

طرح دوره و طرح درس- درس میکروبیولوژی پیشرفته فاضلاب- دوره PhD
COURSE PLAN OF ADVANCED ENVIRONMENTAL MICROBIOLOGY

Coordinating Unit:	Department of Environmental Health Engineering, School of Public Health	
Degree	PhD	
Course Title:	Advanced Environmental Microbiology	
Compulsory/Elective	Compulsory	
Course Prerequisites:	None	
Prerequisite knowledge	----	
Duration	First semester	Credit Units: 2
Course Description	<p>A survey of modern developments emphasizing the application of the knowledge of fundamental microbiology to address problems which exist in today's environment. The course will introduce students to complex concepts that link microbial activities to key physical, geological, and chemical processes on Environment. Topics to be covered in the course will include geomicrobiology, soil microbiology, and aquatic microbiology, as well as some industrial aspects of microbiology. Students will learn how microbes influence geochemical processes at the earth's surface, the cycling of nutrients in the oceans, lakes and rivers, and the engineering and use of microorganisms to accelerate the natural degradation or transformation of chemicals and elements in the subsurface environment through bioremediation. Students will learn how microorganisms are selected and engineered to accelerate degradation of contaminants in water, air and soils, the limitations and benefits of bioremediation, and the future of this technology in contaminant cleanup in remote environments. Students will also be introduced to microbial processes of industrial importance, such as fermentations for food industry and wastewater treatment. Also Journal articles will be assigned in advance of discussions by presentation of students at power point.</p>	
Course Objectives	<p>Main Objectives Understand the role of microorganisms in environmentally relevant processes including Bioremediation of pollutants, biogeochemical cycling and wastewater treatment</p> <p>Specific Objectives</p> <ol style="list-style-type: none"> 1. Learn principles of microbial diversity and microbial ecological theory and how they apply to environmental microbiology 2. To have an understanding of modern pollution problems from a biological point of view. 3. To examine the chemical, biochemical, and molecular aspects of biodegradation of hazardous and toxic compounds. 4. To understand how knowledge applied from these areas has led to the development of bioremediation technology. 	
Learning Outcomes (LO)	<p>Upon completion of this course, students should be able to:</p> <ol style="list-style-type: none"> 1. Apply microbiological techniques in investigating the microbial world 2. Environmental pollution types, extents, and implications. 3. Interactions between natural biological systems, particularly microbial systems, and modern pollutants. 4. Biochemical degradation pathways of the most prominent pollutants. 5. Molecular aspects of biodegradation. 6. Applications of such basic knowledge 7. Preventing, mitigating, and treating environmental pollution 	
Texts & References: (* recommended textbook(s))	<ol style="list-style-type: none"> 1. Raina M Maier , Ian L Pepper, Charles P Gerba, Environmental Microbiology, Academic press, 2008. 2. Lammert, John M. 2007. Techniques in Microbiology. A Student Handbook. Pearson Education Inc . ISBN 0 13 224011 4. 3. Pommerville Jeffrey C. 2010. Alcamo's Fundamentals of Microbiology. 9th edition. Jones and Bartlett Publishers, Sudbury MA (awarded best textbook for a basic microbiology class) 4. Tortora, G. Funke and C. Case. 2010. Microbiology: an Introduction. 10th edition. Pearson Publishing. (current textbook for Bio 315 Microbiology) 	

	<ol style="list-style-type: none"> 5. Atlas, R. M., and R. Bartha. 1993. Microbial Ecology, Fundamentals and Applications. Third Edition. Benjamin-Cummings (Pub.). Redwood City, CA. USA. 6. Hurst, C. J., G. R. Knudsen, M. J. McInerney, L. D. Stetzenbach, and M. V. Walter (eds.). 1997. Manual of Environmental Microbiology. ASM Press. Washington DC. USA. 7. Paul, E. A., and F. E. Clark. 1989. Soil Microbiology and Biochemistry. First Edition. Associated Press (Pub.). San Diego, CA. USA. 8. Weaver, R. W. (ed.). 1994. Methods of Soil Analysis. Part 2. Microbiological and Biochemical Properties. SSSA Inc. (Pub.). Madison, WI. USA. 9. Bitton, G. 2010. Wastewater Microbiology. Wiley-Liss Inc. New York, NY. USA. 10. Weeks, Benjamin and I Edward Alcamo. 2008. Microbes and Society. 2nd ed. Jones and Bartlett Publishers, MA ISBN 13 978 0 7637 4649 0. 11. Wheelis, Mark. 2008. Principles of Modern Microbiology. Jones and Bartlett Publishers. MA. ISBN 13 978 0 7637 1075 0 <p>Note: You can use other references, textbooks or even the Internet to get through the course. Nonetheless, you will be responsible for the material in these cases. This is not saying that you should be afraid of using other resources. On the opposite, you are encouraged to do so; you only need to learn to verify your resources.</p>
Student Assessment:	<p>30% Final exam</p> <p>40% paper summaries and reviews</p> <p>30% 2 Presentations</p>
Learning Outcome Assessment	<p>1-Tests and final examination.</p> <p>2- Course evaluation</p>
Pedagogical Methods	<p>* Lecture</p> <p>* Project</p> <p>* Exercises and problems</p> <p>* Student presentation</p> <p>* Independent study</p> <p>Paper summaries will be handed in the time schedule given and in the following style: Title: Bold, capital initials, Centered, 12 points Times New Roman font, single space. Authors are listed under the title as in the original paper. Body text: One or two paragraphs consisting of an introductory statement, materials and methods statement(s), main results, and a concluding statement. Face is 12 points Times New Roman font, Double space. Reference: Soil Science Society of America style. Face is 12 points Times New Roman font, single space.</p>

Lesson Plan of Advanced Environmental Microbiology- PhD Level

Advanced Environmental Microbiology- PhD Level							
Day(S) Sunday(S)	Date(S) Dd/Mm/Yy	Field	Year Of Entry	Department	Course Leader	Time	Context
Week1		Environmental Health		Environmental Health Eng.	Dr.Gholami		Terminology
Week2		Environmental Health		Environmental Health Eng.	Dr.Gholami		Environmental Microbiology- Definition
Week3		Environmental Health		Environmental Health Eng.	Dr.Gholami		Bacteria,Protozoa, Viruses
Week4		Environmental Health		Environmental Health Eng.	Dr.Gholami		Algae And Fungi
Week5		Environmental Health		Environmental Health Eng.	Dr.Gholami		Scope, Cell Structures& Characterization
Week6		Environmental Health		Environmental Health Eng.	Dr.Gholami		Microbial Staining&Pure Culture Techniques
Week7		Environmental Health		Environmental Health Eng.	Dr.Gholami		Ecosystem Contro
Week8		Environmental Health		Environmental Health Eng.	Dr.Gholami		Environmental Samplin
Week 9		Environmental Health		Environmental Health Eng.	Dr.Gholami		Aquatic Environment
Week10		Environmental Health		Environmental Health Eng.	Dr.Gholami		Biodegradation Of Organic Pollutant
Week11 Saturday		Environmental Health		Environmental Health Eng.	Dr.Gholami		Aeromicrobiology
Week12 Saturday		Environmental Health		Environmental Health Eng.	Dr.Gholami		Extreme Environment
Week13		Environmental Health		Environmental Health Eng.	Dr.Gholami		One Carbon Biodegradation
Week14 Saturday		Environmental Health		Environmental Health Eng.	Dr.Gholami		Hydrocarbon Degradation
Week15 Saturday		Environmental Health		Environmental Health Eng.	Dr.Gholami		Aromatic Hydrocarbons
Week16		Environmental Health		Environmental Health Eng.	Dr.Gholami		Microbial Corrosion
Week 17 Saturday		Environmental Health		Environmental Health Eng.	Dr.Gholami		Biodrainage
Week18		Environmental Health		Environmental Health Eng.	Dr.Gholami		Bioleaching
Week19		Environmental Health		Environmental Health Eng.	Dr.Gholami		Climate change and environ. Microb.
Week20		Environmental Health		Environmental Health Eng.	Dr.Gholami		Future perspective and required research
Week21		Environmental Health		Environmental Health Eng.	Dr.Gholami		Presentation and assigned paper

Course Contribution to Program Outcomes

KNOWLEDGE	LEVEL of CONTRIBUTION				
	1	2	3	4	5
<p>THEORETICAL</p> <p>Demonstrates a basic knowledge of microbiology principles in the specific disciplines focused on this program.</p> <p>Defines environmental microbiology problems and integrates both theoretical and applied knowledge of Environmental Microbiology solutions.</p> <p>PRACTICAL</p> <p>Decides the optimum solution among the alternatives and comparing alternative solutions from the viewpoints of technical, economical and sustainable.</p>					
SKILLS	1	2	3	4	5
<p>CONCEPTUAL / COGNITIVE</p> <p>Analyses a environmental microbial system, component or a process.</p> <p>Designs to meet desired requirements under realistic constraints.</p> <p>PRACTICAL</p> <p>Utilizes modern technical tools by selecting among the alternatives for microbial applications.</p> <p>Analyze results obtained throughout the experiments.</p>					

Course Contribution to Program Outcomes(CONTINUED)

PERSONAL AND PROFESSIONAL COMPETENCIES	0	1	2	3	4
<p>Ability to Work Independently and Take Responsibility Works both independently and a part of a multidisciplinary team. Uses initiative when needed.</p> <p>Learning Competence Demonstrates abilities to follow developments in science and technology for self-innovation. Demonstrates abilities to attain the information needed for produce solutions to a given problem and survey literature through databases and other sources to do this.</p> <p>Communication and Social Competence Uses language effectively in both written and oral ways, furthermore reads, writes and speaks at least one foreign language.</p> <p>Transfers information and ideas effectively by written, oral, and visual tools.</p>					

ECTS Workload CALCULATION TABLE

Activity	Quantity	Time Period (Hours/Unit)	Total Workload Hours
Class Participation			
Course Period (15 Weeks for Classes + 2 Weeks for Final Exams)	17	3	51
Preparation for EACH Assignment, Exam and Activity			
Project	1	7	7
Presentation	3	7	21
Term Paper	3	15	45
Final Exam	1	15	15
Class Preparation			
Weekly Time Spent Outside Classroom for Reading, Review, Research and Other Activities	17	3	51
Total Workload			190