



جامعة ديالى
كلية العلوم
قسم التقنيات الاحيائية

Level Three
(UGIII)
Semester Five

	Ministry of Higher Education and Scientific Research - Iraq University of Baghdad College of Science Department of Biotechnology	
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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية			
Module Title	Molecular Biology	Module Delivery	
Module Type	Core	<input checked="" type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar	
Module Code	BIOT35019		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	UGIII	Semester of Delivery	5
Administering Department	Type Dept. Code	College	Type College Code
Module Leader	Nuha Joseph Najeeb Kandala	e-mail	Nuha.najeeb@sc.uobaghdad.edu.iq
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Dalal Salah	e-mail	dr.tbdalal@gmail.com

Scientific Committee Approval Date	6/8/2025	Version Number	1.0
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Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	Semester	1
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	<ol style="list-style-type: none"> 1. To study the molecular basis of biological activity. 2. Deals with the basic concept of molecular biology 3. Deals with the examination of plants, animals, as well as human genetics in order to find the variation as well as relationships between them. 4. The field of molecular <u>biology</u> is focused especially on <u>nucleic acids</u> (e.g., <u>DNA</u> and <u>RNA</u>) and <u>proteins—macromolecules</u> that are essential for life processes. 5. Studying the behavior of cells in various conditions and their functional structure. 6. Studying the chemical structures and processes of biological phenomena that involve the basic units of life, <u>molecules</u>. 7. Given the fundamental importance of these macromolecular mechanisms throughout the history of molecular biology. 8. To develop knowledge skills and understanding of Molecular Biology theory through some application techniques 9. The field overlaps with other areas of <u>biology</u> and <u>chemistry</u>, particularly <u>genetics</u> and <u>biochemistry</u>
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> 1. To understanding the interactions between the various systems of a cell, including the interactions between DNA, RNA and protein biosynthesis, the transcription factors as well as learning how these interactions are regulated. 2. Understanding the complex molecular networks of a single molecule to inspect the activities of a cell during life processes. 3. To understand macromolecules and the macromolecular mechanisms found in living things, such as the molecular nature of the gene and its

mechanisms of gene replication, mutation, expression .

4. Identify the relationship between prokaryotic and eukaryotic cells depending on a molecular level.
5. Particular, molecular biology seeks to understand the three-dimensional structure of biological macromolecules through several techniques
6. Learning how these molecules (nucleic acid and proteins)interact and behave within the cells to promote proper growth, division, and development .
7. Learning the ability to extract and purify DNA and RNA from animal, Plant, and bacterial cells, measure DNA purity and concentration and conduct genetic tests.
8. Become familiar with gel electrophoresis (method for DNA separation and analysis).
9. They conduct experiments involving the molecular genetics of cells to research and prepare a report of their findings.
10. List the various terms associated with molecular biology.
11. Analyzing genetically the functioning and mechanism of cells.
12. Identify the basic of molecular biology and their applications.

<p>Indicative Contents</p> <p>المحتويات الإرشادية يتضمن الكلمات المفتاحية المهمة للمحاضرات</p>	<p>The indicative content of Molecular biology includes the following.</p> <p>Lec1: A-Introduction of molecular biology B-Definition of Molecular biology C-Identified DNA as the primary agent of genetic material D-key experiments which identified DNA as the primary genetic material E-The two major piece of evidence supporting DNA as the genetics material [15 hrs]</p> <p>Lec 2: A-The chemical composition of nucleic acid B-The structure of DNA and RNA. C-What is the structure of DNA? How is the structure related function? D-Chargaff's Law : the experiment , examples of Chargaff's Law applications . E-The history of DNA structure.</p> <p>Lec 3: A-The Watson and Crick model. B-Watson and Crick Physical characteristics of the model C-Base Pairs and Stacking D-Alternative DNA Structures E-Compare between prokaryotic and eukaryotic cells F-DNA and RNA Molecules in different types of cells</p> <p>Lec 4: A-Different types of nucleic acid B Supercoiling is Necessary for Packaging of Bacterial DNA C-The Eukaryotic Nucleosome. D-Some examples of genome in different organisms.</p> <p>Lec 5: A-Melting Separates DNA Strands ; Cooling Anneals Them B- Hybridization of DNA and RNA C- Fluorescence in Situ Hybridization (FISH) D- Types of DNA sequencing .</p> <p>Lec 6: A-DNA Replication Introduction to Prokaryotic replication B-Mechanism of DNA replication C-Stages of replication process(initiation ,elongation and termination)</p>
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D-Types of enzymes in stages of replication

Lec 7: Eukaryotic Chromosomes

B-Synthesis of Eukaryotic DNA

C-Types of enzymes in stages of replication

D- Stages of replication process

E-Cell Division in Higher Organisms.

Lec 8: A-Overview of Recombination

B-Types of Recombination

C- Recombination in Higher Organisms

D-Types of repair system

Lec 9: introduction to gene expression

A-Types of RNA

B-The structure of RNAs

C- Structure and function of Ribosomal RNA:

D- Structure and function of Transfer RNA:

Lec 10: A-Transcription process in prokaryotic and eukaryotic cells

B-Stages of transcription

C-Enzymes in transcription stages

Lec 11: The modification and splicing of pre –mature RNA in eukaryotic cells:

A-The Structure of Messenger RNA

B-Modification methods:

1-Add cap in 5UTR

2-Add poly A in 3UTR

C- The process of splicing

D- The Comparison between prokaryotic and eukaryotic cells in transcription

Lec 12:A- Regulation at the Level of Transcription Involves Several Steps .

	<p>B-Types of genes .</p> <p>B- The Operon Model of Gene Regulation</p> <p>C-Examples of operons</p> <p>Lec 13: A-Genetic code</p> <p>B-Characterization of Genetic code</p> <p>C- wobble hypothesis</p> <p>Lec 14: A-Types of proteins</p> <p>B- The types of amino acids</p> <p>C-Classification of amino acids according to function and structure</p> <p>Lec 15: A-Translation process in prokaryotic and eukaryotic cells</p> <p>B-Stages of translation .</p> <p>C-Enzymes in translation stages</p> <p>D-compare between prokaryotes and eukaryotic cells.</p>
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<p>Learning and Teaching Strategies</p> <p>استراتيجيات التعلم والتعليم</p>	
<p>Strategies</p>	<p>The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, scientific visits, and by considering types of simple experiments involving interesting sampling activities for the students.</p>

Student Workload (SWL)			
الحمل الدراسي للطلاب محسوب لـ ١٥ اسبوعاً تملئ من قبل المقررية			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل	64	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعياً	4.26
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل	61	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعياً	4.06
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	125		

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1, 2, 3, and 10
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8,9 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered

Week 1	History of molecular biology
Week 2	Genes, Genomes and DNA The chemical composition of nucleic acid
Week 3	The Watson and Crick model of DNA
Week 4	The structure of DNA in the Cell (prokaryotes and eukaryotes cells)
Week 5	Reversible denaturing of DNA (denaturation and hybridization) Types of DNA sequences in the cell
Week 6	Cell Division and DNA Replication (Replication in Prokaryotic cells)
Week 7	DNA Replication in Eukaryotic cells
Week 8	Recombination and Repair
Week 9	Mid-term Exam + Introduction to Gene Expression
Week 10	Transcription of Genes (Transcription in eukaryotes and Prokaryotes cells)
Week 11	The modification and splicing of pre-mature mRNA in eukaryotic cells (The Structure of Messenger RNA)
Week 12	Regulation of gene expression.
Week 13	Genetic Code (Characteristics of the Genetic Code)
Week 14	Protein Structure and Function
Week 15	The Translation process (Protein Synthesis)
Week 16	The preparatory week before the Final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Laboratory tools and apparatus

	(Get introduced to the essential tools and apparatus)
Week 2	Lab 2: preparation of laboratory solutions (concentration and Dilutions) (Get introduced to the different important chemicals and their preparation)
Week 3	Lab 3: Molarity calculation Relating to DNA and RNA (Knowing how to calculate the molarity o nucleic acid)
Week 4	Lab 4: Laboratory solutions for nucleic acid extraction and maintaining (Get introduced to the main solutions used to keep nucleic acid in an intact state)
Week 5	Lab 5: DNA extraction from human blood (Solution and bacterial preparation for extraction and learn how to do the isolation.)
Week 6	Lab 6: DNA extraction from Bacteria (Solution and blood sample preparation for extraction and following the experiment steps and learn how to perform the isolation)
Week 7	Lab 7: DNA extraction from plant (Solution and plant sample preparation and following the experiment steps and learn how to perform the isolation)
Week 8	Lab 8: RNA isolation (Get introduce to extraction solutions and steps)
Week 9	Lab 9 : Determining DNA concentration and purity (Learn how to measure and to determine the purity and concentration of extracted nucleic acid)
Week 10	Lab 10: AgaroseGel Electrophoresis of DNA (Get introduced to the main concept of this technique and learn how to perform it)

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Molecular Biology. David Clark.(2005) (printed in Elsevier Academic Press).	Yes
Recommended Texts	Genetics / Benjamin, A .pierce . (2002). MOLECULAR BIOLOGY, Anjali Priyadarshini and Prerna Pandey,(2018).	No
Websites	https://www.infobooks.org/free-pdf-books/biology/molecular-biology https://youtu.be/3jslVQDGkLU, https://youtu.be/8wAwLwJAGHs	

Grading Scheme				
مخطط الدرجات				
Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
<p>Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.</p>				



Ministry of Higher Education and
Scientific Research - Iraq
University of Baghdad
College of Science
Department of Biotechnology



MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Plant Biotechnology		Module Delivery
Module Type	Core		<input checked="" type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar
Module Code	BIOT35020		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	1 UGIII	Semester of Delivery	
Administering Department	Type Dept. Code	College	Type College Code
Module Leader	Dr. Majid Rasheed Majeed	e-mail	Majid.Majeed@sc.uobaghdad.edu.iq
Module Leader's Acad. Title	Assist .Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Dr.Alaa Abdulhussein Jabr Dr. Haifa Nori Mater	e-mail	Haifa.mater@sc.uobaghdad.edu.iq
Peer Reviewer Name	Dr.Alaa Abdulhussein Jabr	e-mail	Majid.Majeed@sc.uobaghdad.edu.iq
Scientific Committee Approval Date	6/8/2025	Version Number	1.0

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

Prerequisite module	Semester
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Co-requisites module		Semester	
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Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادي	
Module Aims أهداف المادة الدراسية	10. This course deals with the study of plant biotechnology . 11. To understand the role of plants in medical and industrial purposes. 12. Role of plant extraction in molecular biology ,genetics and environmental.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	13. To understand plant biotechnology, Some important terms in medical and industrial purposes. 14. To know the types of plant secondary compounds. 3. Advance plant breeding and plant improvement by learning critical skills in molecular biology, genetics, environmental 4. Plant biotechnology is a part of our daily lives in applications such as developing nutritionally enhanced foods, enabling sustainable agricultural production, and engineering plants for industrial and medical purposes. 5. The Plant Biotechnology major provides an inter disciplinary curriculum integrating the science and practice of crop production through courses in molecular biology, genetics, biochemistry, plant protection, 6. Understand the Role of plant biotechnology to develop sustainable environmental practices that reduce pollution and waste. 7. Understand the Role of plant biotechnology to develop antibiotic and pesticides
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the collection of different of plants. Isolation and primitive identification according to the acquired skills from the theoretical and practical information through lectures and Lab.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا تملئ من قبل المقررية			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4.26
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	61	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.06
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1, 3, 5, 8 and 12
	Assignments	2	10% (10)	2, 12	LO # 2, 4, 6 and 9
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 3, 5, 6 and 9
Summative assessment	Midterm Exam	2 hr.	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	History and scope of plant biotechnology. Introduction, definitions, cell theory, concept of in vitro cell culture
Week 2	Scope and importance of biotechnology ,pharmaceutical sciences ,industrial biotechnology ,environment ,agriculture ,educational scope
Week 3	Classical and Neoclassical Techniques for secondary metabolite production in plant cell culture, introduction

Week 4	Conventional methods ,plant cell culture, Organic cultures for secondary metabolite production
Week 5	Conventional methods, strain improvement ,media optimization,suger level ,Nitrate level , phosphate levels ,growth regulators
Week 6	Culture conditions,Tempertatur,IIIumination,Medium PH
Week 7	Mid-term Exam.
Week 8	Secondary metabolites of plant , classification: (Terpenoids), definitions, General function, types, structure
Week 9	Nitrogen containing compound (Alkaloids), definitions, General function, types, structure
Week 10	Secondary metabolites of plant , classification: (Phenolics), definitions, General function, types, structure
Week 11	Secondary metabolites of plant , classification: (Tannins), definitions, General function, types, structure
Week 12	Secondary metabolites of plant (Glycosides) , definitions, General function, types, structure
Week 13	Extraction of glycosides from plants.
Week 14	Production of secondary metabolites in culture.
Week 15	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر


	Material Covered
Week 1	Significance of medicinal plants to human being
Week 2	Extraction techniques of medicinal plants
Week 3	Plant Secondary Metabolites (Terpenoids)
Week 4	Some of Plant Secondary Metabolites (Essential Oils)
Week 5	Plant Secondary Metabolites (Alkaloids)
Week 6	Plant Secondary Metabolites (Drug application of Alkaloids)
Week 7	Plant Secondary Metabolites Phenolic compounds(phenols)
Week 8	Plant Secondary Metabolites (Tannins)
Week 9	Mid-term Exam.

Week 10	Plant Secondary Metabolites (Flavonoids)
Week 11	Some of Plant Secondary Metabolites (Glycoside)
Week 12	Separation and isolation techniques.
Week 13	Final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Plant biotechnology , K.G. Ramawat 2008 PLANT BIOTECHNOLOGY AND TRANSBENIC PLANTS By: KIRSI-MARJA OKSMAH-CALDENTEY and WOLFGANG H. BARZ/ 2002	Yes
Recommended Texts	Plant Biotechnology: Recent Advancements and Developments By:Suresh Kumar Gahlawat • Raj Kumar and Salar Priyanka Siwach/ 2007	Yes
Websites	PRINCIPLES OF PLANT BIOTECHNOLOGY ICAR eCourse / 2015	

Grading Scheme مخطط الدرجات				
Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
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	Ministry of Higher Education and Scientific Research - Iraq University of Baghdad College of Science Department of Biotechnology	
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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية			
Module Title	Gene-Chemo biotechnology		Module Delivery
Module Type	Core		<input checked="" type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar
Module Code	BIOT35021		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	UGIII	Semester of Delivery	
Administering Department	Biotechnology	College	Science
Module Leader	Dr. Asmaa Mohammed Saud/ Dr. Rana Kadhim Mohammed	e-mail	E-mail asmaa.saud@sc.uobaghdad.edu.iq phd.rana.kadhim@gmail.com
Module Leader's Acad. Title	Professor/ Professor	Module Leader's Qualification	Ph.D./ Ph.D.
Module Tutor	Dr.Ali Qasim	e-mail	aliqasim.biotech@gmail.com
Peer Reviewer Name	Asmaa Mohammed Rana Kadhim	e-mail	E-mail asmaa.saud@sc.uobaghdad.edu.iq phd.rana.kadhim@gmail.com
Scientific Committee Approval Date	6/8/2025	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	<ul style="list-style-type: none"> • This course includes covering the concepts of biochemical and genetic techniques. It aims to deal with microorganisms, plant and animal cells in the medical and industrial fields, and their components of vital compounds, by applying all modern technologies. • In the investigation of DNA and methods of extraction and purification and detection of damage resulting in addition to the control of gene expression. • In the investigation of proteins and methods of extraction, as well as methods of purification and determination of molecular weight.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> 1. Extraction, precipitation of Protein. 2. Protein purification. 3. Calculations and Preparing a Purification Table. 4. Column chromatography. 5. Estimation of molecular weight by gel filtration. 6. Structure and Function of DNA. Control the cloned gene expression under transcription and translation. 7. The Nucleic acid purification. 8. Understand the quantification method for detect the DNA damage (by: Comet assay technique). 9. Technique for Quantitative detection of specific DNA sequences. 10. Understand the process of transformation techniques.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A –

- **Introduction of Protein purification:** define of Protein purification, method of Extraction protein [5. hrs]
- **Precipitation and differential solubilization:** Ammonium sulfate precipitation by $(\text{NH}_4)_2\text{SO}_4$, salting out, salting in, Dialysis, method of Removing the ammonium sulphate , Ultracentrifugation, Purification table
- **Column chromatography:** define; Common types of chromatographic stationary phases, Ion exchange resins contain charged groups. [11 hrs]
- **Gel filtration chromatography:** Types of gels used ; Dextran:, Polyacrylamide, Agarose, Advantages of Gel filtration, Applications of gel filtration[8. hrs]
- **Estimation of molecular weight by gel filtration:** Elution volume (V_e) Relative elution volume (V_e/V_0), Void volume, V_0 . [6 hrs]
- **Application of Estimation of molecular weight of unknown protein**[12. hrs]
- **Application of precipitation table**[5 hrs]

Part B - Gene-chemobiotechnology of Protein techniques.

..... Gene-chemobiotechnology of DNA techniques.

-Structure & Function of DNA – Nucleoside, Nucleotide, Reversible Denaturing of DNA, Melting temperature (T_m) [5 hrs]

-Gene Technology – Optimization of cloned genes expression, Promoters, *lac* Promoters, *Trp* Promoters, (σ) factor, expression vectors, Shine-Dalgarno(S-D) sequence, Coding usage, Short tandem repeats (STRs), simple sequence repeats (SSRs), *E. coli*. [11 hrs]

-The Nucleic acid purification – DNA purification, EtBr-CsCl gradient, Solid-phase, Nucleic Acid Extraction , cell lysis, oligo(dT), affinity chromatography, Isolate mRNA. [8 hrs]

-Comet assay technique – single-cell gel electrophoresis, (SCGE), fluorescent dye, epifluorescence microscopy, genotoxicity testing , mechanistic studies of DNA damage and repair. [6 hrs]

-Nucleic Acids Detection Techniques- genetically modified organisms, (GMO), Quantitative detection of specific DNA sequences, Southern blotting, Northern blotting, Identify inherited disease, electrophoretic, nitrocellulose

	<p>paper support, radioactive probe, formaldehyde, Capillary blotting, hybridization . [12 hrs]</p> <p>-Polymerase chain reaction& Microarray technique – Denaturation, Primer Annealing, Extension, Taq polymerase, DNA amplification, Polymorphisms, parallel gene expression analysis, Manufacturing of microarrays, cDNA, DNA GeneChip, Affymetrix, Allele. [12 hrs]</p> <p>-DNA Exchanged – transformation, naturally transformable bacteria, competent cells, heat shock, Electroporation. [5 hrs]</p>
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	<p>Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.</p>

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Module Evaluation					
تقييم المادة الدراسية					
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Summative assessment	Midterm Exam	2 hr	10% (10)	15	LO # 1-14
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Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	-Introduction of Protein purification
Week 2	-Precipitation and differential solubilization
Week 3	- Introduction of Column chromatography
Week 4	- Ion exchange chromatography
Week 5	- Gel filtration chromatography
Week 6	- Estimation of molecular weight by gel filtration:

Week 7	- Application of Estimation of molecular weight of unknown protein
Week 8	DNA Exchanged
Week 9	Structure & Function of DNA
Week 10	Gene Technology
Week 11	The Nucleic acid purification
Week 12	Comet assay technique
Week 13	Nucleic Acids Detection Techniques
Week 14	Polymerase chain reaction& Microarray technique
Week 15	The Midterm Exam
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Extraction methods of protein
Week 2	Lab 2: Precipitation of Protein
Week 3	Lab 3: Ion Exchange Chromatography
Week 4	Lab 4: Gel filtration Chromatography
Week 5	Lab 5: DNA Structure
Week 6	Lab 6: DNA and Protein sequence online databases
Week 7	Lab 7: Plasmid DNA Isolation
Week 8	Lab 8: Polymerase Chain Reaction
Week 9	Lab 9: Application of primer design

Week 10	Lab 10: Application NCBI
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Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Wilson and walkers principles and techniques of biochemistry and molecular biology,8th,2018	Yes
Recommended Texts		No
Websites		

Grading Scheme مخطط الدرجات				
Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 - 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

	Ministry of Higher Education and Scientific Research - Iraq University of Baghdad College of Science Department of Biotechnology	
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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Pathogenic Bacteria		Module Delivery
Module Type	Core		<input checked="" type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar
Module Code	BIOT35022		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	IUGIII	Semester of Delivery	
Administering Department	Type Dept. Code	College	Type College Code
Module Leader	Suhad S. Mahmood	e-mail	suhad.mahmood@sc.uobaghdad.edu.iq
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor		e-mail	
Peer Reviewer Name	Jenan M. AlSaffar	e-mail	E-mail
Scientific Committee Approval Date	6/8/2025	Version Number	1.0

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<p>Module Aims أهداف المادة الدراسية</p>	<p>13. To develop knowledge skills and understanding of Bacteriology theory through some application techniques.</p> <p>14. To develop a comprehensive understanding of the fundamental principles and concepts of bacteriology, including the structure, and classification of bacteria.</p> <p>15. To explore bacteria's diverse roles and impact in various fields, such as medicine.</p> <p>16. To examine the pathogenicity of bacteria and their interactions with host organisms, including the mechanisms of infection, virulence factors, and host immune responses.</p> <p>17. To introduce diagnostic techniques used in bacteriology, including microscopy, culture methods, biochemical tests, and molecular diagnostics for identifying and characterizing bacteria.</p> <p>18. To explore the diversity of bacteria in different environments, their ecological roles, and their adaptations to extreme conditions.</p> <p>19. To develop critical thinking and analytical skills in evaluating scientific literature, experimental data, and research findings related to bacteriology.</p>
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	<p>20. To promote effective communication and collaboration in discussing and presenting bacteriological concepts, research, and practical applications.</p> <p>21. To instill an awareness of ethical considerations and biosafety practices in bacteriological research and applications.</p>
<p>Module Learning Outcomes</p> <p>مخرجات التعلم للمادة الدراسية</p>	<p>15. Knowledge of Bacterial Classification: Understand the classification and taxonomy of bacteria, including major bacterial groups, their characteristics, and distinguishing features.</p> <p>16. Understanding Bacterial Morphology: Identify and describe the different morphological forms of bacteria, such as cocci, bacilli, spirilla, and their variations.</p> <p>17. Understanding Bacterial Pathogenesis: Gain insight into the mechanisms by which bacteria cause disease, including virulence factors, host-pathogen interactions, immune response to bacterial infections, and strategies for bacterial control.</p> <p>18. Understanding Diagnostic Techniques: Familiarize students with laboratory techniques used for the identification and diagnosis of bacterial infections, including staining methods, culture techniques, biochemical tests, and molecular diagnostics.</p> <p>19. Understanding Bacterial Interactions: Gain knowledge of bacterial interactions with other microorganisms, such as symbiotic relationships, biofilm formation, and competition within microbial communities.</p> <p>20. Application of Bacteriology: Apply the acquired knowledge of bacteriology in practical contexts, such as clinical microbiology, environmental microbiology, food microbiology, industrial applications, and research endeavors</p>
<p>Indicative Contents</p> <p>المحتويات الإرشادية يتضمن الكلمات المفتاحية المهمة للمحاضرات</p>	<p>The indicative content of <u>bacteriology</u> includes the following.</p> <p>Lec1: Introduction to pathogenic Bacteria: Definition and scope of bacteriology</p> <p>Historical milestones and contributions to the field</p> <p>Lec 2: Bacterial Pathogenesis and Host Interactions: Mechanisms of bacterial pathogenicity, Virulence factors: adhesion, invasion, toxins, Host</p>

response to bacterial infections: innate and adaptive immunity, Principles of bacterial control and prevention

Lec 3: Normal flora, definition, types of normal bacteria flora, Understanding the composition and functions of the normal flora is crucial for maintaining a healthy microbial ecosystem

Lec 4: Gram-positive bacteria

-The genus of Staphylococci; Overview of the Staphylococci genus and its characteristics, Cell Structure, and Morphology, Staphylococcal Infections: Laboratory Diagnosis of Staphylococcal Infections, Treatment, and Prevention of Staphylococcal Infections

Lec 5: Genus of Streptococci, Overview of the Streptococci genus and its characteristics, Virulence Factors of Streptococci: Streptococcal Infections, Laboratory Diagnosis of Streptococcal Infections, treatment and Prevention of Streptococcal Infections

Lec 6: Gram negative cocci

Genus of Neisseria, Neisseria Species, , Neisseria Overview and its characteristics, , Neisseria Toxin Production, Neisseria Disease, , Neisseria Pathogenesis, , Neisseria Diagnosis: , Neisseria Laboratory diagnosis

Lec. 7 : Gram-negative rod:

-Escherichia coli, Strains and Types , Escherichia coli Overview and its characteristics, Escherichia coli Toxin Production, Escherichia coli Disease, Escherichia coli Pathogenesis, Diagnosis: Laboratory diagnosis of Escherichia coli

- **Genus of Proteus** , Proteus Strains and Types , Proteus Overview and its characteristics, Proteus Toxin Production, Proteus Disease, Proteus Pathogenesis, Diagnosis: Laboratory diagnosis of Proteus

Genus of Klebsiella , Strains and Types , Klebsiella Overview and its characteristics, Klebsiella Toxin Production, Klebsiella Disease, Klebsiella Pathogenesis, Klebsiella Diagnosis: Laboratory diagnosis of Klebsiella

Lec 8: SALMONELLA and SHIGELLA , SALMONELLA and SHIGELLA Overview and its characteristics, SALMONELLA and SHIGELLA Toxin Production, SALMONELLA and SHIGELLA Disease, SALMONELLA and SHIGELLA Pathogenesis, SALMONELLA and SHIGELLA Diagnosis: Laboratory diagnosis

Lec. 9 : PSEUDOMONAS , : PSEUDOMONAS Overview and its characteristics, : PSEUDOMONAS Toxin Production, : PSEUDOMONAS Disease, : PSEUDOMONAS Pathogenesis, Diagnosis: Laboratory diagnosis of : PSEUDOMONAS

Lec. 10: - BACILLUS SPECIES: Spore and non-spore forming bacteria:

Spore forming bacteria, Genus of CLOSTRIDIA, Overview and its characteristics, BACILLUS species types, BACILLUS Toxin Production, BACILLUS Disease BACILLUS, Pathogenesis, Diagnosis: Laboratory diagnosis of BACILLUSu

Lec.11: -Non-spore forming bacteria, Corynebacterium diphtheriae , an overview and Corynebacterium diphtheriae characteristics, Corynebacterium diphtheriae Toxin Production, Diphtheria Disease, Corynebacterium diphtheriae Pathogenesis, Diagnosis: Laboratory diagnosis of diphtheria involves the identification of Corynebacterium diphtheriae in clinical samples.

Lec. 12: Mycobacterium bacteria, Mycobacterium overview and its characteristics, Mycobacterium Toxin Production, Tuberculosis Diseases, Mycobacterium Pathogenesis, Diagnosis: Laboratory diagnosis of Tuberculosis involves the identification of Mycobacteria tuberculosis, M. leprae in clinical samples.

Lec 13: Genus of Bacteroides Overview and its characteristics, Bacteroides Toxin Production, Bacteroides Disease, Bacteroides Pathogenesis, Diagnosis: Laboratory diagnosis of Bacteroides

Lec 14: Genus of Spirochetes , Structure and Morphology, Pathogenic Spirochetes, Spirochetes Toxin Production, Spirochetes Disease, Spirochetes Pathogenesis, Diagnosis: Laboratory diagnosis of Spirochetes

	Lec 15: Mycoplasmas , Structure and Morphology, Pathogenic Mycoplasma, Mycoplasmas Toxin Production, Mycoplasmas Disease, Mycoplasmas Pathogenesis, Diagnosis: Laboratory diagnosis of Mycoplasmas
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, scientific visits, and by considering types of simple experiments involving interesting sampling activities for the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا تملئ من قبل المقررية			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4.26
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	61	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.06
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية				
	Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome

Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1, 2, 3, and 10
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8,9 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to Bacteriology:
Week 2	Bacterial Pathogenesis and Host Interactions
Week 3	Normal flora
Week 4	Gram positive bacteria- Staphylococci
Week 5	Streptococci
Week 6	Gram negative rod
Week 7	Neisseria
Week 8	Escherichia coli
Week 9	SALMONELLA and SHIGELLA
Week 10	Haemophilus influenzae,
Week 11	PSEUDOMONAS
Week 12	CLOSTRIDIA

Week 13	Bacteroides
Week 14	Spirochetes
Week 15	Mycoplasmas
Week 16	The preparatory week before the Final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Introduction in practical bacteriology
Week 2	Staphylococci
Week 3	Streptococci
Week 4	Gram negative rod
Week 5	Neisseria
Week 6	Escherichia coli
Week 7	SALMONELLA and SHIGELLA
Week 8	CLOSTRIDIA
Week 9	Bacteroides
Week 10	Review and rendering all labs

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Lippincott's Illustrated Reviews - Microbiology (Thao Doan, Roger Melvold)	Yes

Recommended Texts		No
Websites	https://www.microbiologybook.org/book/immunol-sta.htm	

Grading Scheme مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 - 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.



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Department of Biotechnology



MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Fermentation Technology		Module Delivery	
Module Type	Core		<input checked="" type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar	
Module Code	BIOT35023			
ECTS Credits	5			
SWL (hr/sem)	125			
Module Level	UGIII	Semester of Delivery		5
Administering Department	Type Dept. Code	College	Type College Code	
Module Leader	Dr. Khalid Jaber Kadhum		e-mail	Khalid.kadhum@sc.uobaghdad.edu.iq
Module Leader's Acad. Title	Professor		Module Leader's Qualification	Ph.D.
Module Tutor	Dr. Reem Walid, Lecture Talib		e-mail	
Peer Reviewer Name	Dr. Nadhem Hasan Hayder		e-mail	Nadhim.haider@sc.uobaghdad.edu.iq
Scientific Committee Approval Date	6/8/2025		Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		Semester	
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
<p>Module Aims أهداف المادة الدراسية</p>	<ol style="list-style-type: none"> 1. Introduce the fundamental principles of fermentation: To provide students with a comprehensive understanding of microbial fermentation processes, including aerobic and anaerobic systems. 2. Develop practical skills in fermenter design and operation: To equip students with knowledge of bioreactor configurations, scale-up strategies, and process control mechanisms. 3. Understand microbial physiology and metabolism in fermentation: To explore how growth kinetics, substrate utilization, and metabolic pathways influence product yield and process efficiency. 4. Analyze upstream and downstream processing: To familiarize students with media formulation, sterilization, inoculum preparation, and product recovery techniques. 5. Apply fermentation strategies in industrial biotechnology: To explore the production of antibiotics, enzymes, biofuels, organic acids, and recombinant proteins via microbial fermentation. 6. Encourage innovation through case studies and research exposure: To inspire students to connect academic knowledge with real-world biotechnological applications through industry-relevant examples and literature.
<p>Module Learning Outcomes مخرجات التعلم للمادة الدراسية</p>	<ol style="list-style-type: none"> 1. Explain the fundamental principles of fermentation processes <ul style="list-style-type: none"> • Illustrate the stages of microbial growth and their relevance to product formation. 2. Analyze microbial metabolism and its impact on fermentation <ul style="list-style-type: none"> • Evaluate factors influencing microbial growth kinetics and substrate utilization. 3. Design and evaluate bioreactor systems <ul style="list-style-type: none"> • Compare various bioreactor types and configurations. • Calculate and interpret key parameters such as agitation, aeration, oxygen transfer, and pH control. 4. Demonstrate knowledge of upstream processing <ul style="list-style-type: none"> • Formulate suitable media for different types of fermentations.

	<ul style="list-style-type: none"> • Outline inoculum development and sterilization techniques. <ol style="list-style-type: none"> 5. Assess downstream processing strategies <ul style="list-style-type: none"> • Describe the steps involved in product separation and purification. • Select appropriate downstream techniques based on product characteristics. 6. Interpret and analyze fermentation data <ul style="list-style-type: none"> • Use experimental results to monitor process performance. • Apply basic statistical and analytical tools to assess fermentation outcomes. 7. Work effectively in laboratory and team settings <ul style="list-style-type: none"> • Operate basic fermentation equipment safely and efficiently. • Collaborate in planning, conducting, and reporting on fermentation experiments.
<p>Indicative Contents</p> <p>المحتويات الإرشادية يتضمن الكلمات المفتاحية المهمة للمحاضرات</p>	<p>This course includes coverage of concepts (Fermentation Techniques):</p> <p>Aimed at exploiting the microbial cells and their components in the production of many vital compounds such as enzymes, proteins, hormones, antibiotics, organic acids and their use in the industrial and environmental fields. The use of bioreactor in the production of microbial metabolites.</p>

Student Workload (SWL)			
الحمل الدراسي للطلاب محسوب لـ ١٥ اسبوعا تملئ من قبل المقررية			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل	64	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعيا	4.26
Unstructured SWL (h/sem)	61	Unstructured SWL (h/w)	4.06

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	<p>Providing students with the basics and additional topics related to the outputs of thinking and analysis of biotechnologies</p> <ul style="list-style-type: none"> - Forming discussion groups during lectures to discuss topics in biotechnology that require thinking and analysis. - Asking students a set of thinking questions during lectures such as what, how, when and why for specific topics. - Giving student's homework that requires self-explanations in causal ways.
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الحمل الدراسي غير المنتظم للطلاب خلال الفصل		الحمل الدراسي غير المنتظم للطلاب أسبوعياً	
Total SWL (h/sem)	125		
الحمل الدراسي الكلي للطلاب خلال الفصل			

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1,2,,3 and 10
	Assignments	2	10% (10)	2, 12	LO # 3,4,5,6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5,8,9 and 10
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	An introduction to fermentation technology: What is fermentation: upstream processing (USP) and downstream processing (DSP)
Week 2	Industrial strains: Isolation of microbial strains: Strain improvement.
Week 3	Media for industrial fermentation
Week 4	Culture systems: Batch culture
Week 5	Culture systems: Continuous culture
Week 6	Culture systems: Fed batch culture
Week 7	Mid-term Exam
Week 8	Solid state fermentation: What is solid state fermentation (SSF)? Substrates used in SS: Environmental parameters that influence solid-substrate fermentations: The Current and Potential Applications of SSF: Bioreactors used for solid-substrate fermentations
Week 9	Fermenters: definition, Fermenter design and construction
Week 10	Fermenter control and monitoring; Sampling and Analysis.
Week 11	Types of bioreactors: Stirred tank bioreactor.
Week 12	Types of bioreactors: Airlift Bioreactors; Tower fermenters; Fluidized bed bioreactor
Week 13	Sterilization of the fermenter: The achievement and maintenance of aseptic conditions
Week 14	Downstream processing.
Week 15	The Recovery and Purification of Fermentation Products

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Production of ethanol by yeast.
Week 2	Isolation of Industrial Microorganisms from Soil and their Potential to Produce Antibiotics.
Week 3	The rate of fermentation varies with the type of sugar being metabolized.
Week 4	Fermentation of lactose by lactic acid producing bacteria: Yoghurt
Week 5	Exam
Week 6	How fermentation varies with changes in temperature.
Week 7	Yeast fermentation with and without aeration
Week 8	Anaerobic fermentation
Week 9	Production of protease by <i>Aspergillus niger</i> in liquid culture
Week 10	Production of protease by <i>Aspergillus niger</i> in solid state fermentation
Week 11	Bioreactor: design and construction
Week 12	How to sterilize bioreactor
Week 13	Downstream processing: how to extract and purified a microbial product from fermentation culture.
Week 14	Downstream processing: Purification of enzymes from liquid culture
Week 15	Downstream processing: Purification of enzymes from solid state fermentation

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?

Required Texts	<p>1. Manual of Industrial Microbiology and Biotechnology, (Third edition 2010) By Richard H. Baltz <i>et. al.</i></p> <p>2- Principles of fermentation technology (second edition 2003) By Stanbury PF; Whitaker; Hall SJ.</p> <p>3- Bioprocess Engineering: Basic concepts By Fikret Kargi. ➤</p>	yes
Recommended Texts	<p>1. Fermentation Microbiology and Biotechnology A.L Demain <i>et. al</i></p> <p>2. Practical Fermentation Technology Brain Mchneil & Linda M. Harvey.</p>	No
Websites	WWW.Fermentation technology.org	

Grading Scheme				
مخطط الدرجات				
Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
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	F – Fail	راسب	(0-44)	Considerable amount of work required
<p>Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.</p>				



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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Mycology		Module Delivery	
Module Type	Cor		<input checked="" type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar	
Module Code	BIOT35024			
ECTS Credits	5			
SWL (hr/sem)	125			
Module Level	UGIII	Semester of Delivery		5
Administering Department	Type Dept. Code	College	Type College Code	
Module Leader	Dr. Abdulkareem Jasim Hashim		e-mail	Abdulkareem.hashim@sc.uobaghdad.edu.iq
Module Leader's Acad. Title	Professor		Module Leader's Qualification	Ph.D.
Module Tutor	Dr. Sinai Waleed & Dr.Zainb Anas		e-mail	E-mail
Peer Reviewer Name	Dr. Abdulkareem Jasim Hashim		e-mail	E-mail Abdulkareem.hashim@sc.uobaghdad.edu.iq
Scientific Committee Approval Date	6/8/2025	Version Number	1.0	

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		Semester	
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<p>Module Aims أهداف المادة الدراسية</p>	<p>22. This course deals with the basic concept of mycology. 23. To understand the role of mycology in biotechnology field.</p>
<p>Module Learning Outcomes مخرجات التعلم للمادة الدراسية</p>	<p>21. To know the old classification systems of fungi. Morphology of fungi, how fungi differ from bacteria, Sexual and asexual spores 22. To know the importance of fungi, Living mode of fungi, Cultivation of fungi, , Reproduction. 23. Recognize the new classification systems of fungi, and the main divisions and characteristics to each divisions and classes, Division: Myxomycota, Classification and the main characteristics of this division with examples 24. Divisions: Eumycota and Classes: Chytridiomycetes and Hyphochytridiomycetes, The main characteristics for each class with examples. 25. Class: Oomyceyes, Main characteristics, Classification to its orders, with examples. 26. Class: Zygomycetes, Main characteristics, Classification to its orders, with examples. 27. Class: Ascomycetes: Main characteristics, Classification to its subclasses, with examples. 28. Class: Deutomycetes: Main characteristics, Classification to its subclasses, with examples. 29. To use these characteristics to isolate, purify, and identify the fungi which obtained from different sources. 30. Recognize how fungal isolates can play very important role in biotechnology such as production of bio materials. 31. To understand that, there is a group of fungi causes diseases like skin infection. 32. To recognize that, there is a group of fungi which has ability to produce types of mycotoxins</p>
<p>Indicative Contents المحتويات الإرشادية يتضمن الكلمات المفتاحية المهمة للمحاضرات</p>	<p>Indicative content includes the following:- Introduction, Fungal classification systems, How fungi differ from bacteria, Morphology of fungi, Reproduction. Important of fungi, Living mode of fungi, Cultivation of fungi, sexual and asexual reproduction in fungi. Classification of fungi, Division 1: Myxomycota, general characteristics, the classes involved in this division. (One example for each class). Division 2: Eumycota , general characteristics, Class 1,Chytridiomycetes and its classification, Class 2, Hyphochytridiomycetes.</p>

	<p>Division 2: Eumycota, Class 3: Oomycetes , general characteristics, and the classification of this class.</p> <p>Division 2: Eumycota, Class 4: Zygomycetes, general characteristics, Orders involved in this class. The role of some strains in production of biomaterials.</p> <p>Division 2: Eumycota, Class 5: Ascomycetes, general characteristics, Subclasses involved in this class. The role of some strains in production of biomaterials, food manufacturing, plant pathogens, Human pathogens.</p> <p>Division 2: Eumycota, Class 6: Basidimycetes, general characteristics, Subclasses involved in this class. The role of some strains in production of enzymes such laccase, peroxidase, cellulose, Edible and poisoning mushroom.</p> <p>Division 2: Eumycota, Class 7: Deutromycetes, general characteristics, Subclasses involved in this class.</p> <p>Medical mycology</p> <p>Mycotoxins</p>
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Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the collection of different samples, media preparation. Isolation and primitive identification according to the acquired skills from the theoretical and practical information through lectures and Lab.
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Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا تملئ من قبل المقررية

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4.26
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	61	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.06
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation

تقييم المادة الدراسية

	Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Quizzes	2	10% (10)	5, 10	LO #1, 2, 10 and 11

Formative assessment	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

Material Covered	
Week 1	Introduction, Classification systems of fungi, Morphology of fungi, Sexual and asexual spores
Week 2	Important of fungi, Living mode, Elements and environmental requirements for fungi cultivation, Sexual and asexual reproduction, sexual compatibility.
Week 3	Classification of fungi, Division 1: Myxomycota, general characteristics, the classes involved in this division. Myxomycetes and Plasmodiophoromycetes (One example for each class).
Week 4	Division 2: Eumycota , general characteristics, Class 1,Chytridiomycetes and its classification, Order1: Chytridiales, order 2: Blastocladales , order 3: Monoblepharidales. Class 2, Hyphochytridiomycetes.
Week 5	Division 2: Eumycota, Class 3: Oomycetes , general characteristics, and the classification of this class. Order 1: Saprolegniales Order 2: Peronosporales and the families involved in this order: Family 1:- Pythiaceae, Family2:- Peronosporaceae Family 3:- Albuginaceae.
Week 6	Division 2: Eumycota, Class 4: Zygomycetes, general characteristics, Orders involved in this class. Order 1: Mucorales Order 2: Entomophthorales Order 3: Zoopagales . The role of some strains in production of biomaterials.
Week 7	Mid-term Exam.
Week 8	Division 2: Eumycota, Class 5: Ascomycetes, general characteristics, Subclasses involved in this class. Subclass 1: Hemiascomycetidae which classified into Order 1: Endomycetales contains two families. Family 1:- Endomycetaceae and Family 2: Saccharomycetaceae. Order 2: Taphrinales. The role of some strains in production of biomaterials, food manufacturing, plant pathogens, Human pathogens.

Week 9	<p>Division 2: Eumycota, Class 5: Ascomycetes, Subclass 2: Euascomycetidae, general characteristics.</p> <p>Classification of this subclass which involves three Series: Series 1: Plectomycetes Genus 1: Aspergillus and Genus 2: Penicillium their role in biotechnology. The role of some strains in production of biomaterials, food manufacturing, plant pathogens, Human pathogens.</p> <p>Series 2: Pyrenomycetes: which involve 5 orders: Order 1: Erysiphales, Order 2: Chaetomyales, Order 3: Claviceptales, Order 4: Shpaeriales and Order 5: Hypocreale</p>
Week 10	<p>Division 2: Eumycota, Class 5: Ascomycetes, Series 3: Discomycetes: general characteristics, This Series classified into two groups: Group 1: Hypogean: which presence under the surface of soil.</p> <p>Group 2: Epigean</p> <p>Subclass 3: Loculoascomycetidae</p>
Week 11	<p>Division 2: Eumycota, Class 6: Basidiomycetes, general characteristics, Subclasses involved in this class.</p> <p>Subclass 1: Heterobasidiomycetidae, general characteristics, This subclass involves two orders:</p> <p>Order 1: Uredinales (Rust fungi)</p> <p>Order 2: Ustilaginales (Smut fungi)</p> <p>These two orders contain very economically important strains.</p>
Week 12	<p>Division 2: Eumycota, Class 6: Basidiomycetes, Subclasses 2: Holobasidiomycetidae, general characteristics.</p> <p>The role of some strains in production of enzymes such laccase, peroxidase, cellulose, Edible and poisoning mushroom.</p>
Week 13	<p>Division 2: Eumycota, Class 7: Deutromycetes, general characteristics, Orders involved in this class.</p> <p>Order 1: Moniliales, Order 2: Sphaeropsidales, Order 3: Melanconiales And Order 4: Mycelia sterile</p>
Week 14	<p>Medical mycology which involve: classification of this fundi according to the site of infection.</p>
Week 15	<p>Mycotoxins which involve the main groups of mycotoxins.</p>
Week 16	<p>Preparatory week before the final Exam</p>

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Introduction
Week 2	Lab 2: Isolation of fungi
Week 3	Lab 3: Fungal classification (Division: Myxomycota)
Week 4	Lab 4: Division: Eumycota Subdivision: Mastigomycotina Class: Chytridiomycetes
Week 5	Lab 5: Division: Eumycota Subdivision: Mastigomycotina Class: Oomycetes



Week 6	Lab 6: Division: Eumycota Subdivision: Mastigomycotina Class: Zygomycetes
Week 7	Lab 7: Subdivision: Ascomycotina Class: Hemiascomycetes (Protoascomycetes)
Week 8	Lab 8: Subdivision: Ascomycotina Class: Ascomycetes Subclass: Plectomycetidae
Week 9	Lab 9: Subdivision: Ascomycotina Class: Ascomycetes Subclass: Loculloascomycetidae
Week 10	Lab 10: Subdivision: Ascomycotina Class: Ascomycetes Subclass: Discomycetidae

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Introductory mycology by Alexopoulos, C.J and C.W.Minis. Third edition.	Yes
Recommended Texts	Introduction to fungi by John Webster and Roland W.S.Weber 2007. Cambridge.	Yes
Websites	https://www.Mycology	

Grading Scheme مخطط الدرجات				
Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 - 49)	FX - Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F - Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Level Three (UGIII) Semester Six

	Ministry of Higher Education and Scientific Research - Iraq University of Baghdad College of Science Department of Biotechnology	
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BIOTMODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Microbial Genetics	Module Delivery	
Module Type	CORE	<input checked="" type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar	
Module Code	BIOT36025		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	UGIII		
Administering Department	Type Dept. Code	College	Type College Code
Module Leader	Nuha Joseph Najeeb Kandala	e-mail	Nuha.najeeb@sc.uobaghdad.edu.iq
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Dalal Salah	e-mail	dr.tbdalal@gmail.com
Scientific Committee Approval Date	6/8/2025	Version Number	1.0

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

Prerequisite module	None	Semester	2
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<p>Module Aims أهداف المادة الدراسية</p>	<p>24. Introduce students to one of the branches of genetics, which is the inheritance of microorganisms, and to study all the factors that participate in showing the facts of the genetic matters of microorganisms.</p> <p>25. Understanding microbial genes, genomes, and gene expression is essential for understanding the biology and evolution of microorganisms and their interactions with the environment.</p> <p>26. Microbial genetics is important for understanding molecular techniques used to study the genes and proteins, for bacteria, archaea, and eukaryotic organisms for fundamental research as well as practical applications in diverse areas of medicine and biotechnology.</p> <p>27. Studying a brief history for the inheritance of microorganisms, the use of bacteria in genetic studies, and multiplication the DNA of bacteria and phages (prokaryotic), mutations and their types.</p> <p>28. To illustrate at an advanced level how microbial genetic systems contribute to the current understanding of molecular processes involved in the replication, recombination, and repair of genomes and their differential expression in response to environmental stimuli.</p> <p>29. Understand the mechanisms underlying bacterial recombination and get information on PCR, and how to interpret and analyses the obtained outcome.</p> <p>30. Understanding of fundamental concepts in microbial genetics.</p> <p>31. Microbial genetics focuses on bacterial recombination, mobile elements ,mechanisms of gene transfer (conjugation, transformation and transduction),</p> <p>32. To develop knowledge skills and understanding of microbial genetics theory through some application techniques.</p>
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<p>Module Learning Outcomes</p> <p>مخرجات التعلم للمادة الدراسية</p>	<p>33. Insight into genetic methods used to investigate interesting biological problems.</p> <p>34. Insight into current, exciting topics in microbial genetics and related fields.</p> <p>35. Understanding of how microbial genetics has advanced science and society.</p> <p>36. Discuss the structure, function, expression, and evolution of microbial genes and methods for their study.</p> <p>37. Learning about mutation and the available techniques for selecting and isolating mutated bacterial cell.</p> <p>38. Discuss the bacterial gene transfer and their various molecular biological applications.</p> <p>7.Learning what is related to it vector elements include , plasmids, phage and transposone , mechanisms of gene transfer (conjugation, transformation and transduction), recombination and repair of defects.</p> <p>8.Discuss research and review articles related to both fundamental concepts and emerging topics in microbial genetics.</p> <p>9-Learning the ability to extract and purify nucleic acid and conduct genetic tests.</p> <p>10-Get introduced to Polymerase chain reaction and how this technique helps in gene detection through designing primers that are complimentary to targeted genes.</p> <p>11-The ability to conduct various laboratory experiments related to genetic diagnosis for bacteria and viruses to research and prepare a report of their findings.</p> <p>12-Analyzing genetically the functioning and mechanism of cells.</p> <p>13-Identify the basic of microbial genetics and their applications.</p>
<p>Indicative Contents</p> <p>المحتويات الإرشادية يتضمن الكلمات المفتاحية المهمة للمحاضرات</p>	<p>The indicative content of Molecular biology includes the following.</p> <p>Lec1: Introduction to Genetics of Microorganisms</p> <p>A-Advantages for using bacteria and viruses for genetics study</p> <p>B-Classification of Organisms</p> <p>C-The Bacterial Genome</p> <p>D-Bacteria Were Used for Fundamental Studies of Cell Function</p> <p>E-Viruses and Bacterial Viruses(phages) [15 hrs]</p> <p>Lec2: Replication in Bacteria</p>

A-Types and principle of replication.

B-The mechanism of replication.

C-The role of enzymes in replication.

C-Replication in phage and archaebacteria

D-types of replication in plasmids

Lec3: A-Overview of DNA Repair

B-Types of repair system

1-profreading repair

2- DNA Mismatch Repair System

3-General Excision Repair System

4-Photoreactivation Cleaves Thymine Dimers

Lec4: Transcription in Bacteria

A-RNA Molecules

B-The Structure of RNA

C-Transcription: Synthesizing RNA from a DNA Template

D-The Substrate for Transcription

E-The Process of Bacterial Transcription

Lec5: Translation in Bacteria

A- Bacteria-Synthesizing proteins (amino acids) from RNA

B-The Substrate for Translation

C-The Process of Bacterial Translation .

Lec6: A-Definition of mutations

B-Classification of mutation .

C-Nomenclature of mutatin

D-Mechanisms of mutations.

E-The influence of chemicals and phiscal agents among mutations

Lec 7: A-Luria and Delbruck experiment.

B-The Newcombe experiment .

C-The Lederbergs experiment.

D-Mutation rates

E-Calculation mutation rates.

Lec8: mobile elements :the plasmids

A-The Characteristic features of Plasmid

B-Classified plasmids according to the function.

C-Plasmids replication and control

Lec9: A-The Nature of Transposable Elements

B-General Characteristics of Transposable Elements

C-Mechanisms of Transposition

D-Types of transposable Elements in Bacteria

Lec10: A-the Bacteriophage

B-Types of cycle in Bacteriophages

C-Techniques for the Study of Bacteriophages

Lec11: Genes Transfer in Bacteria

A- Bacterial Conjugation

B- Methods of Conjugation

C- Role of conjugation in bacterial evolution

D- The conjugation of Gram-positive

Lec12: Gene Transfer by Transformation

A- Transformation is Gene Transfer by Naked DNA

B- Transformation as Proof that DNA is the Genetic Material

C- Transformation in Nature

D- Artificially Induced Competence

E-Transformation by plasmids

F-Transfection

Lec13: Gene Transfer by Virus—Transduction

A- Types of transduction

1-Genralized transduction

	<p>2-specialized transduction</p> <p>B-phages and gene transfer,lytic and lysogenic cycles.</p> <p>C-Techniques for the Study of Bacteriophages</p> <p>Lec 14:Regulation of Gene Expression</p> <p>A- Transcriptional regulators</p> <p>B- the lac Operon</p> <p>C-types of enzymes in lac operon</p> <p>D-Mutations and the <i>lac</i> Operon</p> <p>Lec 15: A- <i>trp</i> Operon and Attenuation</p> <p>B- types of enzymes in <i>trp</i> operon</p> <p>C-Sequence of Events for Attenuation</p>
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	<p>The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, scientific visits, and by considering types of simple experiments involving interesting sampling activities for the students.</p> <p>It can be summarized in the following points:</p> <ol style="list-style-type: none"> 1-Qualifying students to solve problems related to the intellectual framework of the foundations and applications of microbiological inheritance 2- Encouraging students to visit the library to obtain academic knowledge related to academic vocabulary. 3- Improving students' skills by visiting websites to obtain additional knowledge of academic subjects. 4- brainstorming during the lecture 5-To qualify students to obtain knowledge and understanding of microbial genetics, 6-Contribute to preparing correct scientific thinking for students to solve obstacles in the fields of scientific research 7-Expand students' perceptions to get acquainted with modern technologies adopted globally

Student Workload (SWL)

الحمل الدراسي للطلاب محسوب لـ ١٥ اسبوعاً من قبل المقررية

Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل	64	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعياً	4.26
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل	86	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعياً	5.73
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	150		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1, 2, 3, and 10
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8,9 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الأسبوعي النظري

	Material Covered
Week 1	Introduction to Genetics of Microorganisms
Week 2	Replication in bacteria and viruses

Week 3	Types of repair system
Week 4	Transcription in Bacteria
Week 5	Translation in Bacteria
Week 6	Mutation
Week 7	Inheritance in bacteria
Week 8	Mobile elements: The Plasmids
Week 9	Mid-term Exam + Movable Genes
Week 10	Viral Genetics
Week 11	Gene Transfer: 1-Conjugation
Week 12	Gene Transfer: 2-Transformation
Week 13	Gene Transfer: 3-Transduction
Week 14	Regulation of Gene Expression 1-Lactose operon
Week 15	Regulation of Gene Expression 2-Tryptophan operon
Week 16	The preparatory week before the Final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: General concept of Transformation
Week 2	Lab 2: Practical/ transformation

	(studying the transferring of genetic material by the method of transformation)
Week 3	Lab 3: General concept of conjugation
Week 4	Lab 4: Practical / conjugation (studying the transferring of genetic material by the method of conjugation)
Week 5	Lab 5: General concept of specialized and generalized transduction
Week 6	Lab 6: Practical / generalized transduction studying the transferring of genetic material by the method of transduction
Week 7	Lab 7: Isolation of mutant bacteria Learn the types of mutation./ molecular level, isolation.
Week 8	Lab 8: : General concept of PCR
Week 9	Lab 9 : Practical/ PCR - PCR calculation
Week 10	Lab 10: Primer design\ Using NCBI

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Molecular Genetics of Bacteria.4th Edition Jeremy W. Dale and Simon F. Park ,2014. -1 2- Genetics.Leland H.Hartwell .(2000) 3-Color atlas of genetics Eberhad, Passarge. (2001).	Yes
Recommended Texts	Molecular Microbiology. David H. Persing.; Fred C. Tenover Randall T. Hayden.;Margareta Ieven.; Melissa B. Miller.;Frederick S. Nolte.;Yi-Wei Tang.;Alex van Belkum.(2016). DIAGNOSTIC PRINCIPLES AND PRACTICE THIRD EDITION	No

Websites	https://microbiologynote.com/best-and-top-books-for-microbial-genetics-and-molecular-biology/
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Grading Scheme مخطط الدرجات				
Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 - 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
<p>Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.</p>				



Ministry of Higher Education and
Scientific Research - Iraq
University of Baghdad
College of Science
Department of Biotechnology



MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Food Biotechnology		Module Delivery	
Module Type	Core		<input checked="" type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar	
Module Code	BIOT36026			
ECTS Credits	6			
SWL (hr/sem)	150			
Module Level	UGIII	Semester of Delivery	6	
Administering Department	Type Dept. Code	College	Type College Code	
Module Leader	Dr. Hutaf A. A. Alsalm		e-mail	Hutaf.alsalm@sc.uobaghdad.edu.iq
Module Leader's Acad. Title	Professor		Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)		e-mail	E-mail
Peer Reviewer Name	Name		e-mail	E-mail
Scientific Committee Approval Date	6/8/2025		Version Number	1.0

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<p>Module Aims أهداف المادة الدراسية</p>	<p>33. To learn general concepts of food microbiology and important microorganisms in food. 34. To understand the microbiological standard of food. 35. This course deals with the basic concepts of microbial growth and the factors influencing microbial growth in food. 36. To identify the microorganisms that cause food spoilage. 37. To identify the foodborne disease-causing microorganisms. 38. To protect food from contamination and spoilage by knowing the controlling methods of microorganisms in food. 39. To develop skills for detecting microorganisms that cause food spoilage and foodborne diseases.</p>
<p>Module Learning Outcomes مخرجات التعلم للمادة الدراسية</p>	<p>39. Enable students to obtain knowledge and understanding of food microbiology. 40. List the various terms associated with food microbiology. 41. Define important bacterial genera associated with food. 42. Summarize the common microbial spoilage in foods. 43. Discuss the factors influencing microbial growth in food. 44. Describe the microbiological standard for food. 45. Describe the spoilage of every specific food group. 46. Identify food spoilage caused by microbial enzymes. 47. Explain the three microbial foodborne diseases based on illness mode. 48. Explain the parasites that cause foodborne diseases. 49. Identify indicators of bacterial pathogens. 50. Identify the different control methods for microorganisms in food.</p>
<p>Indicative Contents المحتويات الإرشادية يتضمن الكلمات المفتاحية المهمة للمحاضرات</p>	<p>Indicative content includes the following. <u>Part A – General concepts</u> Introduction to food microbiology – History and development of food microbiology, Discovery of microorganisms, what are their functions, Development of food microbiology, Characteristics of predominant microorganisms in food, Important microorganisms in food (important mold genera, important yeast genera, important viruses, important bacterial genera),</p>

	<p>Sources of microorganisms in food, Microbiological standard of food, Bacteriological standard of food, Common Microbial Spoilage of foods, Microbial growth characteristics, Factors influencing microbial growth in food . [20 hrs]</p> <p><u>Part B -The spoilage of food</u></p> <p>Microbial food spoilage - Important factors in microbial food spoilage (significance of microorganisms, significance of foods), Spoilage of Specific Food Groups (meat, egg, milk, Vegetables, fruits, and nuts, Cereals, Canned food, Sugars and confectioneries, drinks, Mayonnaise and salad dressing, Spices and condiments, Pickles), Food Spoilage by Microbial Enzymes. [14 hrs]</p> <p><u>Part C -The foodborne diseases</u></p> <p>Microbial foodborne diseases– Important facts in Foodborne diseases, Foodborne Intoxications, Foodborne Infections, Foodborne Toxicoinfections, parasites, indicators of bacterial pathogens. [14 hrs]</p> <p><u>Part D -The control of food spoilage</u></p> <p>Control of microorganisms in food– Control of access (cleaning and sanitation), Control by physical removal, Control by heat, Control by low temperature, Control by reduced Aw, Control by Low pH and organic Acids, Control by modified atmosphere (or reducing O–R potential), Control by antimicrobial preservatives, Control by irradiation. [12 hrs]</p>
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	<p>Type something like: The main strategy that will be adopted in delivering this module is to encourage students’ participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.</p>

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا تملئ من قبل المقررية

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4.26
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	86	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.73
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	History and development of food microbiology
Week 2	Characteristics of predominant microorganisms in food
Week 3	Sources of microorganisms in food
Week 4	Microbiological standard of food
Week 5	Microbial growth characteristics
Week 6	Factors influencing microbial growth in food
Week 7	Microbial food spoilage (Important factors in microbial food spoilage)
Week 8	Microbial food spoilage (Spoilage of Specific Food Groups, P1)
Week 9	Microbial food spoilage (Spoilage of Specific Food Groups P2, Food Spoilage by Microbial Enzymes)
Week 10	Microbial foodborne diseases (Important Facts in Foodborne Diseases, Foodborne Intoxications)
Week 11	Microbial foodborne diseases (Foodborne Infections, Foodborne Toxicoinfections)
Week 12	Microbial foodborne diseases (Parasites, Indicators of Bacterial Pathogens)
Week 13	Control of microorganisms in food (Control of access (Cleaning and Sanitation), Control by physical removal, Control by Heat)
Week 14	Control of microorganisms in food (Control by Low Temperature, Control by Reduced Aw, Control by Low pH and Organic Acids)
Week 15	Control of microorganisms in food (Control by Modified Atmosphere (or Reducing O–R Potential), Control by Antimicrobial Preservatives, Control by Irradiation)
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Preparation of Samples Part 1
Week 2	Lab 2: Preparation of Samples Part 2
Week 3	Lab 3: Methods for Microbiological Examination of Foods
Week 4	Lab 4: Microbiological Examination of Milk
Week 5	Lab 5: Mid Exam 1
Week 6	Lab 6: Microbiological examination of Fruits and Vegetables
Week 7	Lab 7: Microbiological Examination of Table Eggs
Week 8	Lab 8: Canned Food
Week 9	Lab 9: Why you should avoid Canned food
Week 10	Lab 10: Toxins (Poisons)
Week 11	Lab 11: Mid Exam 2

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	-Food microbiology (Mantrile TY,1987) -Food Microbiology Laboratory Manual(Venata Vedum-Mai and Melissa J)	Yes
Recommended Texts	-Fundamental food microbiology (Bibek Ray,2004) - Practical food microbiology (D Robert & M Greenwood, 2003)	No
Websites	https://www.coursera.org/learn/industrial-biotech https://www.youtube.com/channel/UCJlzzBwuorwLbviAhEgbnqQ	

Grading Scheme

مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.



Ministry of Higher Education and
Scientific Research - Iraq
University of Baghdad
College of Science
Department of Biotechnology



MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Immunology		Module Delivery
Module Type	Core		<input checked="" type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar
Module Code	BIOT36027		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	UGIII	Semester of Delivery	
Administering Department	Type Dept. Code	College	Type College Code
Module Leader	Mouruj A. Alaubydi	e-mail	Mouruj.najeeb@sc.uobaghdad.edu.iq
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Jenan M. AlSaffar	e-mail	jinan.jawad@sc.uobaghdad.edu.iq
Scientific Committee Approval Date	6/8/2025	Version Number	1.0

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<p>Module Aims أهداف المادة الدراسية</p>	<p>40. To develop knowledge skills and understanding of Immunology theory through some application techniques. 41. To understand antigen and immunoglobulin types, innate and adaptive immunity, body molecules related to immunity, and immune response measurement. 42. This course deals with the basic concept of Immunology. 43. This is the basic subject for genetic immunology and immune diseases. 44. To perform practical analysis.</p>
<p>Module Learning Outcomes مخرجات التعلم للمادة الدراسية</p>	<p>51. Recognize how the immune system works in the human and animal body. 52. List the various terms associated with immunology. 53. Summarize what is meant by antigens and antibodies, and other immune molecules in the immune system. 54. Discuss the reaction and involvement of antigens and antibodies in immunology. 55. Define and describe innate and adaptive immunity. 56. Identify the basic immune molecules and their applications. 57. Discuss the immune response in innate and adaptive immunity. 58. Discuss the various properties of immune molecules. 59. Explain the genetic bases of immune molecules. 60. Identify the relationship between innate and adaptive immunity.</p>
<p>Indicative Contents المحتويات الإرشادية يتضمن الكلمات المفتاحية المهمة للمحاضرات</p>	<p>The indicative content of <u>Immunology</u> includes the following.</p> <p>Lec1: Immunology – Immune system definitions, immune soluble and cellular components, Antigen types, types of immunity, types of the immune response, and immunoglobulin types. [15 hrs]</p> <p>Lec 2: Innate immunity – definition, cells and soluble components of innate immunity, mechanisms of innate immunity, phagocytosis and killing</p>

mechanisms, types of innate immunity, roles of innate immunity in the body defenses, generation, and development of innate immune components.

Lec 3: The internal defense system, lymphoid system including; primary lymphoid organs and secondary lymphoid organs.

Lec 4: Third line of defense: Acquired or developed or adaptive immunity; characteristics of acquired immunity, types, cells related with adaptive immunity, development of lymphocytes, types of lymphocytes and development.

Lec 5: immunogens and antigens, definition, differentiation between both items, differentiation between immunogenicity and antigenicity, types and chemical structure of antigens, types of antigens on the bases of their origin, the requirement for immunogenicity, adjuvants, primary and secondary responses.

Lec 6: T dependent and T independent antigen, main features of T dependent antigen, humoral immune response, the biological role of humoral immune response, cell-mediated immune response, and stages of adaptive immune response development.

Lec 7: Major histocompatibility molecules, types, functions, structures, genetic and protein organization of MHC types on the chromosome.

Lec 8: Antibodies, structures chemical compositions, antibody regions, differentiation among each antibody, functions, random mutation and class switching, and natural antibody.

Lec 9: classes of immunoglobulins, general properties, IgG characteristics, and biological properties, IgA characteristics and biological properties, IgE characteristics and biological properties, IgD characteristics and biological properties, and IgM characteristics and biological properties.

Lec 10: Complement system, functions of complement, complement pathways, anaphylotoxins, and the importance of complement membrane attack complex.

Lec 11: Hypersensitivity, types of antigens and reaction, types of hypersensitivity reactions, type I hypersensitivity, anaphylactic reaction.

Lec 12: type II hypersensitivity, type III hypersensitivity, type IV hypersensitivity

	<p>Lec 13: Cytokines and chemokines: pro-inflammatory cytokines, pre-inflammatory cytokines</p> <p>Lec 14: Antigen–antibody reactions (part 2), stages of Ag-Ab reactions, measurement of Ag-Ab reactions, precipitation, application of precipitation, immunodiffusion technique, single diffusion in two dimensions, and Ouchterlony technique. Immunoelectrophoresis, agglutination, agglutination mechanism, application of agglutination, slide agglutination.</p> <p>Lec 15: Antigen–antibody reactions (part 3), immunofluorescence, Enzyme immunoassay, direct and indirect ELISA, competitive ELISA, flow cytometer.</p>
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	<p>The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, scientific visits, and by considering types of simple experiments involving interesting sampling activities for the students.</p>

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا تملئ من قبل المقررية			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4.26
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	86	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.73
Total SWL (h/sem)	150		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1, 2, 3, and 10
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8,9 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Immunology –Introduction to Immune System
Week 2	Innate immunity
Week 3	The internal defense system
Week 4	The third line of defense: Acquired or developed or adaptive immunity
Week 5	Immunogens and antigens
Week 6	T-dependent and T-independent antigen

Week 7	Mid-term Exam + Major histocompatibility molecules
Week 8	Antibodies
Week 9	Classes of immunoglobulins
Week 10	Complement system
Week 11	Hypersensitivity/ introduction, types of antigens, type I hypersensitivity, anaphylactic reaction.
Week 12	Type II hypersensitivity, type III hypersensitivity, type IV hypersensitivity
Week 13	Cytokines and chemokines
Week 14	Antigen-antibody reactions I
Week 15	Antigen-antibody reactions II
Week 16	The preparatory week before the Final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Introduction in practical immunity
Week 2	The bactericidal activity of serum
Week 3	Antigen Preparation
Week 4	Rosetting Techniques
Week 5	ABO blood grouping
Week 6	Phagocytosis
Week 7	Exam - Serological tests
Week 8	Enzyme-Linked Immunosorbent Assays (ELISA)
Week 9	Complement fixation test



Week 10	Review and rendering all labs
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Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Lippincott's Illustrated Reviews - Immunology (Thao Doan, Roger Melvold)	Yes
Recommended Texts	Essential clinical immunology/ <i>Edited by</i> John B. Zabriskie/ <i>The Rockefeller University</i>	No
Websites	https://www.microbiologybook.org/book/immunol-sta.htm	

Grading Scheme مخطط الدرجات				
Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
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has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

	Ministry of Higher Education and Scientific Research - Iraq University of Baghdad College of Science Department of Biotechnology	
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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Environmental Biotechnology		Module Delivery
Module Type	Core		<input checked="" type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar
Module Code	BIOT36028		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	1 UGIII	Semester of Delivery	6
Administering Department	Type Dept. Code	College	Type College Code
Module Leader	Dr. Nadhem Hasan Hayder		e-mail Nadhim.Haider@sc.uobaghdad.edu.iq
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Dr. Zainab, Lecturer Hiba Abdul-Alrahman		e-mail E-mail

Peer Reviewer Name	Dr. Nadhem Hasan Hayder	e-mail	Nadhim.Haider@sc.uobaghdad.edu.iq
Scientific Committee Approval Date	6/8/2025	Version Number	1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		Semester	
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	<p>45. Exploitation of microorganisms for production of different biomolecules, organic acids etc.</p> <p>46. Development of different biological system for waste treatment resulted from municipals and industries.</p> <p>47. Recycling of wastes and production of biofuels and biofertilizres</p> <p>48. Monitoring the fate of pollutants in the Environment</p> <p>49. Biological control of pathogens and pest using microorganisms and microbial products</p>
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	<p>61. To understand the concept of Environmental Biotechnology and the field dealing with Environmental biotechnology</p> <p>62. Learning the students, the operation and application of Techniques used in biological treatment of waste in laboratory and in the field.</p> <p>63. Enabling the students to use different treatment process for metabolism and removal of Nitrogen compounds, Metabolism of phosphorous compounds, Metabolism of Sulphur compounds, Reduction of CO2 emission through biological treatment.</p> <p>64. Identify the students the concept of Biodegradation and the process adopted for biodegradation process such as Aerobic and anaerobic degradation in lab or in the field.</p> <p>65. Learning the students, the possibility of Biodegradation of different pesticides used in agriculture or in municipality for treatment of pest in lab or in the field.</p> <p>66. Enabling of students, to applied Bioremediation techniques for removal and treatment of pollutants from the environment in the field.</p> <p>67. Possibility to applied large scale bioreactors for production of biosurfactant in order to be used in different fields such as in oil recovery, medical, agriculture and industrial applications.</p>

	<p>68. To understand the concept of Bio sorption or Metal Uptake by Microorganisms and recovery by microbes from bioleaching, bio sorption, direct or indirect leaching process.</p> <p>69. Learning the possibility of application of microorganisms and Microbial pesticides (bactericidal, fungicidal, insecticidal, etc.), for pest control.</p> <p>70. Development the power of students in working and application of Anaerobic processes for waste treatment and bioenergy production.</p> <p>71. Learning the student's solid wastes treatment in the field such as using exsitu treatment (composting and methane production).</p>
<p>Indicative Contents المحتويات الإرشادية يتضمن الكلمات المفتاحية المهمة للمحاضرات</p>	<p>Indicative content includes the following:</p> <ol style="list-style-type: none"> 1. Definition and Importance of Environmental Biotechnology. Biological Treatment Process, Techniques used in biological treatment. 2. Biological treatment by activated sludge, Source of wastewater, Types of bacteria in activated sludge, Microbial processes 3. Environmental Treatment: Metabolism of Nitrogen compounds, Phosphorous, Sulfur compounds and Reduction of CO₂ emission through biological treatment (Algal photosynthesis). 4. Biodegradation, Factors that effect in biodegradation, Aerobic and anaerobic degradation, The advantages and disadvantages of anaerobic process. 5. Biodegradation OF HERBICIDES AND PESTICIDES, and HYDROCARBONS. 6. Bioremediation of Environmental Pollutants, in situ bioremediation: and Ex situ bioremediation. 7. Bio surfactant, Biosurfactant Classification, mechanisms of biosurfactant interaction, Major biosurfactant classes and Applications of Biosurfactants. 8. Bio sorption or Metal Uptake (Recovery) By Microorganisms, Bio - Sorbent Microbial Groups: Bacteria, Fungi, Microbial Mechanisms for Removal of Metal Ions. 9. Microbial pesticides, Bacteria pesticides: Bacillus sp., Mechanism of action of Bacillus thuringiensis on caterpillars. 10. Mechanisms of biological control: Direct antagonism, Antibiotic-mediated suppression, Lytic enzymes and other microbial byproducts. 11. Anaerobic processes and bioenergy; Treatment of different wastes. 12. Solid wastes treatment: sources and management 13. Biomedical waste treatment; sources; types; collection; and treatment

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the field studies for treatment of different types of wastes using biological system, produced beneficial products, pest management and restoration of environmental quality according to the acquired skills from the theoretical and practical information through lectures and Lab.
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Student Workload (SWL)

الحمل الدراسي للطلاب محسوب لـ ١٥ اسبوعا تملئ من قبل المقررية

Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل	64	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعيا	4.26
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Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	150		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
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	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 2, 4, 7 and 10
Summative assessment	Midterm Exam	2 hr.	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Importance of Environmental Biotechnology, field dealing with Environmental biotechnology Bio-methylation and bio magnification, Important terms in Environmental Biotechnology
Week 2	Biological Treatment Process, Techniques used in biological treatment, Suspended growth process (Activated sludge), Process variables used in control of the biological processes, Attached film growth: Trickling Filter, Rotating Biological Contactor (RBC), Fluidized beds.
Week 3	Biological treatment by activated sludge, Source of wastewater, The nature and composition of waste water, Soft and hard organic matter (BOD) digestion, Microbial ecology: Activated sludge bacteria, Types of bacteria in activated sludge, Bacterial flocs, Microbial processes: ingestion, respiration and growth and division, Factors effects the Growth of bacteria: Substrate concentration, Availability of the nutrients, oxygen and Temperature.
Week 4	Environmental Treatment: Metabolism of Nitrogen compounds, Source of nitrogen compounds, nitrogen removal: ammonification, nitrification, and denitrification, Metabolism of phosphorous compounds, Metabolism of Sulphur compounds, Reduction of CO ₂ emission through biological treatment, Wastewater treatment (Algal photosynthesis), Eutrophication, Eutrophication causes and treatment
Week 5	Biodegradation, Factors that effect in biodegradation, Types of hydrocarbons highly hazardous and poisoning, Examples of microbial strains with suitable degradative potentials, Aerobic and anaerobic degradation, Some anaerobic process which, may occur in some soils or sediments, The advantages and disadvantages of anaerobic process, Sequential degradation.
Week 6	Biodegradation OF HERBICIDES AND PESTICIDES, Co-metabolism of MCA and MCPA, Biodegradation OF HYDROCARBONS, (a) Aliphatic hydrocarbons (b) Aromatic hydrocarbons, Biodegradation OF SOME SPECIFIC WASTES , TESTING FOR BIODEGRADABILITY.
Week 7	Mid-term Exam.
Week 8	Bioremediation of Environmental Pollutants, Principles of Bioremediation, Characteristics of Microbial Populations for Bioremediation Processes, Mechanisms of oxidation, Environmental Factors effects bioremediation: Nutrients, temp. etc. Bioremediation Strategies: <i>in situ</i> bioremediation: Bioventing, Biosparging and Bio-augmentation, Ex situ bioremediation: Land farming, Composting and Bioreactors, Advantages and disadvantages of bioremediation
Week 9	Bio surfactant in microbiology and biotechnology, Biosurfactant Classification and Their Microbial Origin, The mechanisms of biosurfactant interaction with cell membrane of Gram negative bacteria, Major biosurfactant classes and microorganisms involved, Physiological Role of Biosurfactants, Kinetics of biosurfactant production, Advantages of biosurfactants

	compared to their chemically synthesized surfactant, Applications of Biosurfactants in different fields.
Week 10	Bio sorption or Metal Uptake (Recovery) By Microorganisms, Metal recovery by microbes: bioleaching, bio sorption, direct or indirect leaching process, BIOSORPTION, Bio - Sorbent Microbial Groups: Bacteria, Fungi, Microbial Mechanisms for Removal of Metal Ions: Immobilization, Volatilization, Extracellular Precipitation, intracellular Accumulation, Oxidation-reduction Reactions, Adsorption to Cell Surfaces
Week 11	Microbial pesticides, Advantages of Microbial pesticides, Disadvantages of Microbial Pesticides, Bacteria pesticides: <i>Bacillus</i> sp., Mechanism of action of <i>Bacillus thuringiensis</i> on caterpillars, Bt formulations that are now commercially available, maximize the effectiveness of Bt treatments.
Week 12	Mechanisms of biological control: Direct antagonism, Types of interspecies antagonisms leading to biological control, Antibiotic-mediated suppression, Some of antibiotics produced by microorganism for pest suppression, Lytic enzymes and other microbial byproducts for pest control.
Week 13	Anaerobic processes and bioenergy: anaerobic digestion, anaerobic filters, up flow anaerobic sludge blanket reactors; Treatment of dairy, fertilizer, tannery, sugar, and antibiotic industries waste waters.
Week 14	Solid wastes treatment: sources and management (composting, worm culture and methane production).
Week 15	Biomedical waste treatment; sources; types; collection; and treatment
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Introduction to environmental Biotechnology
Week 2	Bioremediation, basic strategies, factors affect Bioremediation, Biostimulation, laboratory procedure
Week 3	Bioabsorption of heavy metal by microorganism
Week 4	Biodegradation of Phenol compounds
Week 5	Biodegradation of hydrocarbone compounds
Week 6	Biodegradation of aromatic hydrocarbone
Week 7	Bioflim, stages for biofilm formation, types of pollutants remediated by Biofilms, lab. procedure
Week 8	Production of biosurfactant by bacteria, application of biosurfactant, groups of biosurfactant, substrates of biosurfactant

Week 9	Production of cellulase by microorganism
Week 10	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	1. Chatterji, A.K. 2003. Introduction to Environmental Biotechnology. 2. Eugenia, et. al., 2003. Environmental Biotechnology and cleaner process. 3. Thomas, D. B., 1990. Biotechnology: A text book of industrial microbiology.	Yes
Recommended Texts	Waste water microbiology third edition Environmental biotechnology, second edition	Yes
Websites		

Grading Scheme مخطط الدرجات				
Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
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Ministry of Higher Education and
Scientific Research - Iraq
University of Baghdad
College of Science
Department of Biotechnology



MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Antibiotics		Module Delivery	
Module Type	Core		<input checked="" type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar	
Module Code	BIOT36029			
ECTS Credits	5			
SWL (hr/sem)	125			
Module Level	1 UGIII	Semester of Delivery		6
Administering Department	Type Dept. Code	College	Type College Code	
Module Leader	Dr suhad saad Mahmood		e-mail	suhad.mahmood@sc.uobaghdad.edu.iq
Module Leader's Acad. Title	Professor		Module Leader's Qualification	Ph.D.
Module Tutor			e-mail	E-mail
Peer Reviewer Name			e-mail	
Scientific Committee Approval Date	6/8/2025		Version Number	1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		Semester	
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	<p>50. Understand the Principles of Antimicrobial Therapy</p> <p>51. Explore Bacterial Resistance Mechanisms</p> <p>52. Recognize the Clinical Use of Antibiotics</p> <p>53. Interpret Antibiotic Susceptibility Testing</p> <p>54. Understand the adverse effects, contraindications, and drug interactions of common antibiotics.</p> <p>55. Introduce newer antibiotics and strategies to combat multidrug-resistant organisms (MDROs).</p>
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	<p>Describe the major classes of antibiotics and their mechanisms of action against bacterial targets.</p> <p>Differentiate between bactericidal and bacteriostatic agents based on their effects on microbial cells.</p> <p>Explain how bacteria acquire and express resistance through genetic and biochemical mechanisms.</p> <p>Interpret antibiotic susceptibility testing results (e.g., MIC, zone of inhibition) and apply them to clinical decision-making.</p> <p>Evaluate the appropriate use of antibiotics for various types of infections based on pathogen, site, and host factors.</p> <p>Discuss the principles and importance of antimicrobial stewardship in reducing resistance and preserving antibiotic efficacy.</p> <p>Identify common adverse effects and contraindications of major antibiotic classes.</p> <p>Apply knowledge of combination antibiotic therapy to clinical scenarios involving resistant or mixed infections.</p> <p>Analyze current trends and challenges in antibiotic resistance and new</p>

	<p>antibiotic development.</p> <p>Demonstrate responsible attitudes towards the use of antibiotics in clinical and public health settings.</p>
<p>Indicative Contents المحتويات الإرشادية يتضمن الكلمات المفتاحية المهمة للمحاضرات</p>	<ul style="list-style-type: none"> □ Introduction to Antimicrobials <ul style="list-style-type: none"> • History and discovery of antibiotics • Classification: antibacterial, antifungal, antiviral, antiparasitic agents □ Mechanisms of Action <ul style="list-style-type: none"> • Inhibition of cell wall synthesis (e.g., beta-lactams, glycopeptides) • Inhibition of protein synthesis (e.g., aminoglycosides, tetracyclines, macrolides) • Inhibition of nucleic acid synthesis (e.g., quinolones, rifampicin) • Disruption of cell membrane function (e.g., polymyxins) • Antimetabolites (e.g., sulfonamides, trimethoprim) □ Pharmacokinetics and Pharmacodynamics of Antibiotics <ul style="list-style-type: none"> • Absorption, distribution, metabolism, and excretion • Time-dependent vs. concentration-dependent killing □ Antibiotic Resistance <ul style="list-style-type: none"> • Types: intrinsic, acquired, adaptive • Mechanisms: enzyme production (e.g., beta-lactamases), efflux pumps, target modification • Horizontal gene transfer and mobile genetic elements □ Antibiotic Susceptibility Testing <ul style="list-style-type: none"> • Methods: disk diffusion, MIC, E-test, automated systems • Interpretation and clinical relevance □ Clinical Use of Antibiotics <ul style="list-style-type: none"> • Empirical vs. targeted therapy • Site-specific antibiotic selection (e.g., CNS, respiratory, urinary tract infections) • Narrow vs. broad-spectrum antibiotics □ Adverse Effects and Toxicity <ul style="list-style-type: none"> • Allergic reactions, organ toxicity, Clostridioides difficile infection • Drug-drug interactions □ Antibiotic Stewardship <ul style="list-style-type: none"> • Strategies to promote appropriate use • Role of guidelines and infection control policies □ Combination Therapy and Synergy <ul style="list-style-type: none"> • Rationale and clinical scenarios • Synergistic and antagonistic combinations □ Emerging Antibiotics and Global Challenges <ul style="list-style-type: none"> • Multidrug-resistant organisms (MDROs) • Novel antibiotic development and resistance surveillance □ Case Studies and Clinical Applications <ul style="list-style-type: none"> • Interpretation of lab reports • Selection of appropriate antibiotic regimens

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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
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Strategies	<ol style="list-style-type: none"> 1. Lectures with Visual Aids <ul style="list-style-type: none"> ○ Use PowerPoint slides, infographics, and animations to explain complex mechanisms (e.g., bacterial resistance, antibiotic action). ○ Highlight key concepts using case-based discussion points. 2. Case-Based Learning (CBL) <ul style="list-style-type: none"> ○ Present clinical scenarios to encourage application of knowledge to real-life antibiotic selection and resistance interpretation. 3. Small Group Discussions <ul style="list-style-type: none"> ○ Encourage students to discuss antibiotic choices, resistance patterns, and stewardship challenges in small peer groups. 4. Interactive Quizzes and Polls <ul style="list-style-type: none"> ○ Use tools like Kahoot, Socrative, or in-class polling to review material and identify areas needing clarification. 5. Laboratory Practical Sessions (if applicable) <ul style="list-style-type: none"> ○ Hands-on training in antibiotic susceptibility testing (e.g., Kirby-Bauer method, MIC determination). 6. Problem-Based Learning (PBL) <ul style="list-style-type: none"> ○ Guide students through structured clinical problems that require integrating microbiology, pharmacology, and patient care. 7. Role-Playing / Simulated Prescribing <ul style="list-style-type: none"> ○ Have students act as clinicians, interpreting culture results and selecting antibiotics using guidelines and evidence. 8. Research and Presentation Projects <ul style="list-style-type: none"> ○ Assign topics like "Recent advances in antibiotic development" or "Global strategies to combat AMR" for student-led presentations. 9. Flipped Classroom <ul style="list-style-type: none"> ○ Assign recorded lectures or readings before class, using in-person time for active problem-solving or discussion. 10. Guest Lectures <ul style="list-style-type: none"> • Invite infectious disease specialists or pharmacists to provide real-world perspectives on antimicrobial therapy and stewardship. 11. Use of E-learning Platforms
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	<ul style="list-style-type: none"> Provide access to online modules, WHO AMR resources, or antimicrobial prescribing tutorials.
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Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا تملئ من قبل المقررية			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4.26
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	61	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.06
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1, 3, 5, 8 and 12
	Assignments	2	10% (10)	2, 12	LO # 2, 4, 6 and 9
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 3, 5, 6 and 9
Summative assessment	Midterm Exam	2 hr.	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Antibiotics, History, discovery, classification of antibiotics Lecture + introductory quiz
Week 2	Mechanisms of Action I Cell wall inhibitors (e.g., beta-lactams, glycopeptides) Visual aids, mechanism animation, MCQs

Week 3	Mechanisms of Action II ,Protein synthesis inhibitors (e.g., aminoglycosides, macrolides, tetracyclines), Case comparisons: bacteriostatic vs. bactericidal
Week 4	Mechanisms of Action III DNA/RNA synthesis inhibitors (e.g., quinolones, rifampin), membrane disruptors, antimetabolites Drug matching exercise
Week 5	Mechanisms of Action III ,DNA/RNA synthesis inhibitors (e.g., quinolones, rifampin), membrane disruptors, antimetabolites ,Drug matching exercise
Week 6	Mechanisms of Resistance, Enzymatic degradation, efflux pumps, target modification, biofilms, genetic transfer, Video + worksheet + discussion
Week 7	Mid-term Exam.
Week 8	Laboratory Identification & Susceptibility Testing ,Culture-based methods, MIC, disk diffusion, E-test, interpreting antibiograms ,Practical lab session or virtual simulation
Week 9	Adverse Effects & Toxicity, Common side effects, hypersensitivity, nephrotoxicity, hepatotoxicity, C. difficile ,Adverse event case studies
Week 10	Antibiotic Combination Therapy Synergism, antagonism, clinical uses (e.g., TB, endocarditis), fixed-dose combinations Group presentations on combination regimens
Week 11	Antibiotic Stewardship & Global ChallengesPrinciples of stewardship, overuse/misuse, hospital protocols, WHO & CDC initiatives Guest lecture or stewardship simulation
Week 12	Emerging Threats & New Antibiotics MDR, XDR organisms, novel agents, resistance surveillance programs Research posters or peer-reviewed article discussions
Week 13	Emerging Threats & New Antibiotics MDR, XDR organisms, novel agents, resistance surveillance programs Research posters or peer-reviewed article discussions
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Introduction to Lab Safety & Aseptic Technique - Understand lab safety protocols - Perform aseptic techniques for culture handling - Use of biosafety cabinets - Streak plating and pipetting practice
Week 2	Antibiotic-Producing Microorganisms- Isolate potential antibiotic-producing soil microbes- Soil dilution plating- Primary screening (cross-streak method)
Week 3	Kirby-Bauer Disk Diffusion Method- Learn disk diffusion technique - Interpret zone of inhibition- Inoculation of Mueller-Hinton agar- Apply antibiotic disks- Measure zonesLab report with results and interpretation

Week 4	Determination of Minimum Inhibitory Concentration (MIC) - Understand MIC and dilution principles - Broth dilution method or E-test- Analyze turbidity and growth MIC chart + comparative table
Week 5	Effect of Antibiotics on Gram-Positive vs. Gram-Negative Bacteria- Compare antibiotic sensitivity across cell wall types - Parallel testing on E. coli and S. aureus
Week 6	Combination Therapy and Synergy Testing - Understand synergy/antagonism - Checkerboard assay or disk diffusion synergy test
Week 7	Antibiotic Susceptibility Profile Report (Capstone Lab) - Apply all techniques to analyze a clinical isolate - Receive unknown sample - Perform ID, disk diffusion, MIC
Week 8	Screening for Antibiotic-Producing Microbes - Isolate soil bacteria - Understand natural antibiotic production - Soil dilution - Streaking onto actinomycete agar - Cross-streak method
Week 9	Lab Orientation, Biosafety & Aseptic Technique - Understand BSL-2 safety - Master sterile handling of bacteria - Aseptic technique practice - Inoculation of sterile broth/plates
Week 10	Exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Microbiology	Yes
Recommended Texts	no	Yes
Websites		



Grading Scheme

مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors

	C – Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

	<p>Ministry of Higher Education and Scientific Research - Iraq University of Baghdad College of Engineering Department of Electrical Engineering</p>	
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MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسي

Module Information معلومات المادة الدراسية			
Module Title	Scientific Research Methodology		Module Delivery
Module Type	Basic		<input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar
Module Code	UOB309		
ECTS Credits	1		
SWL (hr/sem)	25		
Module Level	UGIII	Semester of Delivery	
Administering Department	Type Dept. Code	College	Type College Code

Module Leader	Dr. Ali A. Alzubadi	e-mail	ali.kareem@sc.uobaghdad.edu.iq
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	None	e-mail	None
Peer Reviewer Name	Prof. Assist. Dr. Auday H. Shaban	e-mail	auday.h@sc.uobaghdad.edu.iq
Review Committee Approval	6/8/2025	Version Number	1.0

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	
Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية			
Module Aims أهداف المادة الدراسية	<ul style="list-style-type: none"> Preparing the student to the basic principles of the scientific method and to be able to locate information necessary to conduct research. Teaching the student to be capable of critically reviewing research. Give a knowledge to write a good scientific paper and reports and to present findings to colleagues. Also understand the ethics. 		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> The student will acquire knowledge of the basic principles of the scientific method. The student will be able to locate information necessary to conduct research, to use computerized databases, and be familiar with psychology web-based resources. The student will be capable of critically reviewing research reports and to synthesize a body of literature. The student will be able to develop testable hypotheses. The student will be knowledgeable of general research designs, experimental methods, and good research practices. They will be able to select appropriate experimental designs to test hypotheses. The student will understand the ethical treatment of human and animal participants in research and will be knowledgeable of the institutional requirements for conducting research. The student will be able to conduct simple statistical analyses of data and to interpret the results of the analyses. 		

	<p>8. The student will be able to draw conclusions from the research and to assess the generalizability of study results.</p> <p>9. The student will be able to write research reports and to present findings to colleagues.</p>
<p>Indicative Contents المحتويات الإرشادية</p>	<p>Quantitative research is about the collection and analysis of numerical data. It typically involves the collection of data through methods like surveys. Researchers analyze that data through various methods of mathematical and statistical analysis. Quantitative research is done in a wide range of fields, such as economics, marketing, public health, and psychology, and includes methods like the following</p>
<p>Learning and Teaching Strategies استراتيجيات التعلم والتعليم</p>	
<p>Strategies</p>	<p>The main strategy that will be adopted in delivering this module is to encourage students' participation in the discussions, dialogues and group work lectures & exercises, while at the same time refining and expanding their critical thinking skills. There are many teaching and learning methods used, and the most important of these methods are:</p> <p>Theoretical lecture, discussion and dialogue, panel discussions on certain topics, theoretical student research</p> <p>Library and electronic activities (which helps students to reach the following results:</p> <ol style="list-style-type: none"> 1- The scientific ability to distinguish between correct information and wrong information. 2- Ease of scientific drafting and ease of correction. 3. Ability to memorize and guess. 4- The ability to link concepts and principles with reality. 5. Ability to invoke, link, interpret.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	18	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	1.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	7	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	0.46
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	25		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Attending lectures	1	10%(10)	all	continue
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الأسبوعي النظري مادة منهجية البحث	
Material Covered	<u>Research Methodology</u>

Week 1	1. Research Methodology: (a) A review of the Fundamentals (b) Definitions of Research (c) Objectives of Research
Week 2	(a) Motivation in Research (b) General Characteristics of Research (c) Types of Research
Week 3	2. The Research Problem (a) What is a Research Problem (b) Selecting the Problem
Week 4	(a) Sources of the Problem (b) Statement of a Problem (c) Evaluation of a Problem
Week 5	3. The Review of Literature (a) Meaning of Review of Literature (b) Objectives of Review of Literature
Week 6	(a) Sources of Literature (b) Reporting the Review of Literature
Week 7	4. The Research Approach (a) The Qualitative Approach (b) The Quantitative Approach
Week 8	(a) The Mixed-Methods Approach (b) Criteria for Selecting a Research Approach
Week 9	5. Data Collection Methods (a) Questionnaires (b) Interviews
Week 10	(a) Focus Groups (b) Observation
Week 11	1. Sampling (a) Meaning and Definition of Sampling
Week 12	(a) Functions of Population and Sampling (b) Methods of Sampling
Week 13	1. Preparation of the Research (a) Characteristics of a Good Research Title
Week 14	(b) Structure of research paper: (1) Abstract (2) Introductions (3) Review of the literature

	(4) Methodology (5) Result & Discussions (6) Conclusions (7) References
Week 15	Preparatory Week
Week 16	Final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Research Methodology by Ashish Kumar Sharma (2020)	Yes
Recommended Texts	Scientific Research Methodology by Alejandro Drewes (2021)	Yes
Websites		

APPENDIX:

GRADING SCHEME

مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 - 49)	FX - Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F - Fail	راسب	(0-44)	Considerable amount of work required

Note:

NB Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.



