



Course Specifications

Revised November 2019

Course Title:	Biotechnology
Course Code:	4014401-3
Program:	BSc Microbiology
Department:	Biology
College:	Faculty of Applied Science
Institution:	Umm Al-Qura University

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A. Course Identification

1. Credit hours:	3 hours
2. Course type	
a.	University <input type="checkbox"/> College <input type="checkbox"/> Department <input checked="" type="checkbox"/> Others <input type="checkbox"/>
b.	Required <input checked="" type="checkbox"/> Elective <input type="checkbox"/>
3. Level/year at which this course is offered:	4 th year/ Level 7
4. Pre-requisites for this course (if any):	Molecular microbiology (4013462-3)
5. Co-requisites for this course (if any):	None

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	30	50 %
2	Blended		-
3	E-learning		-
4	Correspondence		-
5	Other	30	50 %

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	Lecture	30
2	Laboratory/Studio	42
3	Tutorial	-
4	Practical/Field work/Internship	6
5	Others (specify)	30
	Total	102
Other Learning Hours*		
1	Study	30
2	Assignments	8
3	Library	15
4	Projects/Research Essays/Theses	10
5	Others (specify)	-
	Total	63

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

This course is designed to cover the basic scientific knowledge and its application in biotechnology field. Fundamental molecular biology & practical applications, some historical examples, modern applications of biotechnology will be discussed to provide tools and basic knowledge in order to understand biotechnology. The emerging areas of biotechnology, for example agricultural biotechnology, protein, forensic Biotechnology, bioremediation, aquatic biotechnology, regulatory agencies and issues that impact biotechnology industry will be discussed as well. In addition to that, a provocative and issues in Biotechnology, genetically modified food, genetic testing, embryos for research/human cloning, ethical/legal/social questions & dilemmas will be incorporated.

2. Course Main Objective

❖ **After completing this course student should be able to:**

- Understand the principles of microbial biotechnology.
- List the important roles of microbial biotechnology in our life.
- understand the differences which cut DNA
- understand gene isolation and cloning
- Examine purify and quantify nucleic acids (DNA and RNA).
- Prepare biological samples from different sources (Blood, bacteria, liver, kidney, etc...).
- List the restriction enzymes
- Aware with prokaryotes genome
- Understand how primers design
- Aware with principle of gene cloning process
- Understand role of PCR in biotechnology
- Aware with genetic map, fingerprinting and microarray.
- Describe the concept of forensic
- Familiar with synthetic genes
- Familiar with edible vaccines
- Understand bioethics in biotechnology and microbiology
- List the biotechnological products produced biotechnology.
- Aware with the ethics of biotechnology
- Differentiate between GMO and non-modified.
- Aware with all molecular and biotechnological processing.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	Knowledge:	
1.1	<p>❖ After completing this course student should be able to:</p> <ul style="list-style-type: none"> • Summarize the principles of microbial biotechnology. • List the important roles of microbial biotechnology in our life. • List the restriction enzymes • Aware with prokaryotes genome • Understand how primers design 	

CLOs		Aligned PLOs
	<ul style="list-style-type: none"> • Aware with principle of gene cloning process • Aware with genetic map, fingerprinting and microarray. • Describe the concept of forensic • Familiar with synthetic genes • Familiar with edible vaccines • List the biotechnological products produced biotechnology. • Aware with the ethics of biotechnology • Aware with all molecular and biotechnological processing. 	
2 Skills:		
2.1	<p>Cognitive skills to be developed</p> <ul style="list-style-type: none"> ❖ Having successfully completed the course students should be able to: <ul style="list-style-type: none"> • Understand the principles of microbial biotechnology. • understand the differences which cut DNA • understand gene isolation and cloning • Summarize the role of the restriction enzymes in microbial biotechnology • Understand how primers design • understand principle of gene cloning process • Understand role of PCR in biotechnology • Describe the genetic map, fingerprinting and microarray. • Describe the concept of forensic • Design synthetic genes • Describe edible vaccines • Understand bioethics in biotechnology and microbiology • List the biotechnological products produced biotechnology. • Differentiate between GMO and non-modified. 	
2.2	<p>Psychomotor Skills</p> <ul style="list-style-type: none"> ❖ Upon successful completion of this course, the student is expected to be able to: <ul style="list-style-type: none"> • Perform the laboratory experiments precisely • Operate all devices in molecular microbiology lab • Prepare lab solutions and reagent. • Understanding instructions and operate DNA equipment • Use computers and internet to search for recent information in Biotechnology. • Prepare biological samples from different sources (Blood, bacteria, liver, kidney, etc...). • Prepare lab solutions (e.g. electrophoresis buffers and reagent). 	
3 Competence:		
3.1	<ul style="list-style-type: none"> ❖ Upon successful completion of this course, the student is expected to be able to: <ul style="list-style-type: none"> • Aware with microbial biotechnology and its application in our life. • Developing oral presentations. • Communicating personal ideas and thoughts. 	

CLOs		Aligned PLOs
	<ul style="list-style-type: none"> • Work independently and as part of a team to finish some assignments. • Communicate results of work to others. • Demonstrate professional attitudes and behaviors towards others. • Propose the smart questions • Understand and dissecting the problem so that it is fully solved understood. • Demonstrate the assertiveness for his decision. • Demonstrate his capability for the responsibility and Accountability • Show Effective verbal communication with clarity and must be characterize with the following interpersonal attributes; (verbal communication, Non-verbal communication, good listening for the others, questioning, good manners, problem solving, Social awareness,self-management, responsibility and accountability) • Enhancing the ability of students to use computers and internet. • Interpret the laboratory data. • Know how to write a report. 	

C. Course Content

No	List of Topics	Contact Hours
1	Introduction to the main objectives of the course.	2
2	Restriction Enzymes	2
3	Gene isolation and Gene cloning.	2
4	PCR.	2
5	Molecular Marker	2
	Fingerprinting and forensic	2
6	Microarray	2
	synthetic gene	2
7	Edible vaccine	2
8	Genetically modified organisms	2
9	Production of different economically product using biotechnology such as Insulin	2
10	Microbial Biotechnology.	2
11	Different applications of biotechnology in agriculture.	2
12	Different applications of biotechnology in medicine.	4
13	Future applications and potentially risky outcomes of biotechnology applications in various disciplines.	4
Total		30h

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods.

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	Knowledge		
1.1	<p>❖ After completing this course student should be able to:</p> <ul style="list-style-type: none"> Summarize the principles of microbial biotechnology. List the important roles of microbial biotechnology in our life. List the restriction enzymes Aware with prokaryotes genome Understand how primers design Aware with principle of gene cloning process Aware with genetic map, fingerprinting and microarray. Describe the concept of forensic Familiar with synthetic genes Familiar with edible vaccines List the biotechnological products produced biotechnology. Aware with the ethics of biotechnology Aware with all molecular and biotechnological processing. 	<p>-The methodology includes a combination of lectures by the lecturer, seminar presentation by the students and web-interactions.</p> <p>-At the end of the programme, students will be divided into groups for seminar presentation on important areas of the course to assess their understanding and comprehension of the course.</p> <p>-All students will be involved in on-line learning process and each student is required to create an E-mail address to facilitate student web interactions. Using images and movies</p> <p>-Encouraging students to collect the new information about what the new in Microbial biotechnology.</p> <p>-Availability of the reference books and scientific sites concerning Microbial biotechnology.</p>	<ul style="list-style-type: none"> Periodical exam and reports 10% Mid-term theoretical exam 20% Mid-term practical exam 5% Final practical exam 15% Final exam 50%
2.0	Skills		
2.1	<p>Cognitive skills to be developed</p> <p>❖ Having successfully completed the course students should be able to:</p> <ul style="list-style-type: none"> Understand the principles of microbial biotechnology. understand the differences which cut DNA 	<ul style="list-style-type: none"> Lectures. Brain storming. Discussion. 	<ul style="list-style-type: none"> Exam must contain questions that can measure these skills. Quiz and exams. Discussions after the

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
	<ul style="list-style-type: none"> • understand gene isolation and cloning • Summarize the role of the restriction enzymes in microbial biotechnology • Understand how primers design • understand principle of gene cloning process • Understand role of PCR in biotechnology • Describe the genetic map, fingerprinting and microarray. • Describe the concept of forensic • Design synthetic genes • Describe edible vaccines • Understand bioethics in biotechnology and microbiology • List the biotechnological products produced biotechnology. • Differentiate between GMO and non-modified. 		lecture.
2.2	<ul style="list-style-type: none"> ❖ Upon successful completion of this course, the student is expected to be able to: <ul style="list-style-type: none"> • Perform the laboratory experiments precisely • Operate all devices in molecular microbiology lab • Prepare lab solutions and reagent. • Understanding instructions and operate DNA equipment • Use computers and internet to search for recent information in • Biotechnology. • Prepare biological samples from different sources (Blood, bacteria, liver, kidney, etc...). Prepare lab solutions (e.g. electrophoresis buffers and reagent). 	- Follow up students the students in lab and during carryout all the laboratory experiments	-Giving additional marks for the students they have accurate laboratory results and good seminar presentation -Practical exam.
3.0	Competence		
	<ul style="list-style-type: none"> ❖ Upon successful completion of this course, the student is expected to be able to: <ul style="list-style-type: none"> • Aware with microbial biotechnology and its application in our life. 	<ul style="list-style-type: none"> - Lab work - Case Study - Active learning - Small group discussion - Homework (preparing a report on some topics) 	<ul style="list-style-type: none"> - Oral exams. - Evaluate the efforts of each student in preparing the report. - Evaluate the scientific values of

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
	<ul style="list-style-type: none"> Developing oral presentations. Communicating personal ideas and thoughts. Work independently and as part of a team to finish some assignments. Communicate results of work to others. Demonstrate professional attitudes and behaviors towards others. Propose the smart questions Understand and dissecting the problem so that it is fully solved understood. Demonstrate the assertiveness for his decision. Demonstrate his capability for the responsibility and Accountability Show Effective verbal communication with clarity and must be characterize with the following interpersonal attributes; (verbal communication, Non-verbal communication, good listening for the others, questioning, good manners, problem solving, Social awareness, self-management, responsibility and accountability) Enhancing the ability of students to use computers and internet. Interpret the laboratory data. Know how to write a report. 	<p>related to the course depending on web sites).</p> <ul style="list-style-type: none"> Seminars presentation Practical during carryout the experiments in the lab. 	<p>reports.</p> <ul style="list-style-type: none"> Evaluate the work in team Evaluation of the role of each student in lab group assignment Evaluation of students presentations

2. Assessment Tasks for Students

5. Schedule of Assessment Tasks for Students During the Semester

Assessment	Assessment task (eg. essay, test, group project, examination etc.)	Week due	Exam duration	Proportion of Final Assessment
1	Periodical Exam (s)	4	15 min	10 %
2	Mid Term Exam (Theoretic)	8	60 min	20 %
3	Mid Term Exam (practical)	9	30 min	10 %
4	Reports and essay	11	--	5 %
5	Final Practical Exam	15	60 min	15 %
6	Final Exam	16	120 min	40 %
			Total Marks	100%

*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student

consultations and academic advice :

Office hours: 10hrs.

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	W J. Thieman and M.A. Palladino, Introduction to Biotechnology, 3rd edition. 2013. Pearson. ISBN-13: 978-0321766113. Seidman & Moore, Basic Laboratory Methods for Biotechnology: Textbook & Laboratory Reference, 2 nd edition. 2009. Prentice Hall. ISBN: 0321570146.
Essential References Materials	
Electronic Materials	https://www.coursera.org/ https://www.edx.org
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	<ul style="list-style-type: none">• Prepared lecture hall with audio –visual aids.• Equipped laboratory with DNA facilities.
Technology Resources (AV, data show, Smart Board, software, etc.)	<ul style="list-style-type: none">• Digital lab containing 15 computers.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	<ul style="list-style-type: none">• Incubators, autoclaves, measuring equipment, water bath, digital balances, pH meters, safety facilities, PCR, centrifuge, All PCR kits, RNA, DNA extraction kits.• All culture media, chemical, reagents needed.• Electrophoresis units for DNA and Protein• Biofuge, Vortex.

G. Course Quality Evaluation

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching <ul style="list-style-type: none">• Questionaries• Open discussion in the class room at the end of the lectures.
2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department <ul style="list-style-type: none">• Revision of student answer paper by another staff member.• Analysis the grades of students.
3. Processes for Improvement of Teaching <ul style="list-style-type: none">• Preparing the course as PPT.• Using scientific movies.

<ul style="list-style-type: none"> • Coupling the theoretical part with laboratory part • Periodical revision of course content.
4. Processes for Verifying Standards of Student Achievement (eg. check marking by an independent faculty member of a sample of student work, periodic exchange and remarking of a sample of assignments with a faculty member in another institution) <ul style="list-style-type: none"> • After the agreement of Department and Faculty administrations
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. <ul style="list-style-type: none"> • Periodical revision by Quality Assurance Units in the Department and institution

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Prepared by faculty staff: Prof. Dr. Gamal Haridy	Signature:
Date Report Completed: November 2019	
Revised by: 1. Prof. Dr. Khaled Elbanna 2. Dr. Hussein H. Abulreesh 3. Prof. Dr. Shady Elshahawy	Signature:
Date: November 2019	
Program Chair Dr. Hussein H. Abulreesh	Signature:
Dean	Signature:
Date:	