Course Syllabus

1	**Course title**	Biotechnology of Living Organisms	
2	**Course number**	0304924	
3	**Credit hours**	3	
	Contact hours (theory, practical)	(3,0)	
4	**Prerequisites/corequisites**		
5	**Program title**	Ph.D. in Biological Sciences	
6	**Program code**	04	
7	**Awarding institution**	The University of Jordan	
8	**School**	Science	
9	**Department**	Biological Sciences	
10	**Course level**	Ph.D.	
11	**Year of study and semester (s)**	2022/2023 Spring	
12	**Other department (s) involved in teaching the course**	N/A	
13	**Main teaching language**	English	
14	**Delivery method**	☒Face to face learning ☐Blended ☐Fully online	
15	**Online platforms(s)**	☒Moodle ☐Microsoft Teams ☐Skype ☐Zoom ☐Others……	
16	**Issuing/Revision Date**	26 Feb 2023	

17 Course Coordinator:

Name: **Dr. Mamoon Al-Rshaidat** **Contact hours**: Sunday: 2:00 – 3:00 pm

Office number: Biological Sciences Building, Room # 314

Phone number: 22221

Email: m.rshaidat@ju.edu.jo

18 Other instructors:

N/A

19 Course Description:

This course deals with the fundamentals of molecular biotechnology, including molecular research procedures and manipulation of gene expression. Use of microbial systems for commercial product synthesis i.e., pharmaceutical proteins, antibiotics, biopolymers, vaccines, therapeutic agents, bioremediation, and biocontrol agent development. Transgenesis in animals and plants and their use, genetically modified food.

20 Course aims and outcomes:

A- Aims:

This course is designed to provide students with a comprehensive understanding of the latest advances in biotechnology, including the hottest topics in biotechnology that cover a range of organisms and field of applications, from health to animal to environment to agriculture. The course will cover the principles and techniques underlying the design and implementation of biotechnological systems, and their application in solving real-world problems.

The approach to teaching will center on student participation in the analysis of recent research literature, and associated methods with a focus on the application of integrating contemporary approaches concentrating on trends in the field. This will provide the student with various perspectives and help them sharpen their presentation skills and critical thinking.

This course aims at:

- To provide students with a comprehensive understanding of the latest advances in biotechnology
- To familiarize students with the principles and techniques underlying the design and implementation of biotechnological systems
- To enable students to critically evaluate biotechnological approaches and their potential applications in solving real-world problems
- To develop students' ability to communicate scientific ideas and findings effectively

B- Students Learning Outcomes (SLOs):

Upon successful completion of this course, students will be able to:

SLOs / SLOs of the course	SLO (1)	SLO (2)	SLO (3)	SLO (4)
(1) Critically analyze research papers in molecular biotechnology				
(2) Demonstrate a comprehensive understanding of the principles and techniques underlying biotechnological systems				
(3) Evaluate the advantages and disadvantages of different biotechnological approaches in solving real-world problems				
(4) Communicate scientific ideas and findings effectively through written and oral presentations				

21. Topic Outline and Schedule:

Week	Lecture	Topic	Student Learning Outcome	Learning Methods (Face to Face/Blended/ Fully Online)	Platform	Synchronous / Asynchronous Lecturing	Evaluation Methods	Resources
1	1.1	**Course Introduction** **Ch. 2: An Introduction to Genes and Genomes** 2.1 **Assignment (read alone):** A Review of Cell Structure 2.2 **Assignment (read alone):** The Molecule of Life	1,2	Face to Face	-	-	Exam/ Assignment	Ch. 2
	1.2	2.3 Chromosome Structure, DNA Replication, and Genomes		-	-	-	-	-
	1.3	2.4 RNA and Protein Synthesis		-	-	-	-	-
2	2.1	2.5 Mutations: Causes and Consequences		-	-	-	-	-

	2.2	2.6 Revealing the Epigenome		-	-	-	-	-
	2.3	**Ch. 3: Recombinant DNA Technology and Genomics** 3.1 Introduction to Recombinant DNA Technology and DNA Cloning	2,3	-	-	-	-	Ch. 3
3	3.1	3.2 What Makes a Good Vector?		-	-	-	-	
	3.2	3.3 How Do You Identify and Clone a Gene of Interest?		-	-	-	-	
	3.3	3.4 What Can You Do with a Cloned Gene? Applications of Recombinant DNA Technology		-	-	-	-	
4	4.1	Continue		-	-	-	-	
	4.2	Review Chapter 3		-	-	-	-	
	4.3	**First Exam**		-	-	-	-	
5	5.1	**Ch. 4: Proteins as Products** 4.1 Proteins as Biotechnology Products 4.2 Protein Structures	4,5,6	-	-	-	-	Ch. 4
	5.2	4.3 Protein Production: Protein Expression: Upstream Processing Protein Purification Methods: Downstream Processing Protein Verification, Preserving Scaling Up Protein Purification Post-purification Analysis Methods		-	-	-	-	
	5.3	Continue		-	-	-	-	
6	6.1	4.4 Proteomics Protein Microarrays		-	-	-	-	
	6.2	Review		-	-	-	-	
	6.3	**Ch. 5: Microbial Biotechnology**		-	-	-	-	
7	7.1	5.1 The Structure of Microbes	3,4,5,6	-	-	-	-	Ch. 5
	7.2	5.2 Microorganisms as Tools		-	-	-	-	
	7.3	5.1 Using Microbes for a Variety of Everyday Applications 5.2 Vaccines		-	-	-	-	
8	8.1	5.5 Microbial Genomes		-	-	-	-	
	8.2	5.6 Microbes for Making Biofuels		-	-	-	-	
	8.3	5.7 Microbial Diagnostics 5.8 Combating Bioterrorism		-	-	-	-	
9	9.1	**Ch. 9: Bioremediation** 9.1 What Is Bioremediation? 9.2 Bioremediation Basics	3,4,5,6	-	-	-	-	Ch. 9
	9.2	9.3 Cleanup Sites and Strategies 9.4 Applying Genetically Engineered Strains to Clean Up the Environment		-	-	-	-	

		9.5 Environmental Disasters: Case Studies in Bioremediation 9.6 Challenges for Bioremediation						
	9.3	**Midterm Exam**		-	-	-	-	
10	10.1	**Ch. 6: Plant Biotechnology** 6.1 The Future of Agriculture: Plant Transgenics	3,4,5,6	-	-	-	-	Ch. 6
	10.2	6.2 Methods Used in Plant Transgenesis - Conventional Selective Breeding - Cloning: Growing Plants from Single Cells - Antisense Technology		-	-	-	-	
	10.3	6.3 Practical Applications 6.4 Health and Environmental Concerns		-	-	-	-	
11	11.1	**Ch. 7: Animal Biotechnology** 1.1 Introduction to Animal Biotechnology 1.2 Animals in Research	3,4,5,6	-	-	-	-	Ch. 7
	11.2	1.3 Transgenic Animals		-	-	-	-	
	11.3	1.4 Producing Human Antibodies in Animals		-	-	-	-	
12	12.1	**Ch. 11: Medical Biotechnology** 11.1 The Power of Molecular Biology: Detecting and Diagnosing Human Disease Conditions	3,4,5,6	-	-	-	-	Ch. 11
	12.2	11.2 Medical Products and Applications of Biotechnology		-	-	-	-	
	12.3	Continue		-	-	-	-	
13	13.1	*Continue Ch. 11* Biotechnology Revolution (BBC) Video		-	-	-	-	
	13.2	Discussion		-	-	-	-	
	13.3	Discussion		-	-	-	-	
14	14.1	11.3 Gene Therapy		-	-	-	-	
	14.2	11.4 The Potential of Regenerative Medicine		-	-	-	-	
	14.3	Review		-	-	-	-	
15	15.1	**Ch. 13: Ethics and Biotechnology** 13.1 What Is Ethics?	5,6	-	-	-	-	Ch. 13
	15.2	13.2 Ethic and Biotechnology		-	-	-	-	
	15.3	13.3 Economics, The Role of Science, and Communication		-	-	-	-	

22 Evaluation Methods:

Opportunities to demonstrate achievement of the SLOs are provided through the following assessment methods and requirements:

Evaluation Activity	Mark	Topic(s)	SLOs	Period (Week)	Platform
First and Second Exam	40			5	Paper
Course project and participation	20			-	Variable

Final Exam	40	All course material	1,2,3,4,5,6	15	Online

23 Course Requirements

Research articles provided by instructor eLearning account

24 Course Policies:

A- Attendance policies:

Attendance is required, and students missing some of the 1-hour classes will jeopardize their successful completion of the course, due to the discussion nature of the course and the key elements discussed during the course that cannot be found in the textbook. Also, students are required to refer to Student Handbook for questions related to attendance and absence.

B- Absences from exams and handing in assignments on time:

According to the University of Jordan regulations, refer to student handbook

المادة)17(: أ -كل من يتغيب بعذر عن امتحان معلن عنه باستثناء االمتحان النهائي، عليه أن يقدم ما يثبت عذره لمدرس المادة خالل ثالثة أيام عمل من تاريخ زوال العذر، وفي حالة قبول مدرس المادة لهذا العذر فعليه إجراء امتحان معوض للطالب وإذا لم يقبل مدرس المادة العذر تعتبر عالمته صفرًا ، في هذا االمتحان .

C- Health and safety procedures:

Although this course has no laboratory component, health and safety is emphasized throughout the course due to the nature of topics discussed. This is mainly related to working with human, animal and plant objects, and the health and safety concerns related to the consumption of genetically modified products or additives.

D- Honesty policy regarding cheating, plagiarism, and misbehavior:

According to The University of Jordan regulations. Students shall refer to Student Handbook for questions related to cheating and plagiarism.

E- Grading policy + Weighting (i.e. weight assigned to exams as well as other student work)

First & Second exams 40%

Project and Participation. 20%

Final exam 40%

F- Available university services that support achievement in the course:

E-Learning portal, and online resources from the e-library to access scientific literature.

25 References:

A- Required book (s), assigned reading, and audio-visuals:

Research articles and other material provided by the instructor

B- Recommended books, materials, and media:
"**Introduction to Biotechnology, 4th Edition**" by Thieman, W.J and Palladino M.A., Pearson Education, ©2020. ISBN: 1-292-26177-3

26 Additional information:

N/A

Name of Course Coordinator: **Dr. Mamoon Al-Rshaidat**	Signature: -	Date: 26 Feb 2023
Head of Curriculum Committee/Department:	Signature: --	
Head of Department: Dr. Amer Mriesh	Signature: --	
Head of Curriculum Committee/Faculty:	Signature: --	
Dean: Dr. Mahmoud Al-Gaghoub	Signature: --	