

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

Course Information	
Course Title	Environmental Biotechnology
Course Number	Bt 436
Prerequisites	Bt 232 + B 331
Course Website	www.just.edu.jo/isaadoun
Instructor	Prof. Ismail Saadoun
Office Location	PH1L1
Office Phone	23460
Office Hours	Sunday, Tuesday: 3-5
E-mail	isaadoun@just.edu.jo
Teaching Assistant	-
Course Description	
<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>	

Text Book	
Title	Environmental Biotechnology
Author(s)	Alan Scragg
Publisher	LONGMAN
Year	2005
Edition	2 nd
Book Website	http://www.awl-he.com
References	-

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

Course Objectives		Weights
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%
Teaching & Learning Methods	
The 45 hours in total will be mainly lectures and project discussion with few tutorials and including two 1-hour exams	

Learning Outcomes: 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

Useful Resources
Text book, Internet

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

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

Additional Notes	
Assignments	Theoretical Projects
Exams	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.
Cheating	Regulations of JUST will be applied
Attendance	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)
Workload	On average you should expect to spend at least (6) hours per week on this course
Graded Exams	-
Participation	-
Laboratory	Field work to collect information needed to prepare the theoretical projects
Projects	<p>20 typewritten (double space) pages</p> <p>Project Report Format Title, Abstract, Introduction, Objectives: Rational for topics or process selected Results, Conclusions, Recommendations and References</p> <p>Grading: 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>Students can work on the following problems 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>3-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>4- Biological energy sources in Jordan. Biogas project at Rusiefa. Soild wastes used and Technology operated</p> <p>5- Genetically modified organisms (GMOs) and their risks</p> <p>6- Clean Technology and Agrochemicals. Types of agrochemicals and their use Economy of these chemicals. Impact of biotechnology to lessen the problem</p> <p>7- Clean technology and Composting industry. Comparison between home-made and large scale compost production. Technology operated and uses of the product</p> <p>8-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>9- 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>10- Toxicity of polycyclic aromatic hydrocarbons and their health impact</p>
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What is Environmental Biotechnology? Biotechnology is an applied discipline which studies the possibility of using living organisms, their systems or products of their vital functions to solve technological problems. The concept of biotechnology is mainly associated with genetic engineering, but this is not the only method used by Biotechnology. In addition to genetic engineering, biotechnology includes other processes of modification of living organisms, such as selection or crossbreeding. Environmental biotechnology is biotechnology that is applied to and used to study the natural environment. Environmental biotechnology could also imply that one try to harness biological process for commercial uses and exploitation. The International Society for Environmental Biotechnology defines environmental biotechnology as "the development, use and regulation of biological systems for remediation of contaminated environments (land, air, water), and for environment-friendly processes 2 Environmental Biotechnology. natural selection as fundamental. The irony is that Darwin himself rejected muta-tion as too deleterious to be of value, seeing such organisms, in the language of the times, as "sports" " oddities of no species benet.Â Thus, at the other end of the biotech timeline, a century and a half on from Ori-gin of Species, the principles it rst set out remain of direct relevance for what has