College of Engineering

Department of Civil Engineering

CE 509 Biological Treatment Processes

Credit and Contact hours	3 / 3 (Lectures), 0 (Tutorials), 0 (Laboratory)
Required, or Elective	Required
Course Description	Kinetics of biological growth. Modeling of suspended and attached growths. Aerobic treatment processes: Trickling filters, rotating biological contactors, activated sludge, Aerated lagoons and stabilization ponds. Sludge treatment.
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. Recognize fundamental and advanced concepts of microbiology in biological treatment processes of wastewater. K1	**SO1**
CLO2. Recognize the practical design, operation and monitoring of biological wastewater treatment systems. K1	**SO1**
CLO3. Apply fundamental and advanced concepts of microbiology in real-life biological treatment processes of wastewater projects. S1	**SO2**
CLO4. Determine and analyze the quantity and quality characteristics of wastewater. S2	**SO3**
CLO5. Design and compute the dimensions of biological treatment units in real-life projects. S4	**SO5**
CLO6. Apply professional engineering ethics and academic integrity in the design, critical assessment, and research of various wastewater treatment systems, specifically those performing biological removal of organic matter, nitrogen, and phosphorus. V1	**SO6**

Student Outcomes related to this Course

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 3 Investigate scientific research problems independently or through teamwork using critical thinking, appropriate techniques, advanced tools, and management principles.

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.

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<tr><td>Topics Covered</td><td>
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<tr><th>List of Topics</th><th>Related CLOs</th></tr>
<tr><td>1. Characterization and measurement of Organic Pollutant.</td><td>CLO 4</td></tr>
<tr><td>2. Introduction to Biological Treatment.</td><td>CLO 1, 2, 3</td></tr>
<tr><td>3. Microbial Growth Kinetics.</td><td>CLO 1, 3</td></tr>
<tr><td>4. Suspended Biological Treatment Systems.</td><td>CLO 5, 6</td></tr>
<tr><td>5. Attached Growth Biological Treatment system.</td><td>CLO 5, 6</td></tr>
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<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>
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<tr><td>Assignments</td><td>20%</td></tr>
<tr><td>Lecture Attendance</td><td>--</td></tr>
<tr><td>Technical Paper</td><td>20%</td></tr>
<tr><td>Mid-term exams</td><td>20 %</td></tr>
<tr><td>Final Exam</td><td>40 %</td></tr>
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<tr><td>Instructors</td><td>Prof. Anwar Khursheed Ahmad / Prof. Ashraf Refaat</td></tr>
<tr><td>Date of Review</td><td>March 2025</td></tr>
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