.26	CVL311.L06	Lab expt 6	To find the optimum amount of coagulant required to treat the turbid water by Jar Test.
7.27	CVL311.L07	Lab expt 7	To determine residual chlorine in a given sample of water.
7.28	CVL311.L08	Lab expt 8	To find the quantity of dissolved oxygen (DO) present in the given sample.
7.29	CVL311.L09	Lab expt 9	To determine biochemical oxygen demand (BOD) exerted by the given waste water sample.
7.30	CVL311.L10	Lab expt 10	To determine Chemical oxygen demand (COD) exerted by the given waste water sample.
8	Course Evaluation		
8.1	Course work: 30 marks		
8.11	Attendance	none	
8.12	Homework	none	
8.13	Quizzes	Two 30-minutes surprise quizzes in lecture hours: 10 marks	
8.14	Labs	Evaluation of work done on each lab turn in the lab notebook and feedback fron oral quiz about the work done that day. Zero, if the student is absent. 0.75N best marks out of N such evaluations: 20 marks	
8.15	Presentations	None	
8.16	Any other	None	
8.2	MTE	20 marks	
8.3	End-term examination: 50 marks		
9	References		
9.1	Text book	1. Garg, S. K. “Water Supply Engineering”, Khanna Publishers. 2012 2. Sawyer and McCarty “Chemistry for Environmental Engineering and Science”, McGraw Hills. 2000.	
9.2	Other references	3. Peavy, H.S., Rowe, D.R. and Tchobanoglous , G “Introduction to Environmental Engineering” McGraw Hill. 1986 4. Davis, M.L. and Cornwell, D.A., “Introduction to Environmental Engineering”, McGraw Hill. 1998 5. Masters, G.M., “Introduction to Environmental Engineering and Science” Prentice Hall Of India.1998 6. Hammer and Hammer, “Water and Wastewater Technology”, Prentice Hall of India. 1998 7. CPHEEO, “Manual on Water Supply and Treatment”, Bureau of Indian Standards, CPHEEO. 1999	

Mapping of Outcomes vs. Objectives

Outcome no. → Syllabus topic↓	1	2	3	4	5	6
CVL311.A	✓					
CVL311.A1	✓					
CVL311.A2	✓					
CVL311.A3	✓					
CVL311.B		✓				
CVL311.B1		✓				
CVL311.B2		✓				
CVL311.B3		✓				
CVL311.C			✓			
CVL311.C1			✓			
CVL311.C2			✓			
CVL311.C3			✓			
CVL311.D				✓		
CVL311.D1				✓		
CVL311.D2				✓		
CVL311.D3				✓		

CVL311.E					✓	
CVL311.E1					✓	
CVL311.E2					✓	
CVL311.E3					✓	
CVL311.L						✓
CVL311.L1						✓
CVL311.L2						✓
CVL311.L3						✓
CVL311.L4						✓
CVL311.L5						✓
CVL311.L6						✓
CVL311.L7						✓
CVL311.L8						✓
CVL311.L9						✓
CVL311.L10						✓