

**University of Salahaddin - College of Science Biology**  
**Department – Practical Molecular Biology – SYLLABUS**

**2<sup>nd</sup> Semester - Academic Year: 2018/2019**

**Third stage**

**Instructor:**

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M.Sc. Degree in

(Applied Biomolecular Technology)

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**Lectures Timetable:**

| Day/Time | 8:30-11:30 | 11:30-2:30 | 2:30-5:30 |
|----------|------------|------------|-----------|
| Tuesday  | Group A    | Group F    | Group E   |
| Thursday | Group D    | Group C    | Group B   |

## **COURSE DESCRIPTION:**

The course will cover **Practical Molecular Biology**. **Molecular Biology** is that branch of biology that studies the structure and activity of macromolecules essential to life (and especially with their genetic role) and it is helping to diagnose and treat major human diseases (human health), provide solutions for a cleaner environment and produce new pharmaceutical bioproducts and processes either on the molecular level (genetics, gene splicing, or use of recombinant deoxyribonucleic acid [DNA]) or in more visible areas such as cattle breeding. These have been called DNA Marker Technology.

So molecular biology sometimes study this process back word; e.g. if there was a problem in the function of defense cells of immune system we look to the immune cell at a molecular level and see what protein this cell is having problem with, and what and how the amino acids of the protein is changed and what nucleic acid sequence is responsible for the production of this malfunctioned protein (amino acids).

Through this semester discusses some of the methods and applications of **Molecular Biology**. 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 **Molecular Biology**, 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 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 **Molecular biology** graduates to establish an excellent reputation in medical, industrial and research laboratories.

## **Course Rationale:**

**Molecular Biology** 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.

Research efforts bring forth major risk for various types factors of cancer and lead to the knowledge of its causes. The latest advancement in the field of medicine and detection methods is helping the ailing community by improving the probability of survival and the quality of life suffering humanity. Knowledge of preventive measures imparted to the healthy people also help in lowering the incidence of cancer.

## **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:

Practical examinations: 12%

Daily quizzes: 3%

Classroom activity: 1.5%

Attendance: 1%

Final practical examination: 17.5%

## **Lab Citizenship: Safety and Courtesy:**

Strictly following all safety rules is basic to good lab technique.

- ☞ No eating, drinking, smoking or application of cosmetics in the laboratory. Please do not bring any food or drink containers into the lab, or discard such items in trash containers inside the lab.
- ☞ Shoes that cover the feet must be worn at all times (no sandals).
- ☞ Long hair must be tied back.
- ☞ Lab coats should be worn at all times.
- ☞ No pipetting by mouth.
- ☞ Follow carefully instructions for disposal of glass, bacterial cultures, wastes, etc.
- ☞ Wash hands during lab as necessary and thoroughly following lab.

In addition, please note that we may share the room with other biology laboratory sections. As a courtesy, we must diligently clean up

after ourselves at the end of the lab period. Put away your experimental materials and other equipment as directed, and clean up as necessary. Don't leave it to someone else. Take care of your own mess!

Furthermore, please do not disturb ongoing experiments of your classmates or those of other sections that may be in the room.

### **Course Material:**

Required book:

***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

And any other **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 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.

## LECTURE SCHEDULE(Syllabus)

| Weeks   | Lecture Topic   |
|---------|---|
| Week 1  | Basic Concept About Practical Molecular Biology (Preparation of Solutions).               |
| Week 2  | DNA Extraction From Eukaryotic Cells (Human Blood Cells).                                 |
| Week 3  | DNA Extraction From Different Tissues (Bovine Spleen, Liver, Plant and Embedded Paraffin) |
| Week 4  | RNA Extraction From Different Tissues (Bovine Spleen, Liver and Plant).                   |
| Week 5  | DNA Extraction from Bacterial Cells (Bacterial Plasmid Extraction).                       |
| Week 6  | DNA and RNA Concentration and Quantification By UV Spectro-NanoDrop Method.               |
| Week 7  | Detection of DNA and RNA Components.  |
| Week 8  | First semester- 1st Examination this is out of 10%.                                       |
| Week 9  | Melting Point Determination of DNA and RNA Strands.                                       |
| Week 10 | Characterization of DNA (DNA-Dische Diphenylamine Determination)                          |
| Week 11 | Bacterial Transformation  |
| Week 12 | Bacterial Conjugation   |
| Week 13 | Electrophoresis Analysis  |
| Week 13 | Agarose Gel Electrophoresis   |
| Week 14 | Basic Concept Polymerase Chain Reaction (PCR)   |
| Week 15 | Second semester- 2nd Examination which is out of 10%.                                     |
| Week 16 | Extraction and Purification of Native Proteins  |
| Week 17 | Separation and Estimation of Proteins   |
| Week 18 | Separation of Enzymes and their Determination.  |
| Week 19 | Third semester- 2nd Examination which is out of 10%.                                      |

Enjoy your course