



# Course Specifications

<b>Course Title:</b>	<b>Biotechnology</b>
<b>Course Code:</b>	<b>40142111-3</b>
<b>Program:</b>	<b>BSc Biology</b>
<b>Department:</b>	<b>Biology</b>
<b>College:</b>	<b>Faculty of Applied Science</b>
<b>Institution:</b>	<b>Umm Al-Qura University</b>

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## A. Course Identification

<b>1. Credit hours:</b>	3 hours
<b>2. Course type</b>	
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"/>
<b>3. Level/year at which this course is offered:</b>	4 <sup>th</sup> year/ Level 7
<b>4. Pre-requisites for this course (if any):</b>	<b>Molecular Biology (4013182-3)</b>
<b>5. Co-requisites for this course (if any):</b>	None

### 6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom		70 %
2	Blended		
3	E-learning		10 %
4	Correspondence		10 %
5	Other		10 %

### 7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
<b>Contact Hours</b>		
1	Lecture	30
2	Laboratory/Studio	42
3	Tutorial	6
4	Practical/Field work/Internship	6
5	Others (specify)	
	<b>Total</b>	<b>84</b>
<b>Other Learning Hours*</b>		
1	Study	
2	Assignments	
3	Library	
4	Projects/Research Essays/Theses	
5	Others (specify)	
	<b>Total</b>	

\* 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/legality/social questions & dilemmas will be incorporated.

#### -Upon successful completion of this course, the student should:

- ❖ Knowing the different fields of biotechnology
- ❖ Knowing restriction enzymes and how it works.
- ❖ He should be aware with the different ways of cutting DNA using restriction enzymes.
- ❖ He should be aware with the different methods of gene isolation.
- ❖ He should understand gene cloning.
- ❖ He will be able to run a PCR.
- ❖ Also, he should be know the genetic map, fingerprinting and microarray.
- ❖ He will be able to find and understand forensic
- ❖ He should be familiar with synthetic genes and edible vaccines.
- ❖ He should understand bioethics

### 3. Course Learning Outcomes

CLOs		Aligned PLOs
1	<b>Knowledge:</b>	
1.1	<ul style="list-style-type: none"> <li>❖ will understand the differences which cut DNA</li> <li>❖</li> </ul>	
1.2	<ul style="list-style-type: none"> <li>❖ will understand gene isolation and cloning</li> </ul>	
1.3	<ul style="list-style-type: none"> <li>❖ will Have knowledge about fingerprinting , synthetic genes and GMO</li> </ul>	
1.4	<ul style="list-style-type: none"> <li>❖ will be familiar with the edible vaccines</li> </ul> will be aware with bioethics .	
2	<b>Skills:</b>	
2.1	Examine purify and quantify nucleic acids (DNA and RNA).	
2.2	Prepare biological samples from different sources (Blood, bacteria, liver, kidney, etc...).	
2.3	Prepare lab solutions (e.g. electrophoresis buffers and reagent).	
2.4	Using computers and internet to search for recent information in Biotechnology.	
3	<b>Competence:</b>	

CLOs		Aligned PLOs
3.1	Developing oral presentations.	
3.2	Communicating personal ideas and thoughts.	
3.3	Work independently and as part of a team to finish some assignments.	
3...	Communicate results of work to others.	

### 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
<b>Total</b>		<b>30h</b>

### 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	<b>Knowledge</b>		
1.1	Identifying basic definitions of biotechnology.	In class lecturing (using PowerPoint presentation and illustrations)	Written and oral periodical and final exams.
1.2	Describing different biotechnology fields and its approaches.	Laboratory practice on new techniques involved in DNA technology, DNA profiling and genetic engineering implication	Lab exams and reports.

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
		(Conducting experiments and writing reports).	
...	Outlying diverse genetic engineering concepts and its tools.	Activities and assignments.	Evaluation of lab activities results
<b>2.0</b>	<b>Skills</b>		
2.1	Examine purify and quantify nucleic acids (DNA and RNA).	Application of essential scientific techniques through lectures, classes and essays.	Course work reports.
2.2	Prepare biological samples from different sources (Blood, bacteria, liver, kidney, etc...).	Small group discussion	Evaluation of the topics prepared by students according to the content, arrangement, and covering of the topic.
2.3	Using computers and internet to search for recent information in Biotechnology.	Making connections between different topics across the course.	Evaluation of lab reports on operating equipment
<b>3.0</b>	<b>Competence</b>		
3.1	Developing oral presentations.	Engage student in carrying out internet search.	Oral exams.
3.2	Communicating personal ideas and thoughts.	Close monitoring while performing behavioral examination and experimentation.	Evaluation of student essays assignments and search work.
3.3	Work independently and as part of a team to finish some assignments.	Writing group reports.	Observation of student ethical and moral behavior.

## 2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Periodical Exam(s)	4	10%
2	Mid Term Exam (Theoretic)	8	20%
3	Mid Term Exam (practical)	9	10%
4	Reports and essay	11	5%
5	Final Practical Exam	15	15%
6	Final Exam	16	40%
7			
8	<b>Total</b>		<b>100</b>

\*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 :

- Two hours office per week

## F. Learning Resources and Facilities

### 1. Learning Resources

<b>Required Textbooks</b>	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 <sup>nd</sup> edition. 2009. Prentice Hall. ISBN: 0321570146.
<b>Essential References Materials</b>	
<b>Electronic Materials</b>	<a href="https://www.coursera.org/">https://www.coursera.org/</a> <a href="https://www.edx.org">https://www.edx.org</a>
<b>Other Learning Materials</b>	

### 2. Facilities Required

Item	Resources
<b>Accommodation</b> (Classrooms, laboratories, demonstration rooms/labs, etc.)	Prepared lecture hall with audio –visual aids Equipped laboratory with DNA facilities.
<b>Technology Resources</b> (AV, data show, Smart Board, software, etc.)	Digital lab containing 15 computers.
<b>Other Resources</b> (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Incubators, autoclaves, measuring equipment, water bath, digital balances, pH meters, safety facilities.

## G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Obtaining Student Feedback on Effectiveness of Teaching		Questionnaires

<b>Evaluation Areas/Issues</b>	<b>Evaluators</b>	<b>Evaluation Methods</b>
Obtaining Student Feedback on Effectiveness of Teaching		Peer consultation by departmental specialized committee.
Obtaining Student Feedback on Effectiveness of Teaching		Self-evaluation of the program by the departmental plan committee.

**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

<b>Council / Committee</b>	<b>Prof. Dr. Gamal Haridy Osman</b>
<b>Reference No.</b>	
<b>Date</b>	