College of Engineering

Department of Civil Engineering

CE 459 Special Topics in Environmental Engineering

Credit and Contact hours	3 / 3 (Lectures), 0 (Tutorials), 0 (Laboratory)
Required, or Elective	Elective
Course Description	Study of special topics in environmental engineering with emphasis on current problems. Participants are expected to write a report and give an oral presentation on an environmental topic of their choice and of local concern. The work may include literature search, laboratory work, and field investigation.
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. Identify sources, types, and composition of the pollutant, in addition to the physical, chemical, and biological properties to conduct and design environmental engineering experiments. K1	**SO1**
CLO2. Determine quantities of the pollutant or problem in concern that can be treated, and perform quality monitoring plans to meet guidelines. S1	**SO2**
CLO3. Develop design strategies depending on the contemplating environmental issue to mitigate the impact of the pollutants. S1	**SO2**
CLO4. Utilize management and legislation for source reduction and treatment requirements to maintain the quality of the final waste/product. S1	**SO2**
CLO5. Select equipment and setting performance standards from the perspective of an environmental engineer and system manager. V1	**SO6**
CLO6. Discuss the current environmental problems and evaluate its solutions through the available recent literature. V2	**SO7**

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 6 Demonstrate scientific integrity, ethical responsibility, and academic values in scientific publications, research projects, and thesis work.

SO 7 Effectively manage, individually or in groups, specialized tasks and activities in coursework, projects, assignments, and research work with a high level of autonomy and responsibility.

<table>
<tr><td>Topics Covered</td><td>
<table>
<tr><th>List of Topics</th><th>Related CLOs</th></tr>
<tr><td>1. Introduction to Special Topics in Environmental Engineering
• Overview of emerging and persistent environmental challenges
• Importance of interdisciplinary approaches in environmental engineering
• Environmental regulations and policies in Saudi Arabia</td><td>CLO 4, 6</td></tr>
<tr><td>2. Air Pollution and Control Technologies
• Sources and types of air pollutants in urban and industrial areas
• Advanced air pollution monitoring techniques</td><td>CLO 1,2</td></tr>
<tr><td>3. Water and Wastewater Treatment Innovations
• Emerging contaminants in water: Microplastics, pharmaceuticals, and heavy metals
• Water reuse and desalination: Challenges and solutions</td><td>CLO 1, 4, 6</td></tr>
<tr><td>4. Solid and Hazardous Waste Management
• Hazardous waste treatment and disposal
• Circular economy and sustainable waste management</td><td>CLO 3,4,5,6</td></tr>
<tr><td>5. Sustainable Development and Green Technologies
• Renewable energy integration in environmental engineering (solar, wind, and bioenergy)
• Carbon capture and storage (CCS) technologies</td><td>CLO 3,6</td></tr>
<tr><td>6. Soil and Groundwater Contamination
• Sources and fate of soil and groundwater pollutants
• Groundwater protection policies and monitoring strategies</td><td>CLO 1,4,6</td></tr>
<tr><td>7. Climate Change and Its Impact on the Middle East
• Climate change trends and projections for Saudi Arabia
• Impact on water resources, agriculture, and urban infrastructure</td><td>CLO 4,6</td></tr>
</table>
</td></tr>
<tr><td>Textbook(s) and Other Required Material</td><td>• Environmental Engineering textbook related to the contemplating issue and treatment strategies. (e.g. Nalco’s Handbook).
• Students are encouraged to read different journal papers new development in environmental engineering.</td></tr>
<tr><td>Grading System</td><td>Assignments 20%
Lecture Attendance --
Project work 20%
Mid-term exams 20 %
Final Exam 40 %</td></tr>
<tr><td>Instructors</td><td>To be determined</td></tr>
<tr><td>Date of Review</td><td>November, 2024</td></tr>
</table>