Module (Course Syllabus) Catalogue

2023-2024

College/ Institute	Shaqlawa Technical College	
Department	Food Quality Control Technique- (Morning)	
Module Name	Biology and Molecular biology	
Module Code	(BMB105)	
Degree	Technical Diploma [X] Bachler [ ] High Diploma [ ] Master [ ] PhD [ ]	
Semester	1	
Qualification	Technical Diploma Student	
Scientific Title	NA	
ECTS (Credits)	7	
Module type	Prerequisite [ ] Core [√] Assist. [ ]	
Weekly hours	4	
Weekly hours (Theory)	(2)hr Class	(125)Total hrs Workload
Weekly hours (Practical)	(2)hr Class	(125)Total hrs Workload
Number of Weeks	14	
Lecturer (Theory)	Dr. Muayad A. Mahmud	
E-Mail & Mobile NO.	muayad.mahmud@epu.edu.iq 07504773872	
Lecturer (Practical)	Dr. Muayad A. Mahmud	
E-Mail & Mobile NO.	muayad.mahmud@epu.edu.iq	
Websites		

Course Book

Course Description	A course on the use of recombinant DNA techniques. Students will learn technical skills in the context of projects that will allow them to develop their analytical skills, critical thinking skills, and communication skills. These skills and techniques will be the basis for many research fields. The course is complimented by laboratory exercises in which students acquire hands-on experience in studying various aspects of molecular biology applications.
Course objectives	The main objectives of the course include: 1) Identify the basic taxonomy and principles of the scientific method as it pertains to the natural, physical world. 2) Infer relationships, make predictions and solving problems based on an analysis of evidence or scientific information. 3) Apply scientific concepts, quantitative techniques and methods to solving problems and making decisions. 4) Describe the relevance of some aspect of the natural science to their lives and society.
Student's obligation	***Exam policy:** Student Should take 2 exams during the course There will be no make-up exams for absences students without medical report. Other activities such as **Seminars**, **Reports**, Lab activities and **Home works** are compulsory ***Classroom polices:** **1- Attendance:** students are strongly encouraged to attend class on a regular basis, as participation is important to your understanding of the material. This is your opportunity to ask questions. **You are responsible for obtaining any information you miss due to absence** 2- **Lateness:** Lateness to class is disruptive

<table>
<tr><td></td><td>3- Electronic devices: All cell phones are to be turned off at the beginning of class.
4-Talking: During class please refrain from side conversations. These can be disruptive to students and professors.</td></tr>
<tr><td>Required Learning Materials</td><td>Face-to-Face (Lectures and PowerPoint presentation), white-board and online meeting using Zoom us app.
Practical lessons by working in the Lab and performing experiments. Lecture handouts will be available on Moodle plat form and online access will always be possible until final exam time.</td></tr>
<tr><td>Evaluation</td><td>
<table>
<tr><th colspan="2">Task</th><th>Weight (Marks)</th><th>Due Week</th><th>Relevant Learning Outcome</th></tr>
<tr><td colspan="2">Paper Review</td><td></td><td></td><td></td></tr>
<tr><td rowspan="6">Assignments</td><td>Homework</td><td>10%</td><td></td><td></td></tr>
<tr><td>Class Activity</td><td>2%</td><td></td><td></td></tr>
<tr><td>Report</td><td rowspan="4">14%</td><td></td><td></td></tr>
<tr><td>Seminar</td><td></td><td></td></tr>
<tr><td>Essay</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td></td></tr>
<tr><td colspan="2">Quiz</td><td>4%</td><td></td><td></td></tr>
<tr><td colspan="2">Lab. Report and activity</td><td>14%</td><td></td><td></td></tr>
<tr><td colspan="2">Midterm Exam</td><td>16% (T:6, P:10)</td><td></td><td></td></tr>
<tr><td colspan="2">Final Exam</td><td>40% (T:15, P:25)</td><td></td><td></td></tr>
<tr><td colspan="2">Total</td><td>100</td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>Specific learning outcome:</td><td>Upon completion of the course, students should be able to:
Maintain proper lab note keeping aligned to industry standards.
• Execute basic molecular biology techniques used in cloning (for example: pipetting, PCR, transformation, culturing, screening clones, run agarose gel).
• Design, evaluate, and use PCR primers.
• Interpret, evaluate, and explain the theory behind the experimental techniques, and apply this knowledge to troubleshooting efforts.
• Interpret, evaluate, and explain data generated through both experimentation and bioinformatics searchers.
• Compare and use basic Bioinformatics tools to analyze nucleotide and protein sequence for structural and functional domains.</td></tr>
</table>

	• Value scientific integrity (scientist mindset). • Create and present research in the context of the broader field. • Present work in both journal style article and an oral presentation.
Course References:	Alberts, B., Johnson, A., Lewis, J., et al. (2002) Molecular Biology of the Cell. 4th Edition. Garland Science, New York. - References - Scientific Research Publishing. Peter Paolella (1998) Introduction to Molecular Biology. McGraw-Hill International Editions, McGraw-Hill Higher Education Publishing . Cooper, G.M. and Hausman, R.E. (2009). The Cell: A Molecular Approach. 5th Edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.

Course topics (Theory)	Week	Learning Outcome
Topics , Intro (Big Picture)	1	Over all ideas, Intro (Big Picture)
DNA replication	2	Unit of replication and enzymes, replication origin and replication fork, fidelity and processivity of replication, extrachromosomal replicons (plasmid).
Recombination	3	Homologous (General and Site specific) and Non Homologous recombination in prokaryotes and eukaryotes. Mechanisms and proteins involved
Transcription	4	Classes of RNA molecules - structure and function, Transcription factors and machinery - Enzymatic Synthesis of RNA, Basic features of RNA synthesis, E. coli RNA polymerase, transcription activators and repressors, transcription in prokaryotes-initiation, elongation and termination
Transcription	5	Transcription in Eukaryotes - formation of initiation complex, capping, elongation & Termination. Eukaryotic rRNA genes, formation of eukaryotic tRNA molecules, RNA Polymerases of eukaryotes, RNA polymerase II Promoters, Eukaryotic, Promoters for RNA polymerase III, hypersensitive sites, Upstream activation sites and enhancers

RNA Processing	6	Capping and polyadenylation, Splicing mechanisms - major and minor, Alternative splicing pathways, Self splicing introns, Splicing of tRNA precursors, rRNA precursors, small RNAs, Micro RNAs, RNA editing, RNA transport, exon shuffling.
Translation	7	Outline of Translation, The Genetic Code, The Decoding System, Codon, Anticodon interaction, the special properties of the prokaryotic Initiator tRNAfMet, Transfer
Translation	8	RNA genes, Protein Synthesis in prokaryotes and eukaryotes - formation of initiation complex, initiation factors and their regulation, elongation and elongation factors, termination, aminoacylation of tRNA, tRNA-identity, aminoacyltRNA synthetase, translational proofreading, suppressors, Inhibitors and Modifiers of protein synthesis.
Ribosomes	9	The special properties of the prokaryotic and eukaryotic ribosomes, ribosome biogenesis and its regulation.
Regulation of Gene expression in Prokaryotes	10	General aspects of Regulation, transcriptional regulation - inducible and repressible system, positive regulation and negative regulation; Operon concept – Lactose, Tryptophan, Arabinose and galactose operon, relative positions of Promoters and Operators, Regulons,
Regulation of Gene expression in Prokaryotes	11	Master switches, Regulation of Translation, Regulation of the synthesis of Ribosomes, Unregulated changes in gene expression, Feedback Inhibition. RNA interference, mRNA half-life, riboswitches, ribozymes
Gene expression in Eukaryotes	12	Gene alteration (Gene loss, Gene amplification, Gene rearrangement: the joining of coding sequences in the immune system), Regulation mediated through Transcription factors, Regulation of enhancer activity, role of chromatin changes in regulating gene expression, role

		of nucleosome remodeling and posttranslational modifications in transcription initiation, methylation and epigenetics, RNA processing, RNA splicing, RNA degradation and RNA interference in regulation of gene expression, Regulation of gene expression in plant cells by light.
Gene expression in Eukaryotes	13	Regulatory strategies in Eukaryotes, Transcriptional Control by hormones and signaling factors, Translational control, Diseases associated with defects in regulation
Practical Topics	**Week**	**Learning Outcome**
Lab no. Topics , Intro (Big Picture)	1	Over all ideas, Intro (Big Picture)
Lab Safety, pipetting, solutions, and restriction analysis	2	Lab Safety, pipetting, solutions, and restriction analysis
DNA Extraction	3	
DNA Extraction	4	
Restriction Analysis	5	Restriction Analysis
PCR primer design	6	PCR primer design
Restriction analysis and gel electrophoresis	7	Restriction analysis and gel electrophoresis
Bioinformatics	8	Bioinformatics
PCR primer design	9	PCR primer design due
PCR reactions and pGFP-S12 digests	10	4 PCR reactions and pGFP-S12 digests
Clean and digest PCR product	11	Clean and digest PCR product
Lab notebook check	12	Lab notebook check

Scientific Trip	13	Visit of students to diagnostic laboratories in the public and private Medical Centers.

Question Sample:

Q/ Multiple choice question.

1. Which of the following is not considered a microorganism?
a. algae
b. bacterium
c. protozoan
d. flea

2. Microbial resistance to drugs is acquired through
a. conjugation.
b. transformation.
c. transduction.
d. all of these.

3. Which of these microorganisms is associated with Guillain-Barré syndrome?
a. *E. coli*
b. *Salmonella*
c. *Campylobacter*
d. *Shigella*

Q/ Explain questions

1. Differentiate between contamination, infection, and disease. What are the possible outcomes in each?
2. How are infectious diseases different from other diseases?

Q/ True or False type questions

1-The main components of cell wall of Gram positive bacteria include Peptidoglycan and Teichoic acid only
2-Mesosomes are Convoluted invagination of cytoplasmic membrane often at sites of septum formation
3-Generally, well defined nucleus and nuclear membrane, discrete chromosome and mitotic apparatus are present in bacteria

Extra notes:

External Evaluator