

## ENVIRONMENTAL ENGINEERING

<b>VII Semester: CE</b>								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACE015	Core	L	T	P	C	CIA	SEE	Total
		3	1	-	4	30	70	100
<b>Contact Classes: 45</b>		<b>Tutorial Classes: 15</b>		<b>Practical Classes: Nil</b>			<b>Total Classes: 60</b>	
<p><b>COURSE OBJECTIVES:</b>  <b>The course should enable the students to:</b></p> <ol style="list-style-type: none"> <li>I. Describe population forecasts, design period, water demand, and types of demand, factors affecting fluctuations, fire demand, storage capacity, water quality and testing. Drinking water standards</li> <li>II. Describe the basic characteristics of water and study the procedure for determination. Understand the foundations for classical inference involving confidence intervals and hypothesis testing.</li> <li>III. Design the water supply lines, water collection and different distribution networks.</li> <li>IV. Construct and design waste water treatment units such as oxidation ponds, sludge digestion tanks, soak pits etc.</li> </ol> <p><b>COURSE OUTCOMES (COs):</b></p> <ol style="list-style-type: none"> <li>CO 1: Describe population forecasts, design period, water demand, types of demand, factors affecting fluctuations, fire demand, storage capacity, water quality and testing. Drinking water standards</li> <li>CO 2: Determine Layout and general outline of water treatment units, sedimentation, uniform settling velocity, principles, design factors, surface loading, jar test, optimum dosage of coagulant, coagulation, flocculation, clarifier design, coagulants, and feeding arrangements. Filtration.</li> <li>CO 3: Understand Conservancy and water carriage systems, sewage and storm water estimation, type of concentration, storm water over flows combined flow characteristics of sewage, cycles of decay, decomposition of sewage, examination of sewage</li> <li>CO 4: Explore Lay out and general outline of various units in a waste water treatment plant, primary treatment design of screens, grit chambers, skimming tanks-sedimentation tanks-principles and design of biological treatment, trickling filters, standard and high rate</li> <li>CO 5: Construction and design of oxidation ponds, sludge digestion tanks, factors effecting, design of digestion tank, sludge disposal by drying, septic tanks working principles and design-soak pits. Ultimate disposal of waste water, self-purification of rivers, sewage farming.</li> </ol> <p><b>COURSE LEARNING OUTCOMES (CLOs):</b></p> <ol style="list-style-type: none"> <li>1. Understand the concept and importance of protected water supply. Summarize the concept of conditional probability and estimate the probability of event using Bayes' theorem.</li> <li>2. Estimate the Population for the design period by using different forecasting methods.</li> <li>3. Calculate and understand the water demand, types of demand, factors affecting fluctuations.</li> <li>4. Calculate the fire demand, storage capacity, water quality and its testing.</li> <li>5. Understand the concept of Drinking water standards. Comparison from quality and quantity and other considerations sick versus healthy.</li> <li>6. Understand the intakes, infiltration galleries, confined and unconfined aquifers.</li> <li>7. Understand the, distribution systems, requirements, methods and different layouts.</li> <li>8. Understand the Layout and general outline of water treatment system.</li> <li>9. Explain sedimentation, uniform settling velocity principles, design factors, surface loading.</li> </ol>								

<p>10. Understand jar test, optimum dosage of coagulant, coagulation, flocculation, clarifier design, coagulants, and feeding arrangements.</p> <p>11. Understand the concept of multiple random variables in real-world problems aspects of wireless communication system Evaluate Filtration theory, working of slow and rapid gravity filters, multimedia filters, design of filters, troubles in operation comparison of filters.</p> <p>12. Understand disinfection, types of disinfection, theory of chlorination chlorine demand and other disinfection.</p> <p>13. Different treatment methods. Distribution systems, types of layouts of distribution systems, design of distribution systems.</p> <p>14. Analyze Hardy Cross and equivalent pipe methods.</p> <p>15. Understand service reservoirs, joints, and valves such as sluice valves, air valves, scour valves and check valves water meters, laying and testing of pipe lines, pump house.</p> <p>16. Explain Conservancy and water carriage systems, sewage and storm water estimation.</p> <p>17. Understand type of concentration, storm water over flows combined flow.</p> <p>18. Understand characteristics of sewage, cycles of decay, decomposition of sewage, examination of sewage,. B.O.D. and C.O.D. equations.</p> <p>19. Analyze the design of sewers, shapes and materials, sewer appurtenances manhole, inverted siphon, catch basins, flushing tanks, ejectors, pumps and pump houses, house drainage..</p> <p>20. Understand different components requirements, sanitary fittings, traps, one pipe and two pipe systems of plumbing, ultimate disposal of sewage, sewage farming, and dilution.</p> <p>21. Understand and analyze Lay out and general outline of various units in a waste water treatment plant, primary treatment design of screens, grit chambers, skimming tanks-sedimentation tanks-principles.</p> <p>22. Evaluate the design of biological treatment, trickling filters, standard and high rate.</p> <p>23. Understand the septic tanks working principles and design-soak pits. Ultimate disposal of waste water, self-purification of rivers, sewage farming.</p> <p>24. Understand the septic tanks working principles and design-soak pits. Ultimate disposal of waste water, self-purification of rivers, sewage farming.</p>		
<b>UNIT-I</b>	<b>WATER QUALITY, DEMAND AND SUPPLY</b>	<b>Classes: 09</b>
<p>Protected water supply, population forecasts, design period, water demand, types of demand, factors affecting fluctuations, fire demand, storage capacity, water quality and testing. Drinking water standards. Comparison from quality and quantity and other considerations, intakes, infiltration galleries, confined and unconfined aquifers, distribution systems, requirements, methods and layouts.</p>		
<b>UNIT-II</b>	<b>WATER TREATMENT AND DISTRIBUTION</b>	<b>Classes: 09</b>
<p>Layout and general outline of water treatment units, sedimentation, uniform settling velocity, principles, design factors, surface loading, jar test, optimum dosage of coagulant, coagulation, flocculation, clarifier design, coagulants, and feeding arrangements. filtration, theory, working of slow and rapid gravity filters ,multimedia filters, design of filters, troubles in operation comparison of filters, disinfection, types of disinfection, theory of chlorination chlorine demand and other disinfection treatment methods. distribution systems, types of layouts of distribution systems, design of distribution systems, Hardy Cross and equivalent pipe methods, service reservoirs, joints, valves such as sluice valves, air valves, scour valves and check valves water meters, laying and testing of pipe lines, pump house.</p>		
<b>UNIT-III</b>	<b>SEWAGE TREATMENT AND DISPOSAL</b>	<b>Classes: 09</b>
<p>Conservancy and water carriage systems, sewage and storm water estimation, type of concentration, storm water over flows combined flow, characteristics of sewage, cycles of decay, decomposition of sewage, examination of sewage, B.O.D. and C.O.D. equations.</p> <p>Design of sewers, shapes and materials, sewer appurtenances manhole, inverted siphon, catch basins, flushing tanks, ejectors, pumps and pump houses, house drainage, components requirements, sanitary</p>		

fittings, traps, one pipe and two pipe systems of plumbing, ultimate disposal of sewage, sewage farming, dilution.		
<b>UNIT-IV</b>	<b>WASTEWATER TREATMENT</b>	<b>Classes: 09</b>
Lay out and general outline of various units in a waste water treatment plant, primary treatment design of screens, grit chambers, skimming tanks-sedimentation tanks-principles and design of biological treatment, trickling filters, standard and high rate.		
<b>UNIT-V</b>	<b>DESIGN AND WORKING OF TREATMENT UNITS</b>	<b>Classes: 09</b>
Construction and design of oxidation ponds, sludge digestion tanks, factors effecting, design of digestion tank, sludge disposal by drying, septic tanks working principles and design-soak pits. Ultimate disposal of waste water, self-purification of rivers, sewage farming.		
<b>Text Books:</b>		
<ol style="list-style-type: none"> <li>1. S.K. Garg, "Environmental Engineering", Vol. I: Water Supply Engineering, 20<sup>th</sup> Edition Khanna Publishers, 2011.</li> <li>2. Birdie, G.S. and Birdie, "Water Supply and Sanitary Engineering", Dhanpat Rai &amp; Sons, 1992</li> <li>3. Duggal, K.N. "Elements of Environmental Engineering", S.Chand &amp; Co, 2002</li> <li>4. Punmia B.C, Ashok Jain &amp; Arun Jain, "Water Supply Engineering", Laxmi Publications, Pvt. Ltd., New Delhi, 2004</li> </ol>		
<b>Reference Books:</b>		
<ol style="list-style-type: none"> <li>1. Metcalf and Eddy, "Waste Water Engineering, Collection, Treatment and Disposal", Tata McGraw Hill, Inc., New York.</li> <li>2. H.S. Peavy and D.R.Rowe, "Environmental Engineering", 2<sup>nd</sup> Edition, Mc.Graw Hill Publishing.</li> </ol>		
<b>Web References:</b>		
<ol style="list-style-type: none"> <li>1. <a href="http://www.efunda.com/math/math_home/math.cfm">http://www.efunda.com/math/math_home/math.cfm</a></li> <li>2. <a href="http://www.ocw.mit.edu/resources/#Mathematics">http://www.ocw.mit.edu/resources/#Mathematics</a></li> <li>3. <a href="http://www.sosmath.com">http://www.sosmath.com</a></li> <li>4. <a href="http://www.mathworld.wolfram.com">http://www.mathworld.wolfram.com</a></li> </ol>		
<b>E-Text Books:</b>		
<ol style="list-style-type: none"> <li>1. <a href="http://www.keralatechnologicaluniversity.blogspot.in/2015/06/erwin-kreyszig-advanced-engineering-mathematics-ktu-ebook-download.html">http://www.keralatechnologicaluniversity.blogspot.in/2015/06/erwin-kreyszig-advanced-engineering-mathematics-ktu-ebook-download.html</a></li> <li>2. <a href="http://www.faadooengineers.com/threads/13449-Engineering-Maths-II-eBooks">http://www.faadooengineers.com/threads/13449-Engineering-Maths-II-eBooks</a></li> </ol>		