

Philadelphia University	 PHILADELPHIA UNIVERSITY THE WAY TO THE FUTURE	Approval date:
Faculty: Science		Issue:
Department: Biotechnology and Genetic Engineering		Credit hours: 2
Academic year: 2022/2023		Bachelor

Course information

Course#	Course title	Prerequisite
0240355	Environmental biotechnology	0240216
Course type		Class time
☐ University Requirement ☐ Faculty Requirement ☐ Major Requirement ☐ Elective ☒ Compulsory		8:15-9:15 Sun, Tue
		Room # 2901

Instructor Information

Name	Office No.	Phone No.	Office Hours	E-mail
Ayat Al-Azab	1018	2475	Sun, Tue: ٩:٤٥ – ١١:٠٠ Mon, Wed: ١٤:٠٠ – ١٣:٠٠	aalazab@philadelphia.edu.jo

Course Delivery Method

Course Delivery Method			
☒ Physical	☐ Online	☐ Blended	
Learning Model			
Precentage	Synchronous	Asynchronous	Physical

Course Description

This course describes the diverse problems of the environment and the approaches toward their solution or mitigation in connection to the modern or classical methods of biotechnology. It describes the significance in conservation of environmental resources and biodiversity, provision for alternate sources of energy, biological control of pests and pathogens, purification of environment, mitigation of problems of chemical fertilizers, and most important of all, improvement in the quality of life.

Course Learning Outcomes

Number	Outcomes	Corresponding Program outcomes
Knowledge		
K01	Understand the specific concepts and terminology of environmental biotechnology.	Kp2
K02	Name different applications of environmental applications.	Kp2
K03	Compare the classical and the modern techniques and methods of waste treatment.	Kp5
K04	Understand the role of microorganisms as biotechnological agents.	Kp5
K05	Describe the properties of microorganisms with potential application to environmental biotechnology processes.	Kp5
K06	Understand the different type of bioremediation	Kp5

K07	Explain the utilization of genetic engineering in biotreatment of pollutants	Kp2
K08	Describe the role of genetic engineering in biosensor development	Kp2
K09	Explain the role of microorganisms in biofuel production	Kp5
Skills		
Competencies		
C01	Understand the role of biotechnology in preserve environment.	Cp1
C02	Have the ability to describe and explain various technologies of waste treatment.	Cp1
C03	Describe the role of living organisms in bioremediation and biomonitoring of environmental and treatment process.	Cp1
C04	Apply critical thinking and problem solving skills.	Cp1
C05	Be able to put knowledge into practice.	Cp1

Learning Resources

Course textbook	(1) Sharma, N., Sodhi, A. S., & Batra, N. (Eds.). (2021). Basic Concepts in Environmental Biotechnology. CRC Press. (2) Wang, L. K., Ivanov, V., Tay, J. H., & Hung, Y. T. (Eds.). (2010). Environmental biotechnology (Vol. 10). Springer Science & Business Media. (3) Gothandam, K. M., Ranjan, S., Dasgupta, N., & Lichtfouse, E. (Eds.). (2021). Environmental Biotechnology Vol. 3. Springer International Publishing.
Supporting References	Sangeetha, J., Thangadurai, D., David, M., & Abdullah, M. A. (Eds.). (2016). Environmental Biotechnology: Biodegradation, Bioremediation, and Bioconversion of Xenobiotics for Sustainable Development. CRC Press.
Supporting websites	
Teaching Environment	☒ Classroom ☐ laboratory ☐ Learning platform ☐ Other

Meetings and subjects timetable

Week	Topic	Learning Methods*	Tasks	Learning Material Text book
1	Introduction - Environmental biotechnology terminology - Applications of environmental biotechnology - Different biotechnological agents used in waste treatment	Lectures		P. 1-7 P. 1-3 (1)
2	Microbial metabolism: Importance for environmental biotechnology - The metabolic diversity of prokaryotic and eukaryotic microorganisms.	Lectures		P. 193-245 (1)

	- Degradation of organic compounds in aerobic and anaerobic environments - The biochemical cycles of the major elements			
3	Water pollution - Water Pollutants - Effects of Water Pollution - Modern Wastewater Treatment Technologies - Nanomaterials for water remediation	Lectures		P. 35-44 (1)
4,5	Bioremediation: concepts and application - Importance of bioremediation - Classification of bioremediation - Types of bioremediation - Bioremediation applications	Lectures		P. 73-88 (1)
6, 7	The degradation of organic and inorganic pollutants - Sources of Soil Pollutants - Phytoremediation Processes - Organic Pollutants - Inorganic Pollutants - Future Prospects	Lectures		P. 134-148 (1)
8	Genetically modified microbial biosensor for detection of pollutants in water samples - Methods for Quantification/Identification of Pollutants in Environment - Biosensor - Bacterial biosensor - Genetically modified biosensor - Genetically Engineered Bacterial Biosensor for Heavy Metal Detection - Risk and Regulations of Genetically Modified Organisms - Limitation of Genetically Modified Bacterial Biosensor	Lectures		P. 86-99 (2)
9	Midterm exam			
10, 11	Biofuel production, applications and Challenges - Biofuel Processing Technology - Raw Materials for the Synthesis of Biofuels - Biohydrogen - Bioethanol - Environmental Impact of Biofuels - Biofuels and Food Security - Advantages and disadvantages of Biofuels	Lectures		P. 189-198 (1)
12	Bioplastics origin, types and applications - Need for Biopolymers - Nature of the Bioplastics and International Legislation - Classification - Constituents of Bioplastics - Applications of bioplastic	Lectures		P. 199-211 (1)
13,14	- Soil remediation and ecological restoration from heavy metal pollution and radioactive waste material using fungal genetics and genomic resources. - Biomagnification of Heavy Metals and Loss of Soil Biodiversity - Radioactive Waste: Potential Soil, Air and Water Pollutant. - Fungal Genetic and Genomic Resources. - Potential Use of Fungi for Pollution Abatement	Lectures		P. 328-352 (3)

	- Mycoremediation, Mycosorption, and Mycofiltration			
15	Environmental risks and concerns of biotechnology - Unpredictable Impact of GM Species on Native Varieties - Financial Aspects - Environmental Accumulation of Metabolites from Processes - Antibiotic Resistance and Superbugs - Risks Associated with Recombinant Therapeutics - Ethical Concerns	Lectures		P. 177-188 (1)
16	Final Exam			

* includes: Lecture, flipped Class, project- based learning, problem solving based learning, collaborative learning

Course Contributing to Learner Skill Development

Using Technology
Communication skills
Application of concepts learnt

Assessment Methods and Grade Distribution

Assessment Methods	Grade Weight	Assessment Time (Week No.)	Link to Course Outcomes
Mid Term Exam	30%	9	K01-K06 C01-C03
Various Assessments *	30%	2,4,6,7,8,11,13,14,15	K01-K09 C01-C05
Final Exam	40%	16	K01-K09 C01-C05
Total	100%		

* includes: quiz, in class and out of class assignment, presentations, reports, videotaped assignment, group or individual projects.

Alignment of Course Outcomes with Learning and Assessment Methods

Number	Learning Outcomes	Learning Method*	Assessment Method**
Knowledge			
K01-K09	All outcomes	Lectures	Quizzes and exams

Skills			
Competencies			
C01-C05	All outcomes	Lectures	Quizzes and exams

* includes: Lecture, flipped Class, project- based learning, problem solving based learning, collaborative learning

** includes: quiz, in class and out of class assignment, presentations, reports, videotaped assignment, group or individual projects.

Course Policies

Policy	Policy Requirements
Passing Grade	The minimum passing grade for the course is (50%) and the minimum final mark recorded on transcript is (35%).
Missing Exams	- Missing an exam without a valid excuse will result in a zero grade to be assigned to the exam or assessment. - A Student who misses an exam or scheduled assessment, for a legitimate reason, must submit an official written excuse within a week from the exam or assessment due date. - A student who has an excuse for missing a final exam should submit the excuse to the dean within three days of the missed exam date.
Attendance	The student is not allowed to be absent more than (15%) of the total hours prescribed for the course, which equates to six lectures days (M, W) and seven lectures (S,T,R). If the student misses more than (15%) of the total hours prescribed for the course without a satisfactory excuse accepted by the dean of the faculty, s/he will be prohibited from taking the final exam and the grade in that course is considered (zero), but if the absence is due to illness or a compulsive excuse accepted by the dean of the college, then withdrawal grade will be recorded.
Academic Honesty	Philadelphia University pays special attention to the issue of academic integrity, and the penalties stipulated in the university's instructions are applied to those who are proven to have committed an act that violates academic integrity, such as: cheating, plagiarism (academic theft), collusion, and violating intellectual property rights.

Program Learning Outcomes to be assessed in this Course

Number	Learning Outcome	Course Title	Assessment Method	Target Performance level
1	Kp2	Environmental biotechnology	Quizzes and exams	
2	Kp5	Environmental biotechnology	Quizzes and exams	
3	Cp1	Environmental biotechnology	Quizzes and exams	

Description of Program Learning Outcome Assessment Method

Number	Detailed Description of Assessment
Kp2	Quizzes and exams
Kp5	Quizzes and exams
Cp1	Quizzes and exams

Assessment Rubric of the Program Learning Outcome

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