College of Engineering

Department of Civil Engineering

CE 542 Planning & Design of Treatment Plants

Credit and Contact hours	3 / 3 (Lectures), 0 (Tutorials), 0 (Laboratory)
Required, or Elective	Elective
Course Description	This course contains the selection of water-treatment process unit; determination of installation capacity; determination of dimension, layout and hydraulic analysis of each process unit; determination of layout, dimension, and hydraulic analysis of installation piping/pump, installation mechanical system, installation hydraulic profile, creation of installation system design. Survey and data preparation of the existing water system condition; data preparation of technical aspect of design area condition (ease of operation, human resources, sludge quantity, effluent quality, river water quality/outfall, energy requirement, housing condition, general urban planning, map, and road length, clean water supply facility, etc.), non-technical aspects (construction and operation cost, land availability); calculation of wastewater quantity and quality prediction; selection of treatment technology and flowsheet creation; calculation of operation & process unit dimension and piping length also building utilities.
Prerequisites or Co-requisites	None
Course Learning Outcomes	Students completing this course successfully will be able to:

Course Learning Outcomes (CLOs)	***Related Student Outcomes (SO)***
CLO1. Define different microbial and chemical contaminants in water and wastewater streams. K1	**SO1**
CLO2. Explain the local, national and international laws, regulations and guidelines that drive the selection of different water and wastewater treatment processes. K1	**SO1**
CLO3. Explain the resources in wastewater/sludge and treatment technologies to recycle these resources for the benefit of society. K1	**SO1**
CLO4. Apply key theories and principles in the design and selection of appropriate water and wastewater treatment technologies for a given location. S1	**SO2**
CLO5. Use modern software and tools to design, simulate and optimize different water and wastewater treatment processes. S4	**SO5**
CLO6. Select, plan and design an appropriate water and wastewater treatment plant for a given locality/community accounting for existing guidelines, regulations and cost implications. V1	**SO6**

<table>
<tr><td>Student Outcomes related to this Course</td><td>SO 1 Recognize advanced engineering knowledge, concepts, and techniques to identify, interpret, and analyze complex and real-life engineering problems.
SO 2 Provide solutions for complex and real-life engineering problems through critical thinking and the use of modern engineering tools, and identify their impact on social, global, cultural, environmental, safety, and economic factors.
SO 5 Design novel advanced Civil Engineering systems and evaluate their performance, sustainability, and effectiveness for engineering practice and their impact in global, economic, environmental, and societal contexts
SO 6 Demonstrate scientific integrity, ethical responsibility, and academic values in scientific publications, research projects, and thesis work.</td></tr>
<tr><td>Topics Covered</td><td><table>
<tr><th>List of Topics</th><th>Related CLOs</th></tr>
<tr><td>1. Water Treatment System Installation</td><td>CLO 1,2,3</td></tr>
<tr><td>2. Water treatment units</td><td>CLO 4</td></tr>
<tr><td>3. Installation system layout</td><td>CLO 2,6</td></tr>
<tr><td>4. Water treatment media</td><td>CLO 1,2,4</td></tr>
<tr><td>5. Pumps and installation mechanical systems</td><td>CLO 4</td></tr>
<tr><td>6. Hydraulic profile on installation</td><td>CLO 2,6</td></tr>
<tr><td>7. Drawing of system installation design</td><td>CLO 4,5,6</td></tr>
<tr><td>8. Planning and design of Domestic wastewater treatment plant.</td><td>CLO 6</td></tr>
<tr><td>9. Planning & design of data collection</td><td>CLO 5,6</td></tr>
<tr><td>10. Calculation of Material & Sold Balance</td><td></td></tr>
<tr><td>11. Basic dimensions of each unit of process/ operation on preliminary treatment, primary treatment and secondary treatment operation</td><td></td></tr>
<tr><td>12. Calculation of hydraulic profile</td><td></td></tr>
</table></td></tr>
<tr><td>Textbook(s) and Other Required Material</td><td>• Metcalf/Eddy: Wastewater Engineering: Treatment and Reuse, 4th edition, McGraw Hill, Boston, MA</td></tr>
<tr><td>Grading System</td><td>Assignments 20%
Research work 20%
Mid-term exams 20%
Final Exam 40%</td></tr>
<tr><td>Instructors</td><td>Prof. Ashraf Refaat / Prof. Anwar Khursheed Ahmad</td></tr>
<tr><td>Date of Review</td><td>November, 2024</td></tr>
</table>