

# University of Salahaddin - College of Science

## Biology Department –Biotechnology –

### SYLLABUS

#### Instructor:

**Mukhlis Hamad A'ali**

**Ph.D. Degree in**

**(Biology-Human Molecular Genetics)**

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Lectures: Thursday 10:30 pm to 1:30 pm

**1<sup>st</sup> and 2<sup>nd</sup> Semesters- Academic Year: 2023-2024**

**Office: Biology Department**

**Office hours:** Appointment of timetable Schedule

**Class:** 4<sup>th</sup> Class Medical Biology.

#### **COURSE DESCRIPTION:**

The course will cover **Biotechnology**. Biotechnology is a field of applied biology that involves the use of living organisms or parts of organisms for practical uses and bioprocesses in engineering, technology, medicine and other fields requiring bioproducts. Modern use similar term includes genetic engineering as well as cell- and tissue culture technologies. Biotechnology, as ‘the appliance of bioscience’, is helping to diagnose and treat major human diseases, provide solutions for a cleaner environment and produce new industrial bioproducts and processes.

Over the last 20 years, biotechnological advances have revolutionized biology. It's now possible to manipulate the DNA present in an organism. Recent biotechnological advances have dramatically influenced agriculture, basic research, medicine, and the legal system. It is the integrated use of biochemistry, microbiology and engineering sciences in order to exploit microorganisms, cultured tissues/cells, to their best.

Through this semester discusses some of the methods and applications of biotechnology. We'll look at the techniques biologists use in the lab to manipulate DNA and see how to alter the genetic material present in an organism. There are many practical uses for biotechnology, and we'll touch on some of them. We'll also discuss the practical and ethical questions raised by the ability to alter an organism's genetic make-up.

### **COURSE OBJECTIVES:**

At the end of this course students should be able to demonstrate a clear understanding of the facts and basic concepts of molecular biology and biotechnology which are covered in lecture and laboratory, including;

1. To enable candidates to acquire the knowledge and develop an understanding of how materials are provided by biological agents to provide goods and services.
2. To appreciate the role played by biotechnology in improving health care for human beings.
3. To understand the interdisciplinary nature of this subject.
4. To create awareness about the appreciation of biological processes to industries.

5. To develop the ability to appreciate biological phenomenon in nature and the contribution of biotechnology to human welfare.
6. To develop scientific attitude towards biological phenomenon.

As a student on this exciting course, you will be stimulated by the emphasis on laboratory work and research. On a typical morning you might be analysing DNA on a gel and in the afternoon using a fermenter to produce commercial products. One day might involve learning about how microbes can clean up pollution, and on another day visiting a company that researches new anti-cancer drugs.

Our students gain a wide range of laboratory-based skills and techniques, which both provide the practical basis for their studies and provide a useful portfolio of employability skills. These skills, plus associated research experience gained in the final year Honours project, have enabled our biotechnology graduates to establish an excellent reputation in medical, industrial and research laboratories.

### **Course Rationale:**

Biotechnology laboratory methods and techniques is a rigorous course that develops problem-solving skills necessary for success doing science at the bench while exploring in depth the chemistry of biological molecules. Knowledge in this area is directly applicable to the biotechnology fields of pharmaceuticals, environmental processes and remediation, as well as bioinstrumentation.

## **Forms of Teaching:**

Different forms of teaching will be used to reach the objectives of the course: power point presentations for the head titles and definitions and summary of conclusions, movies, photomicrographs and any other illustrations. There will be discussions and the laboratory notes will give enough background to translate, solve, analyze, and evaluate problems sets, and different issues discussed throughout the course.

To get the best of the course, it is suggested that you attend classes as much as possible, read the required lectures, teacher's notes regularly as all of them are foundations for the course. Lecture's notes are for supporting and not for submitting the reading material including the handouts. Try as much as possible to participate in classroom discussions, preparing the assignments given in the course.

## **Grading:**

The students are required to do one closed book exam at the mid of the semester besides other assignments including translations and one project paper. The exam has 10 marks (mean of two examination), the attendance, classroom activities; translations and project paper count 5 marks. There will be a final exam on 15 marks. So that the final grade will be based upon the following criteria:

Mean of two practical examinations: 10%

Daily quizzes: 3%

Classroom activity: 1%

Report and presentation: 1%

Final practical examination: 15%

Total practical Marks: 30/100

## **Course material**

Required book:

***Basic Laboratory Methods for Biotechnology (2nd Edition)* by Lisa A. Seidman & Cynthia J. Moore**

ISBN-13: 978-0-321-57014-7

Publisher: Pearson Benjamin-Cummings Publishing Company

Spiral bound 751pp

Pub. Date: January 2009

***Introduction to Biotechnology (2nd Edition)*, by William J Thieman & Michael A. Palladino**

ISBN-13: 9780321491459

Publisher: Benjamin Cummings

Paperback, 408pp

Pub. Date: August 2008

***Molecular Biology and Biotechnology: A Guide for Students, (3rd Edition)* by Helen Kreuzer & Adrienne Massey**

Book ISBN or Item Number: 978-1-55581-472-4

Publisher: ASM Press

Paperback, 498 pages, two-color throughout with full-color insert, Illustrations, glossary, index.

Publication Date: Oct 2007

***Biotechnology: Science for the New Millennium*, by Ellen Daugherty**

ISBN-13: 978-0008195397

Publisher: EMC/Paradigm

Spiral bound Pub. Date: 2007

And any other **Biotechnology and Molecular Biology books** published.

The core materials of the course consist of the above book, articles from media and internet, and laboratory lecture notes, make sure you read all the materials and prepare well before going for the examinations.

Students are encouraged to search for any other materials that may help improve their English language ability in reading, writing, listening and speaking biotechnology and molecular biology texts.

This **syllabus** may be subject to changes, *i.e.*, we may take either longer or shorter time to finish a topic, if any changes happened you will be notified well in advance.

I hope you enjoy the course and find its content useful no matter where your future studies take you!

## LECTURE SCHEDULE (Syllabus):

<b>Weeks</b>	<b>Lecture Topic</b>
Week 1	<b>Basic Concept on Biotechnology</b>
Week 2	<b>Electrophoresis Technique Analysis</b>
Week 3	<b>Polymerase Chain Reaction Technique (PCR)</b>
Week 4	<b>REVERSE TRANSCRIPTASE PCR (RT-PCR)</b>
Week 5	<b>REALTIME POLYMERASE CHAIN REACTION</b>
Week 6	<b>First semester- 1st examination</b>
Week 7	<b>Restriction Fragment Length Polymorphism (RFLP)-PCR</b>
Week 8	<b>DNA LIGASE ANALYSIS</b>
Week 9	<b>Polyacrylamide Gel Electrophoresis</b>
Week 10	<b>DNA Sequencing (Gene Sequencing)</b>
Week 11	<b>Next-Generation Sequencing (NGS)</b>
Week 12	<b>Second semester- 2<sup>nd</sup> examination</b>
Week 13	<b>Chromatographical Analysis</b>
Week 14	<b>Southern Blotting Technique</b>
Week 15	<b>Blotting Technique</b>
Week 16	<b>Northern Blotting Technique</b>
Week 17	<b>Western Blotting Technique</b>
Week 19	<b>DNA Microarray Analysis</b>
Week 20	<b>Third semester- 3<sup>rd</sup> examination which is out of 10%</b>

**Good luck and happy studying!**