TISHK INTERNATIONAL UNIVERSITY
FACULTY OF APPLIED SCIENCE
Department of MEDICAL ANALYSIS,
-2022 Spring
Course Information for MA 408 MOLECULER BIOTECHNOLOGY

Course Name:	MOLECULER BIOTECHNOLOGY

Code	Regular Semester	Theoretical	Practical	Credits	ECTS
MA 408	8	2	4	4	5

Name of Lecturer(s)-Academic Title:	Salah Balaky - Ass.Proff. Salah Balaky - Ass.Proff.
Teaching Assistant:	Muhammed Qadir
Course Language:	-
Course Type:	Main
Office Hours	thursday 12 AM-02 PM
Contact Email:	salah.balaky@tiu.edu.iq salah.balaky@tiu.edu.iq Tel:07507104024 07507104024
Teacher's academic profile:	BSc (Biology) at Salahaddin University M.Sc. in Microbiology at Salahaddin University PhD in Medical Microbiology at Durham University, UK BSc (Biology) at Salahaddin University M.Sc. in Microbiology at Salahaddin University PhD in Medical Microbiology at Durham University, UK
Course Objectives:	COURSE DESCRIPTION: The course will cover Theory and Practical molecular Biotechnology. Molecular biotechnology is the use of laboratory techniques to study and modify nucleic acids and proteins for applications in areas such as human and animal health, agriculture, and the environment. Molecular biotechnology results from the convergence of many areas of research, such as molecular biology, microbiology, biochemistry, immunology, genetics, and cell biology. It is an exciting field fueled by the ability to transfer genetic information between organisms with the goal of understanding important biological processes or creating a useful product. Molecular Biotechnology is an exciting scientific discipline that is based on the ability of researchers to transfer specific units of genetic information from one organism to another. This conveyance of a gene or genes relies on the techniques of genetic engineering (recombinant DNA technology). Human health studies in the field of molecular biology require the use of DNA, RNA, and protein samples. Successful use of available downstream applications will benefit from the use of high-quantity and high-quality DNA. Therefore, nucleic acid extraction is a key step in laboratory procedures required to perform further molecular research applications. The use of molecular diagnostics, such as pre-implantation diagnostics or predictive genetic testing, still has technical problems as well as novel, and to date unclear, social, ethical and legal implications. The scope of molecular diagnostics in molecular medicine could be expanded well beyond current nucleic acid testing. It plays an important role in practice of medicine, public health, pharmaceutical industry, forensics and biological warfare and drug discovery. The molecular diagnostic marketplace offers a growth opportunity given the interest in utilizing molecular tools to precisely target therapeutics. some fundamentals of molecular biology, and recombinant DNA procedures will be presented. Essential molecular biotechnology laboratory techniques, including chemical synthesis of genes, the polymerase chain reaction (PCR), and DNA sequencing, are discussed. Developments in sequencing technologies have led to the sequencing of the entire genomes of many organisms, and this has enabled researchers to begin to understand organisms from their sequences and to identify novel genes with potentially useful functions. In addition to isolation(cloning) of genes, it is important that these genes function properly in a host organism. To this end, strategies for optimizing the expression of a cloned gene in either prokaryotic or eukaryotic cells are reviewed.
Course Description (Course overview):	Analysis of biological compounds is fundamental to the research into and subsequent understanding of Biology. The practice of empirical science requires collection of observable data. Contemporary science utilized a vast array of tolls and instruments designed to maximize the scope and accuracy of data collection for the purpose of research and analysis. This course aims to elucidate the technologies available for research and analysis in the biotechnology division and prepare our students for advanced laboratory practice and biological analysis.

COURSE CONTENT

Week	Hour	Date	Topic
1	2	6-10/2/2022	Introduction to Molecular Biotechnology, basics and concept of molecular techniques.
2	2	13-17/2/2022	Principles of DNA and RNA Extraction
3	2	20-24/2/2022	Mutations and Mutagenesis
4	2	27/2-3/3/2022	Gene expression, Transcription and Translation (Molecular Central Dogma)
5	2	6-10/3/2022	Regulation of gene expression in Bacteria
6	2	27-31/3/2022	Transfer of genetic materials in bacteria
7	2	3-7/4/2022	Polymerase Chain Reaction (PCR).
8	2	10-14/4/2022	Midterm Exam
9	2	17-21/4/2022	Quantitative PCR (qPCR)
10	2	24-28/4/2022	DNA sequencing and Molecular typing and applications
11	2	8-12/5/2022	Plasmids and transposons
12	2	15-19/5/2022	Molecular cloning in microorganisms
13	2	22-26/5/2022	Proteomics and analyses
14	2	29/5-2/6/2022	SDS Page and 2D Gel Electrophoresis
15	2	5-9/6/2022	Final Exam
16	2	12-16/6/2022	Final Exam

COURSE/STUDENT LEARNING OUTCOMES

1	1. To enable students to gain knowledge and understanding of how to use molecular biotechnology to serve a human being.
2	2. To teach students the basic concepts and principles of molecular techniques to extract Nucleic acid (DNA, RNA) from various type of human tissues.
3	3. To enable students to use the methods of molecular biotechnology to diagnose diseases those have the genetic component through (DNA, RNA).
4	4. To enable students to use Nucleic acid amplification techniques (RT PCR) which is used currently to diagnose viral diseases and manage patients with this kind of illnesses.
5	To teach students • Cloning and Genetic engineering and Molecular Typing and Applications

COURSE'S CONTRIBUTION TO PROGRAM OUTCOMES

(Blank : no contribution, I: Introduction, P: Profecient, A: Advanced)

	Program Learning Outcomes	Cont.
1	Evaluate clinical laboratory data by interpreting laboratory results and relating the data to various disease states.	I
2	apply principles of evidence-based medicine to determine clinical diagnoses.	A
3	apply the basic principles of gross and microscopic anatomy, physiology, biochemistry, immunology, microbiology/virology.	
4	formulate and implement acceptable treatment modalities to various disease states.	I
5	use technology effectively in the delivery of instruction, assessment, and professional development.	I
6	exhibit essential employability qualities by demonstrating laboratory safety, analyzing laboratory results, and displaying professional conduct.	
7	exhibit organizational skills, accountability, and ethical behavior.	
8	apply skills needed in operating laboratory equipment for testing, assessing quality assurance for lab equipment, and adhering to standard safety practices in the laboratory environment.	I
9	apply problem-solving and decision-making skills.	I
10	apply and promote health policies and regulatory standards in the field career.	I

11	develop research in the field of medical analysis using qualitative and quantitative methods.	A

Prerequisites (Course Reading List and References):	Molecular Biology Fifth Edition Robert F. Weaver University of Kansas Molecular Biology and Biotechnology: A Guide for Students, (3rd Edit
Student's obligation (Special Requirements):	Students must attend to lectures and follow all laboratory safety instructions and participate in class activities and completion of all tests, exams, assignments and reports. 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.
Course Book/Textbook:	1. Applied Molecular Biotechnology The Next Generation of Genetic Engineering Edited by Muhammad Sarwar Khan iqrar Ahmad Khan debmalya Barh. 2. An Introduction to Molecular Biotechnology Fundamentals, Methods, and Applications, Edited by Michael Wink. 3. Molecular Genetics of Bacteria textbook by Larry Snyder and Wendy Champness. 4. Molecular Biology and Biotechnology 5th Edition.
Other Course Materials/References:	Online Journal Articles (Google scholar)
Teaching Methods (Forms of Teaching):	Lectures, Presentation, Seminar, Project, , ,

COURSE EVALUATION CRITERIA

Method	**Quantity**	**Percentage (%)**
Attendance	1	5
Participation	1	5
Quiz	1	5
Project	1	5
Midterm Exam(s)	1	20
Lab/Practical Exam(s)	1	20
Final Exam	1	40
Total		**100**

Examinations: True-False, Multiple Choices, Short Answers, , ,

Extra Notes:

ECTS (ALLOCATED BASED ON STUDENT) WORKLOAD

Activities	**Quantity**	**Workload Hours for 1 quantity***	**Total Workload**
Theoretical Hours	16	2	32
Practical Hours	16	4	32
Final Exam	1	2	2
Attendance	1	2	2
Participation	1	2	2
Quiz	1	2	2
Project	1		0
Midterm Exam(s)	1		0
Lab/Practical Exam(s)	1		0
Total Workload			**72**
ECTS Credit (Total workload/25)			**2.88**

Peer review

Signature:	Signature:	Signature:
Name:	Name:	Name:

Lecturer Head of Department Dean