Philadelphia University
Faculty of Science
Department of –Biotechnology and Genetics Engineering
Second Semester, 2009/2010

Course Syllabus

Course Title: Microbial Biotechnology	**Course code:** 240415
Course Level: 4	**Course prerequisite (s) and/or corequisite (s):** 240216
Lecture Time: ST 8:10 -9:00	**Credit hours:** 3 hours

Academic Staff Specifics

Name	Rank	Office Number and Location	Office Hours	E-mail Address
Marwan Abu-Halaweh	**Assistan Prof.**	**908**	**Sunday : 9:00-10:00 Monday: 9:00-10:00**	**mhalaweh@philadelphia.edu.jo**

Course module description:

The course focuses on the vast array of applications in microbiology, which is often referred to as microbial biotechnology. Lectures will cover the fundamentals of bacterial genetics and techniques for genetic engineering as well as the role of microbiology in medicine, agriculture, and the environment. The theory, practice, and the importance of applied microbiology in these areas are explored through examples such as water and sewage treatment.

Course module objectives:

1. Introduce the student to new era of biotechnology.
2. Familiarized the student of the industrial application of microorganism such as enzymes, antibiotics production, bioremediation etc.

Course/ module components

- **Books (title , author (s), publisher, year of publication)**

1- Molecular Biotechnology: Principles and Application of Recombinant DNA3rd edition, B.R. Glick & J.A. Pasternak, 2005.

Teaching methods:

Lectures, discussion groups.

Learning outcomes:

Upon successful completion, students will be able to:
1. Explain how microbiology is applied to manufacturing in the pharmaceutical industry
2. Relate quality control to the manufacturing process
3. Describe the production methods for pharmaceuticals of microbial origin such as antibiotics and vaccines.

4- Improvement of microorganisms: rational screening based on known biochemical pathways and metabolic regulation; metabolic engineering by genetic manipulation of metabolic pathways or sequentially acting enzymes.

5. Mutation of cloned genes and protein engineering: site-directed and random mutagenesis, directed evolution, protein engineering to alter enzyme structure and function.
6. Fermentation processes: medium design for microbial fermentation and fermentation substrate considerations; modes of microbial growth; sterilization of medium and air, heat, chemical, UV and filtration; characteristics of cultures during growth, heat production, viscosity, oxygen transfer; factors affecting oxygen transfer and scale-up.
7. Production of proteins and primary and secondary metabolites.
8. Downstream processing & product recovery.

- **Cognitive skills (thinking and analysis).**

1. Students will have a basic understanding of the scientific method.
2. Students will have the opportunity to practice thinking critically and analytically and reason logically using current information and past experiences.
3. Students will have practice in assessing basic sources of information and how to evaluate and use this information.

- **Communication skills (personal and academic).**

Students will gain experience in effective communication skills by practicing, listening, reading, writing and speaking clearly.
Short oral presentations of 5-8 minutes will be required of all students and will be given during a class period. Students will pick a microbial biotechnology topic and discuss specific issues related to the topic.

- **Practical and subject specific skills (Transferable Skills).**

1. Students will develop an awareness of the relationship between science and technology in terms of the life and Microbial Biotechnology.
2. Emphasis will be placed upon an analytical problem-solving approach to microbial biotechnology. This approach will be implemented in both lectures and laboratories. Students will be given the opportunity to apply techniques discussed during the lecture in the lab.

Assessment instruments

Allocation of Marks	
Assessment Instruments	**Mark**
First examination	**15**
Second examination	**15**
Laboratory exams and reports	**30**
Presentation and Quizzes	**10**
Final examination	**30**
Total	**100**

Course/module academic calendar

Week	**Basic and support material to be covered**	**Homework/reports and their due dates**
(1)	Introduction	**Assignment due date end of week 10**
(2)	DNA, RNA and protein synthesis, Recombinant DNA Technology	
(3)	Manipulation of gene expression in prokaryotes	
(4)	Strain Isolation and screening	
(5)	Fermentation	
(6) First examination	Large scale production of proteins from recombinant microorganism	**Assignment due date**
(7)	Direct mutagenesis and protein engineering	
(8)	Industrial Application of Microorganisms	**Presentation**
(9)	Production of antibodies in *E. coli*	**Presentation**
(10)	Production of small biological molecules	**Presentation**
(11) Second examination	Production of Vaccine	**Presentation**
(12)	Production of Antibiotics	
(13)	Production of biopolymers	
(14)	Microbial insecticides, bioremediations	
(15)	Molecular Diagnostics	

(16) **Final Examination**		

Expected workload:

On average students need to spend 2 hours of study and preparation for each 50-minute lecture/tutorial.

Attendance policy:

Absence from lectures and/or tutorials shall not exceed 15%. Students who exceed the 15% limit without a medical or emergency excuse acceptable to and approved by the Dean of the relevant college/faculty shall not be allowed to take the final examination and shall receive a mark of zero for the course. If the excuse is approved by the Dean, the student shall be considered to have withdrawn from the course.

Module references

Books

Students will be expected to give the same attention to these references as given to the Module textbook(s)

Titles:

1- Industrial Microbiology: An Introduction by Waites, Morgan, Rockey and Higton, Blackwell Science (2001)
2- Brock biology of microorganism, 11th edition, By Madigan,Michael and Martinko,John, (2005)
3- Elements of Chemical Reaction and Engineering, 4th edition, by H. Scott Fogler Pearson Education Inc., (2006).

Journals

- Any biotechnology, applied microbiology and microbial biotechnology journal will be of great benefits to the student for their assignment.

Websites

www. Prenhall.com/madigan

Laboratory Schedule

Week Number	Topics
1	Laboratory Safety and sample collection and processing
2	Enrichment culture of collected samples
3	Selective culture
4	Biochemical analysis and phenotypic characterization
5	Biochemical analysis and phenotypic characterization
6	Biochemical analysis and phenotypic characterization
7	Biochemical analysis and phenotypic characterization
8	Midterm
9	Food Biotechnology
10	Food Biotechnology
11	Food Biotechnology
12	Food Biotechnology
13	Enzyme characterization
14	Final Exam