

CE 507 Environmental Microbiology

Credit and Contact hours	3 / 3 (Lectures), 0 (Tutorials), 0 (Laboratory)																
Required, or Elective	Elective																
Course Description	This course will introduce students to the field of environmental microbiology, which is the study of microbes in natural environments such as soil, water, and air. Investigation will focus on microbial distribution, diversity, physiology, biochemistry, function, and ecology along with commonly employed microbiology methods. Typical issues in environmental microbiology will also be discussed, including biotechnology and bioremediation.																
Prerequisites or Co-requisites	None																
Course Learning Outcomes	<p>Students completing this course successfully will be able to:</p> <table> <thead> <tr> <th>Course Learning Outcomes (CLOs)</th><th>Related Student Outcomes (SO)</th></tr> </thead> <tbody> <tr> <td>CLO1. Define microbes and environmental microbiology. K1</td><td>SO1</td></tr> <tr> <td>CLO2. Explain the distribution of microbes in several different environments, including water, sediments, soil and air. K1</td><td>SO1</td></tr> <tr> <td>CLO3. Describe the diversity of microbes in different environments. K1</td><td>SO1</td></tr> <tr> <td>CLO4. Illustrate the ecological importance of microbes and their function in natural ecosystems. K1</td><td>SO1</td></tr> <tr> <td>CLO5. Describe viral, protozoan, fungal and bacterial metabolism, genetics, growth and function in an environmental context. K1</td><td>SO1</td></tr> <tr> <td>CLO6. Speculate how climate change will impact the distribution, diversity and function of microbes in ecosystems. S1</td><td>SO2</td></tr> <tr> <td>CLO7. Judge methods commonly used in environmental microbiology and identify their limitation (These methods can include enumeration techniques, genetic analysis, functional assays and techniques used to measure microbial activity). V1</td><td>SO6</td></tr> </tbody> </table>	Course Learning Outcomes (CLOs)	Related Student Outcomes (SO)	CLO1. Define microbes and environmental microbiology. K1	SO1	CLO2. Explain the distribution of microbes in several different environments, including water, sediments, soil and air. K1	SO1	CLO3. Describe the diversity of microbes in different environments. K1	SO1	CLO4. Illustrate the ecological importance of microbes and their function in natural ecosystems. K1	SO1	CLO5. Describe viral, protozoan, fungal and bacterial metabolism, genetics, growth and function in an environmental context. K1	SO1	CLO6. Speculate how climate change will impact the distribution, diversity and function of microbes in ecosystems. S1	SO2	CLO7. Judge methods commonly used in environmental microbiology and identify their limitation (These methods can include enumeration techniques, genetic analysis, functional assays and techniques used to measure microbial activity). V1	SO6
Course Learning Outcomes (CLOs)	Related Student Outcomes (SO)																
CLO1. Define microbes and environmental microbiology. K1	SO1																
CLO2. Explain the distribution of microbes in several different environments, including water, sediments, soil and air. K1	SO1																
CLO3. Describe the diversity of microbes in different environments. K1	SO1																
CLO4. Illustrate the ecological importance of microbes and their function in natural ecosystems. K1	SO1																
CLO5. Describe viral, protozoan, fungal and bacterial metabolism, genetics, growth and function in an environmental context. K1	SO1																
CLO6. Speculate how climate change will impact the distribution, diversity and function of microbes in ecosystems. S1	SO2																
CLO7. Judge methods commonly used in environmental microbiology and identify their limitation (These methods can include enumeration techniques, genetic analysis, functional assays and techniques used to measure microbial activity). V1	SO6																
Student Outcomes related to this Course	<p>SO 1 Recognize advanced engineering knowledge, concepts, and techniques to identify, interpret, and analyze complex and real-life engineering problems.</p> <p>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.</p> <p>SO 6 Demonstrate scientific integrity, ethical responsibility, and academic values in scientific publications, research projects, and thesis work.</p>																

Topics Covered	List of Topics		Related CLOs
	1. Introduction		CLO 1,3
	2. Earth environments		CLO 1
	3. Aero-microbiology		CLO 1-3
	4. Aquatic microbiology		CLO 1-3
	5. Microbiology of extreme environments		CLO 4
	6. Methods for detection, enumeration and identification of microbes		CLO 4,5
	7. Bioinformatics and genomics		CLO 5
	8. Biogeochemical cycling		CLO 3,4,7
	9. Microbial food webs dynamics		CLO 4
	10. Microbial communities and communication		CLO 5,6,7
	11. Applications for environmental microbiology		CLO 6,7
Textbook(s) and Other Required Material	<ul style="list-style-type: none"> • Environmental Engineering textbook related to the contemplating issue and treatment strategies. (e.g. Microbial World, Env. Microbiology) 		
Grading System	Assignments	20%	
	Lecture Attendance	--	
	Project work	20%	
	Mid-term exams	20 %	
	Final Exam	40 %	
Instructors	Dr. Faris M Munshi		
Date of Review	November, 2024		