

**Jordan University of Science and Technology**  
**Faculty of Science and Arts**  
**Department of Biotechnology & Genetic Engineering**  
**Semester 2/06-07**

<b>Course Information</b>	
<b>Course Title</b>	<b>Environmental Biotechnology</b>
<b>Course Number</b>	Bt 436
<b>Prerequisites</b>	Bt 232 + B 331
<b>Course Website</b>	<a href="http://www.just.edu.jo/isaadoun">www.just.edu.jo/isaadoun</a>
<b>Instructor</b>	Prof. Ismail Saadoun
<b>Office Location</b>	PH1L1
<b>Office Phone</b>	23460
<b>Office Hours</b>	Sunday, Tuesday: 3-5
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<b>Teaching Assistant</b>	-
<b>Course Description</b>	
<p>The aim of this course is to provide an understanding of the specific application of metabolic capability and molecular biology of microorganisms for exploitation of many areas of biotechnology to reverse and prevent environmental problems. Topics will cover: Environmental monitoring, Sewage treatment, pollution control of domestic, agricultural and industrial wastes, bioremediation and clean technology, energy and biofuels, and mineral resource recovery.</p>	

<b>Text Book</b>	
<b>Title</b>	Environmental Biotechnology
<b>Author(s)</b>	Alan Scragg
<b>Publisher</b>	LONGMAN
<b>Year</b>	2005
<b>Edition</b>	2 <sup>nd</sup>
<b>Book Website</b>	<a href="http://www.awl-he.com">http://www.awl-he.com</a>
<b>References</b>	-

<b>Assessment Policy</b>		
<b>Assessment Type</b>	<b>Expected Due Date</b>	<b>Weight</b>
<b>First Exam</b>	25-3-07	20%
<b>Second Exam</b>	06-05-07	20%
<b>Final Exam</b>	Comprehensive: To be Announced	40%
<b>Assignments</b>	Project (Term Paper & Presentation)	20%

<b>Course Objectives</b>		<b>Weights</b>
1. To provide an understanding of the specific application of metabolic capability and molecular biology of microorganisms		20%
2. Exploitation of organisms in many areas of biotechnology to reverse and prevent environmental problems		15%
3. To provide an understanding of the specific application of microorganisms in sewage treatment		15%
4. To provide an understanding of the specific application of plants and microorganisms in clean technology		20%
5. To provide an understanding of the specific application of plants and microorganisms in bioremediation		20%

6. To provide an understanding of the specific application of microorganisms in energy and biofuels, and mineral resource recovery	10%
<b>Teaching &amp; Learning Methods</b>	
The 45 hours in total will be mainly lectures and project discussion with few tutorials and including two 1-hour exams	

<b>Learning Outcomes:</b> Upon successful completion of this course, students will be able to		
Related Objective(s)		Reference(s)
1	Introduce the student to the problems of pollution and how biotechnology could offer a solution for these problems	Chapter 1
1,2	Describe the different techniques used to monitor pollutants in the environment	Chapter 2
1, 2, 3	Describe the sewage treatment process and importance of wastewater treatment plants	Chapter 3
4	Describe the concept of clean technology and its application	Chapter 4
5	Describe the concept of bioremediation technology and different technologies involved to clean polluted sites	Chapter 5
6	Describe the importance of biofuel and ways to replace hydrocarbon fuel	Chapter 6
6	Describe the importance of microorganisms to leach out minerals from the environment	Chapter 7
1, 4	Describe the applications of rDNA in agrobiotechnology and use of the alternatives to the agrochemicals	Chapter 8

<b>Useful Resources</b>
Text book, Internet

<b>Course Content</b>		
Week	Topics	Chapter in Text (handouts)
1	<b>Introduction</b> Environmental Biotechnology, Pollution and Biotechnological Treatments of Pollution	1
2+3	<b>Environmental Monitoring</b> Sampling Physical, Chemical and biological Analysis Monitoring pollution, Biosensors	2
3-5	<b>Sewage Treatment</b> Function of Waste Treatment Systems Treatment, Sludge Treatment, Anaerobic Digestion	3

6-7	<b>Clean Technology, Domestic, Industrial and Agricultural Wastes</b> Clean Technology, Recycling Domestic, Agricultural and Industrial Wastes	4
8-10	<b>Bioremediation</b> Inorganic and Petroleum-based Wastes Synthetic Organic Compounds Phytoremediation, Gaseous Wastes	5
11	<b>Energy and Biofuel</b> Alternative Non-fossil Energy, Biological Energy Sources, Combustion of biomass Biogas, Oils, Ethanol and Hydrogen Production	6
12	<b>Natural Resource Recovery</b> Oil Recovery, Biorecovery of Metals	7
13-14	<b>Agrobiotechnology</b> Improved Plants and Animals Diagnosis; Animal Vaccines; Biodiversity	8

<b>Additional Notes</b>	
<b>Assignments</b>	Theoretical Projects
<b>Exams</b>	Written, Multiple choice, listing, matching and true & false Make-up exams will be offered for valid reasons only with consent of the Dean. Make-up exams may be different from regular exams in content and format.
<b>Cheating</b>	Regulations of JUST will be applied
<b>Attendance</b>	Lecture attendance is mandatory. Student is allowed maximally 10% absentia of the total module hours. More than this percentage, student with an excuse will be drawn from the module. Otherwise, student will be deprived from the module with zero mark assigned (FINAL GRADE 35)
<b>Workload</b>	On average you should expect to spend at least (6) hours per week on this course
<b>Graded Exams</b>	-
<b>Participation</b>	-
<b>Laboratory</b>	Field work to collect information needed to prepare the theoretical projects
<b>Projects</b>	<p><b>20 typewritten (double space) pages</b></p> <p><b>Project Report Format</b> Title, Abstract, Introduction, Objectives: Rational for topics or process selected Results, Conclusions, Recommendations and References</p> <p><b>Grading:</b> A- Project Report 10% B- Project Presentation 10%</p> <p>1-Reports should be written by your own language and should not exceed 20 typewritten (double space) pages. 2-Reports should deal with an environmental topic selected by the student and approved by me during the first four weeks of the semester. 3-The last two weeks (4 lectures) will be assigned for project presentation and discussion. 4-The dead line to submit the project paper is 20/5/07.</p> <p><b>Students can work on the following problems</b> 1.Wastewater Treatment Plants In Jordan. Number of Plants, their location and district served. Types of wastewater treatment plants and technology used. Future plans to develop to meet the demands. Useful Products generated by wastewater treatment plants and their applications 2- Bioremediation of Terrestrial and Aquatic Habitats. Soil and Marine environments Hydrocarbon, heavy metals and radionucleoides. Phytoremediation</p>

	<p><b>3-</b> Olive-oil mills in Jordan. Number of mills, their location and district served Annual production of wastes (solid and water). Recommendations to recycle the wastes and clean the contaminated sites</p> <p><b>4-</b> Biological energy sources in Jordan. Biogas project at Rusiefa. Solid wastes used and Technology operated</p> <p><b>5-</b> Genetically modified organisms (GMOs) and their risks</p> <p><b>6-</b> Clean Technology and Agrochemicals. Types of agrochemicals and their use Economy of these chemicals. Impact of biotechnology to lessen the problem</p> <p><b>7-</b> Clean technology and Composting industry. Comparison between home-made and large scale compost production. Technology operated and uses of the product</p> <p><b>8-</b> Recycling of organic wastes. Industries that dump organic wastes. Type of wastes produced. Collection sites or treatment plants at each location. Uses of these organic wastes if any. Recommendations to recycle the wastes and clean the contaminated sites</p> <p><b>9-</b> Industrial cities in Jordan. Type of wastes produced by the various industries Treatment plants at each. Recommendations to recycle the wastes and clean the contaminated sites</p> <p><b>10-</b> Toxicity of polycyclic aromatic hydrocarbons and their health impact</p>
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Environmental biotechnology helps clean up the wastes traditional manufacturing methods produce (see "Clean Sweep"). Scientists can inject microbes into the ground to clean up or deactivate groundwater pollution. Environmental biotechnology as discussed in this briefing paper is the application of these processes for the protection and restoration of the quality of our environment. This briefing paper reviews the various areas of environmental biotechnology together with their related issues and implications. The overall aim is to provide balanced information and advance public debate.