جامعة ديالى
كلية العلوم
قسم التقنيات الاحيائية

Level Four
(UGIV)
Semester Seven

	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	Principles of Genetic Engineering		**Module Delivery**	
Module Type	Core		☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	BIOT47030			
ECTS Credits	6			
SWL (hr/sem)	150			
Module Level	UGx11 UGIV	**Semester of Delivery**	7	
Administering Department	Type Dept. Code	**College**	Type College Code	
Module Leader	Reema Mohammed Abed	**e-mail**	Reema.abed@sc.uobaghdad.edu.iq	
Module Leader's Acad. Title	Assistant Professor	**Module Leader's Qualification**	Ph.D.	

Module Tutor	Name (if available)	**e-mail**	E-mail
Peer Reviewer Name	Abdulkareem Al-kazaz	**e-mail**	Abdulkareem.alkazaz @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	
Module Aims أهداف المادة الدراسية	1- To develop knowledge skills and understanding of principle of genetic engineering through some application techniques. 2- To understand the manipulation and modifying of the genetic material of an organism to incorporate desirable traits. 3- To understand extraction and isolation of DNA from prokaryotes and eukaryotes types and determine the purity and concentration of extracted DNA 4- This course deals with the basic concept of cloning. 5- This is the basic subject for recombinant DNA technology 6- To perform practical analysis.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. List the various terms associated with genetic engineering. 2. Recognize how to select the desired gene 3. Summarize what is meant by cloning vectors. 4. Recognize how insert the recombinant DNA into the host 5. discuss the maintaining the introduced DNA in the host so that it is passed on to the next generation 6. Define and describe recombinant DNA technology requires various tools like vector, host and enzymes such as restriction enzymes, ligases, polymerases 7. Identify the basic of transformation. 8. Discuss the features of vectors. 9. Discuss the various properties of plasmids.

	10. Explain the type's restriction enzymes and how they work.
Indicative Contents المحتويات الإرشادية يتضمن الكلمات المفتاحية المهمة للمحاضرات	The indicative content of **principles of genetic engineering** includes the following: **Lec. 1: Gene anatomy** -definitions, structure of genes, sequencing of genes, how to resolve the question on gene structure. **Lec. 2: Introduction to genetic engineering** – definition, discuss some terms regarding to genetic engineering like recombinant DNA, *genetic manipulation.* **Lec. 3: Cloning Steps-** discuss steps of cloning in brief which include extraction of desired gene, extraction of vectors, using restriction enzyme to cut desired gene and vectors , ligation. **Lec. 4: Isolation of total DNA**-explain how to extract the total DNA by different techniques. **Lec 5: : Isolation of plasmid-** explain how to extract the DNA of plasmid by different techniques **Lec 6: Introduction of restriction enzymes**- definition,nomenclature ,main features of restriction enzymes. **Lec 7: Types of restriction enzymes**, , functions, structures ,recognition site , differences between types. **Lec 8: Factor affecting on restriction enzymes** -explain the factors: tempreture, buffer capacity, concentration of DNA, concentration of enzyme. **Lec 9: Introduction to cloning vectors-** definition, explain the best feature of cloning vectors **Lec 10: Types of cloning vectors,** functions of cloning vectors and how can use them in genetic engineering. **Lec 11: Plasmids**, types of plasmids, how can insert gene in to them, the best plasmid and its features. **Lec 12**: **Phages,** types of phages, discuss how can insert gene in to them, the best phage and its features. **Lec 13: Cosmids**, types of cosmids, discuss how can insert gene in to them, its features.

	Lec 14: Expression vectors, types, and discuss how can use them in genetic engineering. **Lec 15: Application of cloning vectors in genetic engineering,** discuss how can use them in genetic engineering. And how can the use in cloning experiment.

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	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

As		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)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
Week	**Material Covered**
Week 1	Gene anatomy
Week 2	Introduction to genetic engineering
Week 3	Cloning Steps
Week 4	Isolation of total DNA
Week 5	Isolation of plasmid
Week 6	Introduction of restriction enzymes
Week 7	Types of Restriction enzymes + mid exam
Week 8	Factor affecting on restriction enzymes
Week 9	Introduction to cloning vectors
Week 10	Types of cloning vectors

Week 11	plasmids
Week 12	phages
Week 13	cosmids
Week 14	expression vectors
Week 15	Application of cloning vectors in genetic engineering

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
Week	**Material Covered**
Week 1	Buffer and solutions
Week 2	Total DNA extraction from prokaryotes (bacteria)
Week 3	Total DNA extraction from eukaryotes (human blood)
Week 4	Total DNA extraction from eukaryotes (plants)
Week 5	DNA plasmid extraction from prokaryotes(bacteria)
Week 6	DNA concentration and purity Measurement
Week 7	Electrophoresis for extracted DNA
Week 8	Retrieval of electrophoresis DNA
Week 9	Restriction and ligation
Week 10	Transformation and transduction
Week 11	PCR technique and types of PCR
Week 12	Types of mutagenesis
Week 13	Review and rendering all labs

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	مبادئ الهندسة الوراثية للدكتور غالب البكري	Yes
Recommended Texts	-Puehler, A. *et al*, A.K. 1984.Advanced molecular genetics - Rogen L., 1999. Applied molecular genetics. -Leland, H. *et al*. 2019. Genetics	No
Websites	www. Genetic genie.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
	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	Animal Tissue Culture			**Module Delivery**	
Module Type	Core			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	BIOT47031				
ECTS Credits	6				
SWL (hr/sem)	150				
Module Level	UGx11 UGIV		**Semester of Delivery**	7	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Dr. Maha Fakhry Majeed		**e-mail**	E-mail	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Dr.Marwa Ibrahim Salman		**e-mail**	E-mail	
Peer Reviewer Name	Mahfoodha Abbas Umran		**e-mail**	Mahfoodha.umram@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**	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	It provides insights into the application of tissue culture on animal cells and particularly human cells. Animal cell culture has been one of the most important tools for biomedical and clinical research and have many application to teach students which including: **1. Model Systems**: Culturing and maintaining the cells 2. **Toxicity Testing** 3. **Cell-based Manufacturing** 4. **Drug Screening and Development** 5. **Cancer Research, and Stem Cell Therapy** 6. **Gene Therapy and Virology** 7. **Genetic Engineering facilitated the production of recombinant proteins**
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. • Knowledge and understanding the students able to know how to use different sources of tissues 2. • Cognitive skills (thinking and analysis). The students will learn the ability to correlate between different biological samples and show the importance of different media in tissue culture 3. • Communication skills (personal and academic). 4. • Practical and subject specific skills (Transferable Skills). The ability to handle different sources for tissue culture 5. Understand the techniques used in tissue culture. 6. * Describe the Equipment's used on tissue culture. 7. * Understand the safety procedures need for tissue culture.
Indicative Contents المحتويات الإرشادية يتضمن الكلمات المفتاحية المهمة للمحاضرات	Indicative content includes the following 1. Explant tissue culture 2. Cell cultures, Cell lines growth and maintenance 3. Cell culture media, cell proliferation and preserved cells 4. Cell culture products 5. Cell culture contaminations 6. Cell culture applications.

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 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.

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					
As		**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	
Week	**Material Covered**
Week 1	**1.**Introduction and Historical background in tissue culture &terms in tissue culture
Week 2	**2.** Origin of culture cells, **Initiation of the Culture, Evolution of Cell Line**
Week 3	**3.** The culture environment, **Cell Adhesion Molecules , Intercellular Junction**
Week 4	**4.** Subculture and cell line , **Cross-contamination and Misidentification**
Week 5	**5.** Differentiation of cells, **Maintenance of Differentiation**
Week 6	**6.** Choosing a cell line , Routine Maintenance
Week 7	**7.** Med exam
Week 8	**8.** Principle of Cell cloning &selection , A- Isolation techniques for Monolayer clone
Week 9	**9.** Cell separation: Suspension &Others
Week 10	**10.** Cell Interaction with substrate**:** Nature of Substrate
Week 11	11.Quantitation : CELL Counting
Week 12	12 Cell Proliferation: Growth Cycle
Week 13	**13.** Mammalian cell products : Basic and application of cell culture
Week 14	**14.** Viral vaccines, Monoclonal antibodies / Recombinant proteins (part I)
Week 15	**15.** Glycoprotein from mammalian cells / Interferons, plasminogen &Blood clotting (part II)
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
Week	**Material Covered**
Week 1	• Sterilization of glassware and preparation of media
Week 2	• Morphology of cells in culture (cell types)
Week 3	• Cell culture contamination
Week 4	• Preparation of Primary cell culture, Culture of chick embryo fibroblast
Week 5	• Secondary cell culture, (Subculture)
Week 6	• Exam
Week 7	• Maintains of cell culture
Week 8	• Counting of cells by direct methods
Week 9	• Cryopreservation
Week 10	• Determination of cytotoxicity (MTT assay)
Week 11	• Isolation of stem cells from Bone marrow / mice
Week 12	• Isolation of stem cells from Adipose tissue
Week 13	• Immunoflurocnce characterization
Week14	• / Preparation to final Examin

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	none	-

Recommended Texts	Cell Culturing Theory and Practice, Ed. By Tim Walton Animal Cell Culture And Technology, (2005) 2nd By Michael Butler	yes
Websites	***https://www.ncbi.nlm.nih.gov*** ***https://www.atcc.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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	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

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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	Plant tissue culture			**Module Delivery**	
Module Type	Core			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	BIOT47032				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level	UGx11 UGIV		**Semester of Delivery**		
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Zainab Farqad Mahmood		**e-mail**	Zainab.mukhtar@sc.uobaghdad.edu.iq	
Module Leader's Acad. Title	Doctor		**Module Leader's Qualification**		Ph.D.
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Majid Rasheed Majeed		**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	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	This course includes covering the concepts of plant tissue culture, which aims to: 1. Dealing with the technique of culturing different plant tissues in order to give a whole plant (embryonic cells). 2. Single cells or parts of leaves, stems or roots can be used to produce a new plant on a culture medium that provides the required plant nutrients and hormones. 3. The purpose of this study is to produce mature plants quickly and propagate plants in the absence of seeds or to create a whole plant starting from its cells as well as to rule out viral infections or other pathogenic infections. 4. The student will be able to draw a clear idea about the subject of plant tissue culture. 5. The student can design a biological experiment for successful tissue culture according to the requirements for healthy plant growth. 6. The student is able to deal with a well-thought-out technique with the plant parts required to be cultivated. Each part has its own characteristics and exact requirements
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	7. Enable the student to know the meaning of plant tissue culture through examples, images and sensory samples 8. Learn about the importance of plant tissue culture 9. Learn how to create plant tissue cultures 10. Identify the types of plant tissue cultures and their applications 11. Identify a unique phenomenon of plant tissues, which is a Totipotency phenomenon 12. Identify the stages and types of development of the fetus 13. Learn how diversified cultures work (protoplasts) 14. Learn how diversified farms work (meristem) 15. What are secondary metabolites and why are they important? 16. How to produce seeds artificially?? 17. How to produce genetically modified plants? 18. How to produce nanoparticles and their importance in plant tissue culture? 19. Learn how to prepare industrial seeds
Indicative Contents	Indicative content includes the following.

المحتويات الإرشادية يتضمن الكلمات المفتاحية المهمة للمحاضرات	The concept of plant tissue culture and its importance The spread and development of plant tissue culture throughout history Stimulation of callus cultures from different plant sources and their applications Plant cell cultures and their applications Totipotency, cellular differentiation, and organogenesis in P.T.C Somatic embryogenesis and embryogenesis Protoplast cultures for plant improvement Meristem cultures for virus-free plants Secondary metabolites in P.T.C and their applications Industrial seed production and its importance Production of transgenic plants and their importance Nanoparticles and plant tissue culture Preparation of industrial seeds from somatic embryos

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	**Encourage students to participate in solving exercises and conducting field experiments while refining and expanding their critical thinking skills. As well as the use of data presentations and educational videos and scientific visits in addition to exams and quizzes.**

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					
As		**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	
Week	**Material Covered**
Week 1	Introduction to plant tissue culture

Week 2	The spread and development of plant tissue culture throughout history
Week 3	Stimulation of callus cultures from different plant sources and their applications
Week 4	Plant cell cultures and their applications
Week 5	Mid-term Exam.
Week 6	Totipotency, cellular differentiation, and organogenesis in P.T.C
Week 7	Somatic embryogenesis and embryogenesis
Week 8	Protoplast cultures for plant improvement
Week 9	Meristem cultures for virus-free plants
Week 10	Secondary metabolites in P.T.C and their applications
Week 11	Industrial seed production and its importance
Week 12	Production of transgenic plants and their importance
Week 13	Nanoparticles and plant tissue culture
Week 14	Preparation of industrial seeds from somatic embryos
Week 15	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
Week	**Material Covered**
Week 1	Lab 1: Introduction to plant tissue culture
Week 2	Lab 2: The spread and development of plant cultivation throughout history
Week 3	Lab 3: Stimulation of callus cultures from different plant sources and their applications Plant cell cultures and their applications
Week 4	Lab 4: Totipotency, cellular differentiation, and organogenesis in P.T.C
Week 5	Lab 5: Somatic embryogenesis and embryogenesis

Week 6	Mid-term Exam.
Week 7	Lab 6: Protoplast cultures for plant improvement
Week 8	Lab 7: Meristem cultures for virus-free plants
Week 9	Lab 8: Secondary metabolites in P.T.C and their applications
Week 10	Lab 9: Industrial seed production and its importance
Week 11	Lab 10: Production of transgenic plants and their importance
Week 12	Lab 11: Nanoparticles and plant tissue culture
Week 13	Lab 12: Preparation of industrial seeds from somatic embryos
Week 14	**Final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Plant biotechnology by Ramawatt K.G 2008 And Plant tissue culture by S.P.misra 2019	**Yes**
Recommended Texts	General Techniques of Plant Tissue Culture Dagla, H. R. (2012). Plant tissue culture. Resonance767-759 ,(8)17 , https://scholar.google.com/scholar?q=Plant+Tissue+Culture:+An+Introductory+Text&hl=en&as_sdt=0&as_vis=1&oi=scholart	**Yes**
Websites	Follow-up Internet references and research published in international journals, as well as recent books, if any, to keep up with the great development in the science of plant tissue culture	

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
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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	Immunogenetics			**Module Delivery**	
Module Type	Core			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	BIOT47033				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level	UGx11 UGIV		**Semester of Delivery**	7	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Dr. Ibtihal Abdulhadi Majeed		**e-mail**	Ibtihal.Majeed@sc.uobaghdad.edu.iq	
Module Leader's Acad. Title	lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Dr. Aseel shakir mahmood		**e-mail**	E-mail Aseel.mahmood@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	
Module Aims أهداف المادة الدراسية	1- This course will provide an essential grounding for understanding the genetic factors affecting immunity and leading to diseases. 2- To identify some genetic variants that dysregulate the normal immune pathways, thereby leading to immune disorders. 3- To understand the inheritance of tissue antigen and tissue compatibility 4- To develop practical skills in genetics and immunology
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Upon successful completion of this subject, students should: 1- Be able to define the genetic systems that encode molecules with integral roles in immune regulation 2- Assess the impact of allelic polymorphism in certain genes which lead to autoimmune diseases , Infectious diseases and Neurological diseases 3- Identify the immunogenetics and its applications . 4- Identify the MHC complex and their classes and the HLA typing 5- Understand the Immunoglobulin gene organization 6- Identify the ABO blood group genes 7- Understand the Role of Immunogenetics in anthropological studies 8- Define the Clinical applications of transplantation 9- Identify the Role of MicroRNAs in immunogenetic dysregulation 10- Be familiar with the safe use and application of some of the basic laboratory equipment used in immunological and genetic studies
Indicative Contents المحتويات الإرشادية يتضمن الكلمات المفتاحية المهمة للمحاضرات	The indicative content of immunogenetics includes the following. **Lec1: Introduction to the Immunogenetics**, origin and history **Lec 2: The major histocomtpatibility complex (MHC)**: definition, The Functions of MHC, Structure of MHC , MHC class I, MHC class II , MHC class III

	Lec 3 :Major histocompatibility complex genes: Human MHC Genes , Nomenclature of HLA Alleles. **Lec 4: Immunogenetics of Blood group**: introduction to ABO blood types , ABO blood group genes **Lec 5: Immunogenetics of immunoglobulins:** Immunoglobulin Structure , Immunoglobulin Classes, IMMUNOGLOBULIN GENE ORGANIZATION **Lec 6: Immunogenetics and Autoimmune diseases:** Autoimmunity and autoimmune genes , Rheumatoid arthritis , thyroid diseases, Type 1 diabetes mellitus, Systemic lupus erythematosus, Systemic sclerosis , Primary biliary cholangitis **Lec 7 : Mid-term Exam.** **Lec 8 : Immunogenetics and Neurological diseases**: Multiple sclerosis , Parkinson's disease, **Lec 9 : Immunogenetics and Infectious diseases**, Tuberculosis, human immunodeficiency virus , Hepatitis B virus (HBV) and hepatitis C virus (HCV) infection, Malaria **Lec 10 : Immunogenetic and infertility :** Introduction **, Role of immune system in infertility, Role of genetics in infertility** **Lec 11: immunogenetics: application and future perspectives** : Application of immunogenetics , Future perspectives of immunogenetics **Lec 12: Gene polymorphisms and their role in autoimmunity:** introduction to Gene polymorphisms , Major histocompatibility complex gene polymorphism and autoimmunity, Toll like receptors polymorphism and effects on autoimmunity **Lec 13: Immunogenetics and the transplantation :**Introduction , Transplantation antigens , The major histocompatibility complex and non-human leukocyte antigens and transplantation ,The allogeneic immune response ,Clinical applications of transplantation immunogenetics **Lec 14**: **Immunogenetics as a tool in anthropological studies :** Introduction, Human genetic diversity , HLA and KIR polymorphism, Gene frequency analysis , Estimation using linkage disequilibrium .

	Lec 15: MicroRNAs and their role in immunogenetic dysregulation :miRNA regulating immune response, miRNA and immune tolerance **Lec 16**: The preparatory week before the Final Exam

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 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 activitiesfor the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعاتملئ 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				
As	**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	
Week	**Material Covered**
Week 1	Introduction to immunogenetics.
Week 2	The major histocompatibility complex
Week 3	Major histocompatibility complex genes
Week 4	Immunogenetics of Blood group
Week 5	Immunogenetics of immunoglobulins
Week 6	Immunogenetics and Autoimmune diseases
Week 7	Mid-term Exam
Week 8	Immunogenetics and Neurological diseases
Week 9	Immunogenetics and Infectious diseases
Week 10	Immunogenetic and infertility
Week 11	immunogenetics: application and future perspectives
Week 12	Gene polymorphisms and their role in autoimmunity

Week 13	Immunogenetics and the transplantation
Week 14	Immunogenetics as a tool in anthropological studies
Week 15	MicroRNAs and their role in immunogenetic dysregulation
Week 16	The preparatory week before the Final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
Week	**Material Covered**
Week 1	Immunogenetics Introduction and background
Week 2	DNA Extraction
Week 3	Gel Electrophoresis
Week 4	Polymerase chain reaction sequence-based typing
Week 5	DNA polymorphisms techniques
Week 6	The enzyme-linked immunosorbent assay (ELISA) ELISA Analysis
Week 7	Exam + KIR Typing
Week 8	HLA typing
Week 9	Western blotting
Week 10	Review and rendering all labs

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Immunogenomics and Human Disease Edited by Andra´s Falus # 2006 John Wiley & Sons,	Yes

Recommended Texts	Immunogenetics: Methods and Protocols [Internet]. Langerak AW, editor. New York: Humana; 2022.	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	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Virology			**Module Delivery**	
Module Type	Core			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**BIOT47034**				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level	UGx11 UGIV		**Semester of Delivery**	7	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Dr. Wisal Salman Abd		**e-mail**	wisal.abd@sc.uobaghdad.edu.iq	
Module Leader's Acad. Title	Assistant Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Dr. Wssan Abbood		**e-mail**	Wasan.aboud@sc.uobaghdad.edu.iq	
Peer Reviewer Name	Dr.Jinan Alsaffar		**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	1. This course deals with the basic concept of virology. 2. To understand the role of virology in biotechnology field.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**1.** To Know what is the virus, Evolutionary origin of the virus, Classification of the virus and Principles of virus structure. **2.** To know Chemical composition of viruses and Cultivation assays of viruses. **3.** To study purification and identification of viruses, Laboratory safety and Reactions to physical and chemical agents. **4.** Replication of the viruses. **5.** To know Defective viruses, Interaction between viruses and Viral genomes as a vector. **6.** Pathogenesis and control of viral disease, modes of transmission of viruses and emerging viral disease. **7.** Classification of DNA enveloped viruses: Herpes viruses, Hepatitis B virus and Pox virus. **8.** Classification of Non enveloped viruses: Adeno viruses, Papilloma virus and Classification of RNA enveloped viruses: Respiratory viruses. **9.** Immunity &antibody production against viruses: Host immune response (Defense Mechanisms) The nonspecific immune defenses The specific immune defenses Activities of interferon Humoral immunity Cellular immunity **10.** To know pathogenesis and control of viral disease. Modes of transmission of viruses. Emerging viral disease. **11.** Prevention and treatment of viral infection **:** Antiviral Drug: Treatment for Flu and other Common Viruses Inhibiting DNA/RNA Synthesis Inhibiting Viral Entry/Exit Inhibiting Viral Spread Virotherapy **12.** Introduction of Vaccines: Viral vaccines: Types of viral vaccines and Perpetration of viral vaccines. **13.** Viral Vaccines: Passive immunization and active immunization
Indicative Contents المحتويات الإرشادية	Indicative content includes the following:-

يتضمن الكلمات المفتاحية المهمة للمحاضرات	Introduction to virology, evolution of viruses, viral classification, How differ from other microorganisms, structure of virus. Chemical composition and cultivation assays of virus. Isolation and purification of virus, laboratory safety reaction of physical and chemical agents. Replication cycle, viral genome and capsid arrangement. Defective viruses, Interaction between viruses, Viral genomes as a vector. Pathogenesis and control of viral disease, Modes of transmission of viruses, Emerging viral disease. Classification of DNA enveloped viruses, Herpes viruses, Hepatitis B virus ,Pox virus. Classification of Non enveloped viruses: Adeno viruses, Papilloma virus Classification of RNA enveloped viruses: Respiratory viruses. Immunity &antibody production against viruses: Host immune response (Defense mechanisms) The nonspecific immune defenses, The specific immune defenses, Activities of interferon, Humoral immunity, Cellular immunity Pathogenesis and control of viral disease, Modes of transmission of viruses, emerging viral disease. Prevention and treatment of viral infection, antiviral drug, treatment for flu and other common viruses, Inhibiting DNA/RNA Synthesis, inhibiting viral entry/exit, inhibiting viral Spread , Virotherapy. Viral vaccines, vaccine preparation. Passive immunization , active immunization

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.

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					
As		**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	
Week	**Material Covered**
Week 1	Introduction to virology, evolution of viruses, viral classification, How differ from other microorganisms, structure of virus.
Week 2	Chemical composition and cultivation assays of virus.
Week 3	Isolation and purification of virus, laboratory safety reaction of physical and chemical agents.

Week 4	Replication cycle, viral genome and capsid arrangement.
Week 5	Defective viruses, Interaction between viruses, Viral genomes as a vector.
Week 6	Pathogenesis and control of viral disease, Modes of transmission of viruses, Emerging viral disease.
Week 7	Mid-term Exam.
Week 8	Classification of DNA enveloped viruses, Herpes viruses, Hepatitis B virus ,Pox virus.
Week 9	Classification of Non enveloped viruses: Adeno viruses, Papilloma virus Classification of RNA enveloped viruses: Respiratory viruses.
Week 10	Immunity &antibody production against viruses: Host immune response (Defense mechanisms) The nonspecific immune defenses, The specific immune defenses, activities of interferon, Humoral immunity, Cellular immunity
Week 11	Immunity &antibody production against viruses: Host immune response (Defense mechanisms) The nonspecific immune defenses, The specific immune defenses, Activities of interferon, Humoral immunity, Cellular immunity.
Week 12	Pathogenesis and control of viral disease, Modes of transmission of viruses, emerging viral disease.
Week 13	Prevention and treatment of viral infection, antiviral drug, treatment for flu and other common viruses, Inhibiting DNA/RNA Synthesis, inhibiting viral entry/exit, inhibiting viral Spread, Virotherapy.
Week 14	Viral vaccines, vaccine preparation.
Week 15	Viral vaccines : Passive immunization , active immunization
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
Week	**Material Covered**
Week 1	Lab 1: Introduction to virology lab: History -virology laboratory and diagnosis
Week 2	Lab 2: Introduction to virology lab: Biosafety requirement
Week 3	Lab 3: -types of microscope used in detection: Direct detection of Virus
Week 4	Lab 4: Laboratory process : Collection of specimen -Transport of specimen -Specimen processing and inoculation -Virus Identification
Week 5	Lab 5: Virus culture and cultivation :

	-CPE -Haemagglutination -Plaque assay -TCID50 assay
Week 6	Lab 6: Detection of viral antibody: -Haemaglutination -Inhibition test -EIA\ELISA
Week 7	Lab 7: Detection of viral Antigen : -Immunofluorescence -EIA\ELISA -Western blot -Imunopreceptation
Week 8	Lab 8: Detection of viral genome: -PCR -Southern& northen blot
Week 9	Lab 9: Virus isolation: -animal Inoculation -Inoculation of egg
Week 10	Lab 10: Virus Isolation :In vitro cell culture
Week 11	Lab 11: Introduction to Vaccines :Typed of Vaccines
Week 12	Lab 12: Vaccine preparation :Types of preparation methods
Week 13	Lab 13: Vaccine production: Vaccine manufacturing process

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. Medical Microbiology	Yes

	Jawetz, Melnick, & Adelberg, Lange	
Recommended Texts	Medical microbiology Bailey & Scott's Diagnostic Microbiology	Yes
	Review of Medical Microbiology and Immunology PUBMed, Google scholar	
Websites	https://www.immunology.net	

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-Four
(UGIV)
Semester Eight

	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	Cytogenetics			**Module Delivery**	
Module Type	Core			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	BIOT48136				
ECTS Credits	6				
SWL (hr/sem)	150				
Module Level	UGx11 UGIV		**Semester of Delivery**	8	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Dr. Maha Fakhry Majeed		**e-mail**	E-mail	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**	E-mail	
Peer Reviewer Name	Mahfoodha Abbas Umran		**e-mail**	Mahfoodha.umran@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	1. Cytogenetic is the study of chromosomes structure and human chromosome number. 2. Cytogenetic is a vital tool to understanding how genetics play a role in the development and progression of certain diseases 3. Chromosomal Abnormalities: Aneuploidies in autosomal and sexsomal chromosome 4. Chromosome Abnormalities structure and their related to Cancer Cytogenetics. 5. Preparation of chromosomes, Visualization of chromosomes 6. Cytogenetic Methods and, detection specific disease by FISH, CISH 7. Detection DNA Deletion and Duplication and their Association with Genetic Disorders.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	8. Explain the organization and complexity of human genome. 9. Explain the nature variance in human genetics, 10. Understand the basic cell division of somatic cells and principles of Cytogenetics heredity in particular the inheritance patterns of human traits 11. Understand the basic principle of dividing gamete cells 12. Explain the gamete production in human 13. Knowledge of basic and essential parts of chromosome 14. Preparation of chromosomes laboratory tissue samples for cytogenetic diagnosis, and 15. Evaluation the cytogenetic examinations and techniques to prepare

	sample 16. Explain the essential elements of genetic counseling and indications for prenatal Diagnosis 17. Evaluate appropriately the family pedigree and the population and ethnic aspects of inherited disorders. 18. Explain the chromosomal abnormalities in clinical syndromes associated with cytogenetic disorders. 19. Knowledge association between structural chromosome abnormalities and some type of cancer 20. Evaluation the chromosome aberration and implication on human health and possible gene therapy.
Indicative Contents المحتويات الإرشادية يتضمن الكلمات المفتاحية المهمة للمحاضرات	Indicative content includes the following. *1.* DNA., Cell. Genetics *2.* Karyotype. *3.* Genetic disease development *4.* Fluorescence in Situ Hybridization. the molecular and cellular aspects of cytogenetic. *5.* Genetic analysis. *6.* Chromosome theory inheritnce *7.* . Population and evolution

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 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.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا تملئ من قبل المقررية			
Structured SWL (h/sem)	64	**Structured SWL (h/w)**	4.26

الحمل الدراسي المنتظم للطالب خلال الفصل		الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	86	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.06
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation تقييم المادة الدراسية					
As		**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	
Week	**Material Covered**
Week 1	• Scope in Genetics, Type of Genetics , Cytogenetic
Week 2	• Properties of Organic Preferntiated for Genetic Experiments, Main sources of variation
Week 3	• : Cell Division and Death, Cell cycle
Week 4	• *Mitosis—The Cell Divides and Control of the Cell Cycle*

Week 5	• *Meiosis*. reduction division (or meiosis I) • equational division (or meiosis II)
Week 6	• Gamete Maturation
Week 7	• Med exam
Week 8	• Following the Inheritance, Inheritance of One Gene— Segregation • Modes of Inheritance, Dominant and recessive alleles
Week 9	• Modes of Inheritance *Autosomal Dominant Inheritance* *Autosomal Recessive Inheritance*
Week 10	• Portrait of a Chromosome , Essential parts of chromosome
Week 11	• Visualizing Chromosomes, Obtaining Cells for Chromosome Study & ideogram
Week 12	• Abnormal Chromosome Number
Week 13	• Sex chromosome aneuploidy
Week 14	• Abnormal Chromosome Structure: Deletion , Duplication and translocation
Week 15	• Inversions ,Iso-chromosomes and Ring Chromosome
Week 16	• **Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
Week	**Material Covered**
Week 1	**1. Apparatus in cytogenetic laboratory**
Week 2	**2. Specific and component of media used in cell culture**
Week 3	**3. Mitosis and Meiosis showed by slides and video**
Week 4	**4. Culturing of blood lymphocyte from human**
Week 5	**5. Preparation of chromosome for visualization**
Week 6	**6. Chromosome Staining and examining the chromosome by Microscope**
Week 7	**7. Ordering chromosome as karyotype/ training**

Week 8	**8. Mid Exam.**
Week 9	**9. Cytogenetic Analysis Mitotic index and blast index &Micronucleus determination**
Week 10	**10. Calculation the Chromosome aberration**
Week 11	**11. Detection the abnormal chromosome structure**
Week 12	**12. Molecular Cytogenetic by FISH Technology**
Week 13	**13. Modern methods used in cytogenetic tests? Sister chromatid chromosome**
Week14	**14. Preparation for final examination**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	none	-
Recommended Texts	Human Cytogenetic Human Chromosome	yes
Websites	https:// www.cytogenetic.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
	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	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded

(0 – 49)	**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	Industrial biotechnology			**Module Delivery**	
Module Type	Core			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	BIOT48037				
ECTS Credits	6				
SWL (hr/sem)	150				
Module Level	**UGx1 UGIV**		**Semester of Delivery**	**8**	
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**	**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**	**1. Introduce the core concepts and scope of industrial biotechnology: To provide a foundation in the use of biological systems and organisms for large-scale industrial production.** **2. Explore the role of microorganisms and enzymes in industrial processes: To examine how microbial strains and biocatalysts are selected, engineered, and optimized for commercial use.** **3. Understand bioprocess design and integration: To develop knowledge of upstream (fermentation, biomass production) and downstream (product recovery, purification) processing.** **4. Examine key industrial applications of biotechnology: To study real-world production of biofuels, enzymes, organic acids, pharmaceuticals, and food ingredients.** **5. Promote sustainable and green biotechnological practices: To encourage the use of renewable resources and environmentally friendly processes in industrial production.** **6. Encourage innovation through metabolic engineering: To expose students to modern tools used for pathway design, genetic modification, and bioprocess optimization.**
Module Learning Outcomes **مخرجات التعلم للمادة الدراسية**	**1. Explain the principles and scope of industrial biotechnology** **o Define industrial biotechnology and distinguish it from traditional biotechnology.** **o Describe the role of biological systems in industrial-scale production processes.** **2. Identify and describe industrially important microorganisms and enzymes** **o Evaluate the selection and improvement of microbial strains for various industrial applications.** **o Discuss enzyme properties, production, and use in biocatalysis.** **3. Describe methods of product recovery, purification, and formulation.** **4. Apply metabolic and genetic engineering techniques for strain improvement** **o Explain examples of engineered pathways for the biosynthesis of key industrial products.** **5. Evaluate industrial applications of biotechnology in various sectors**

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies:	**Providing students with the basics and additional topics related to the outputs of thinking and analysis of biotechnologies.** **- Forming discussion groups during lectures to discuss topics in industrial 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.**
	o Examine case studies in biofuels, food ingredients, pharmaceuticals, and environmental biotech. **6. Interpret and assess bioprocess data** **o Analyze growth curves, yield coefficients, productivity, and process efficiency.** **o Use basic modeling or data analysis tools to optimize processes.**
Indicative Contents **المحتويات الإرشادية** **يتضمن الكلمات المفتاحية المهمة للمحاضرات**	**This course includes covering the concepts of (industrial biotechnology):** **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. Improve the productivity of these vital compounds by applying all modern techniques of genetic engineering and metabolic engineering.**

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**	**4.06**
Total SWL (h/sem)	**150**		

الحمل الدراسي الكلي للطالب خلال الفصل	

Module Evaluation تقييم المادة الدراسية					
As		**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)**		

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	راسب	0 - 49	Considerable amount of work required

Learning and Teaching Resources

Required Texts

- **Manual of Industrial Microbiology and Biotechnology (Third edition 2010) By Richard H. Baltz *et. al***
- **Principles of fermentation technology (second edition 2003) By Stanbury PF; Whitaker; Hall SJ**
- **Bioprocess Engineering: Basic concepts by Fikret Karg**

yes

Delivery plan (weekly Lab. Syllabus)

المنهاج الأسبوعي للمختبر

Week	Material Covered
Week 1-2	Definition and scope of Industrial Biotechnology
Week 3	Industrial microorganism: Isolation of industrial microorganism
Week 4	Ethanol: Production of ethanol by yeast using waste paper as a feedstock.
Week 5	First exam.
Week 6	Bacterial pigments: Production of pigments by *Serratia marcescens.*
Week 7	Bacteriocin: Production of bacteriocin from Bacillus isolate.
Week 8	Protease: Production of protease by *Aspergillus niger* using solid State Fermentation
Week 9	Cellulase: Production of cellulase by soil microorganisms.
Week 10	Second exam.
Week 11	Production of amylase.
Week 12	Production of citric acid
Week 13	Production of glutamic acid
Week 13	Immobilization of enzymes
Week 14	Immobilization: Immobilization of industrial microorganisms.
Week 15	Semester exam.

Week	Material Covered
	Isolation of industrial microorganisms: from the soil and their potential to produce antibiotics.
	Improvement of industrial strains: Maintenance and preservation of industrial strains.
Week 4	Improvement of industrial strains: Optimizing the culture medium and growth conditions: Genetic modification: The selection of induced mutants synthesizing improved levels of primary metabolites: feedback inhibition and repression
	Improvement of industrial strains: The isolation of mutants which do not produce feedback inhibitors or repressors: Metabolic engineering
	Improvement of industrial strains: The isolation of induced mutants producing improved yields of secondary metabolites
	Production of microbial metabolites: Industrial microbiological products as primary and secondary metabolites
	Mid-term Exam
	Production of Ethanol: Biosynthesis of ethanol; Ethanol Production process; Flocculence and Cell Recycling
	Enzyme technology: Enzymes, Commercial production of enzyme; Improvement of enzyme production; improvement of enzymes production, enzyme immobilization
	Production of antibiotics: Why do microorganisms synthesize antibiotic: Strategies for the improvement of antibiotics production: Production of Penicillin: Commercial production of penicillin
	Microbial biomass production: Single cell protein; The choice of an organism for SCP production; Substrate for SCP production; Single cell protein production processes
	Production of amino acids: Production glutamic acid; production of Lysine
Week 14	Production of organic acids: production of Citric acid: Citric acid biosynthesis, Fermentation processes used in citric acid production
Week 15	Biotransformation process

Recommended Texts

1. Fermentation Microbiology and Biotechnology A.L Demain *et. al*
2. Practical Fermentation Technology Brian Mcneil & Linda M. Harvey

Fail Group (0 – 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail			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	Application of genetic engineering			**Module Delivery**	
Module Type	core			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	BIOT48038				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level	UGx11 UGIV		**Semester of Delivery**	8	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Abdulkareem Al-kazaz		**e-mail**	Abdulkareem.alkazaz @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	Reema Mohammed Abed		**e-mail**	Reema.abed@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	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	20. To develop knowledge skills and understanding genetic recombination techniques to manipulate gene sequences in plants, animals and other organisms to express specific traits. 21. To identify the locations and functions of specific genes in the DNA sequence of various organisms. Once each gene is classified, engineers develop ways to alter them to create organisms that provide benefits such as cows that produce larger volumes of meat, fuel- and plastics-generating bacteria, and pest-resistant crops. 22. This course deals with the basic concept of applications in medicine, research, industry and agriculture and can be used on a wide range of plants, animals and microorganisms. Understanding the basic subject of genetic engineering in medicine, genetic engineering has been used to mass-produce insulin, human growth hormones, follistim (for treating infertility), human albumin, monoclonal antibodies, anti-hemophilic factors, vaccines, and many other drugs. 23. To develop knowledge skills and understanding the genetic engineering in research, organisms are genetically engineered to discover the functions of certain genes. And in industrial applications include transforming microorganisms such as bacteria or yeast, or insect mammalian cells with a gene coding for a useful protein. Mass quantities of the protein can be produced by growing the transformed organism in bioreactors using fermentation, then purifying the protein. 24. Understanding the genetic engineering also in agriculture to create genetically-modified crops or genetically-modified organisms.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	11. List the various terms associated with application genetic engineering. 12. Recognize how to use ligase enzyme and understand ligation technique. 13. Summarize what is meant by transformation. 14. Recognize the selection of recombinant and gene structure 15. discuss the *in vitro* mutagenesis 16. Define and describe application of genetic engineering in medicine, industry and agriculture. 17. Discuss the DNA chips 18. Discuss the primer and probe design 19. Summarize what is meant by PCR, real time PCR and RFLP technique. 20. Discuss the genetic mapping.
Indicative Contents	The indicative content of **application of genetic engineering** includes the following:

المحتويات الإرشادية يتضمن الكلمات المفتاحية المهمة للمحاضرات	**Lec. 1: DNA ligation and joining methods**: definition, types of ligase and discuss the factors affecting ligation and how ligation occur. **Lec. 2: Transformation:** definition**,** history of transformation, transformation in gram negative and positive bacteria. **Lec 3: Selection of recombinants:** discuss the methods for screening or selection of recombinant clones. Direct selection of recombinants and indirect selection of recombinants **Lec. 4: Gene structure:** definition, sequencing of genes, how to resolve the question on gene structure. **Lec.5: *In vitro* mutagenesis**: definition, types of mutagens, discuss how mutagens change in DNA **Lec 6: Application of genetic engineering in medicine:** discuss gene therapy, vaccines, and hormones. **Lec 7: Application of genetic engineering in agriculture**: discuss the genetic engineering of some plant. Scientists have developed transgenic potato, tobacco, cotton, corn, strawberry, rape seeds that are resistant to insect pests and certain weedicides. **Lec 8: Application of genetic engineering in industry**: discuss the how to designe bacteria genetically and put into use for generating industrial chemicals. **Lec 9: DNA chips:** discuss DNA chip structure and operating principles, DNA chip design, DNA chip fabrication **Lec 10: Probe and primer design -** definition, explain the best program in designing of primer and probe and how design the primer and probe **Lec 11: PCR technique,** definition: types of PCR and explain the steps of PCR the temperatures used in PCR **Lec 12: Real-time PCR technique:** types of real-time PCR technique, discuss the gene expression and calculation the gene expression. **Lec 13**: **RFLP technique:** definition, discuss how the technique occur **Lec 14: genomic mapping:** Analyzing Sequence variation in genomic DNA, Improving Physical Maps, Reducing the Cost of Genomic DNA sequencing, Interpreting Genomic Sequence; and improving Data Analysis and Management.

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					
As		**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)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
Week	**Material Covered**
Week 1	DNA ligation and joining methods
Week 2	Transformation
Week 3	Selection of recombinants
Week 4	Gene structure
Week 5	*In vitro* mutagenesis
Week 6	Application of genetic engineering in medicine
Week 7	Application of genetic engineering in agriculture
Week 8	Application of genetic engineering in industry
Week 9	DNA chips
Week 10	Probe and primer design
Week 11	PCR technique
Week 12	Real-time PCR technique
Week 13	RFLP technique
Week 14	Genomic mapping
Week 15	The preparatory week before the Final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
Week	**Material Covered**
Week 1	Single nucleotide polymorphisms
Week 2	Sequencing
Week 3	Real time PCR
Week 4	Real time PCR experiment
Week 5	Exam
Week 6	Multiplex PCR
Week 7	Multiplex PCR experiment
Week 8	Cloning
Week 9	Cloning experiment
Week 10	Review and rendering all labs

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	مبادئ الهندسة الوراثية للدكتور غالب البكري	Yes
Recommended Texts	Puehler, A. *et al*, A.K. 1984.Advanced molecular genetics Rogen L., 1999. Applied molecular genetics. Leland, H. *et al.* 2019. Genetics	No
Websites	www. Genetic genie.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
	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	Genetic diseases and molecular diagnosis			**Module Delivery**	
Module Type	Core			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**BIOT48039**				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level	UGx11 UGIV		**Semester of Delivery**	8	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Name		**e-mail**	Aseel.mahmood@sc.uobaghdad.edu.iq Ramina.khoshaba@sc.uobaghdad.edu.iq Rasha.ali@ 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		**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	1. the study of how genes work and transmit information from parents to offspring. It can help us understand the risk of inheriting a genetic disease.. 2. the study and mapping of genomes – the full set of genetic instructions for an organism. It includes both human and other genomes and how these interact with the environment. This course deals with the basic concept of electrical circuits. 3. identify and diagnose genetic disorders and rare diseases 4. develop prevention strategies 5. tailor a patient's treatment.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. this module aims to address a major area of current medical research and to provide students with an understanding of the strengths and weakness of both the current subject knowledge in this area and the practical approaches to it. Understanding the genetics of complex disease has been identified as a major post-genome challenge 2. To inform students in genetic variation and the genetics of non-Mendelian (complex) disease. 3. To introduce students to the different strategies and information input required to identify genes in complex diseases. 4. To compare the various practical approaches used to identify the genetic basis of common disease and to elucidate the role of genes in common

	disease. 5. To outline the relevance and utility of genetic investigations to understanding the pathogenesis of common diseases. Discuss the basic principles and concepts of complex disease genetics as applied to a range of different diseases. 6. Describe the main research strategies and laboratory methods used in investigating the genetics of complex diseases 7. Select appropriate research strategies and laboratory techniques for identifying genes in complex disease: linkage analysis (family studies, sib-pair analysis) or association analysis (TDT or case-control studies) 8. Discuss and evaluate the appropriateness of these different research strategies and laboratory techniques for gene identification in complex diseases
Indicative Contents المحتويات الإرشادية يتضمن الكلمات المفتاحية المهمة للمحاضرات	Indicative content includes the following. <u>Part A - Circuit Theory</u> Genetic variation and the definition of complex genetic diseases. • How to identify and assess the heritable component of a complex disease. • Selecting and applying different research strategies. • Linkage versus association analysis. • Genome-wide association studies.

	• Data/results interpretation and use of computer packages for performing statistical genetic analysis • Knowledge of key examples of complex diseases, including examples such as: Diabetes, Oesteoarthritis, Alzheimer's Disease, Autism.

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 the following: - Providing students with the basics and additional topics related to the pre-skills education outcomes to solve scientific problems -Solve a set of practical examples by the academic staff -Students' participation during the lecture to solve some scientific issues - Summer training .

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					
As		**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	
Week	**Material Covered**
Week 1	Introduction in Genetics Disease, History, Genetic Basis of Disease, genetic variation,immutation
Week 2	Polycystic kidney disease, Symptoms,-Inheritance,genetics genes,Diagnosis-
Week 3	Burkitt's lymphoma,types,Genetics-,Symptoms,-Inheritance,Diagnos
Week 4	Multiple endocrine neoplasia, Genetics,Inheritance,-Molecular diagnosis
Week 5	Retinoblastoma, Genetics,Inheritance,-Molecular diagnosis
Week 6	NEUROFIBROMATOSIS,types, genes, Genetics,Inheritance,-Molecular diagnosis

Week 7	Congenital hypothyroidism, Genetics- Genetic cause of disease, , mechanism of disease, symptom, diagnosis by enzymatic reaction, diagnosis by sequencing , treatment, diet, fellow up
Week 8	cystic fibrosis, Cystic fibrosis, inheritance pattern of cystic fibrosis, mechanism of disease, respiratory sign and symptom, digestive sign and symptom, diagnosis by PCR , diagnosis by real time PCR
Week 9	New-born Screening test, Molecular genetics testing, newborn screening test, newborn screen test in USA and Iraq, current molecular testing in newborn screeing test, galacosemia, genetics cause, pathophysiology, clinical feature, diagnosis, diet, fellow up
Week 10	Duchenne muscular dystrophy, GeneticsDuchenne muscular dystrophy, characterization of sever DMD, dystrophic gene, dystrophic protein, mutation of DMD gene, downstream effect of the absence of dystrophin, DNA diagnosis in BMB/DMD, detection the disease using PCR
Week 11	Examination
Week 12	Ciliac disease, molecular diagnosis, genetics od disease , symptoes,inheretance
Week 13	Genetics liver disease, genes , inheritance, types, molecular diagnosis
Week 14	Diabetes diseases , typ 1 , types 2, genes, molecular diagnosis
Week 15	Genetics genes in cancer disease, inheritance, molecular diagnosis
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
Week	**Material Covered**
Week 1	Lab 1: Nested PCR polymerase chain reaction detection Polycystic kidney disease
Week 2	Lab 2: Gene-expression profiling to Burkitt's lymphoma
Week 3	Lab 3: Multiplex PCR to multiple endocrine neoplasia
Week 4	Lab 4: Genetic diaignosis for nerofibroma

Week 5	Lab 5: Diagnosis of DMD, Method (multiplex PCR),Preparation of multiplex kit,Calculation the PCR,reaction Preparation of agarose gel
Week 6	Lab 6:diagnosis of new born screening test
Week 7	Lab 7: Exame
Week8	Lab8: Diagnosis of cystic fibrosis (CFTR gene
Week9	Lab9: multiplex PCR of Ciliac disease genes
Week10	Lab 10: high resolution melting pcr for Congenital hypothyroidism detection
Wee;11	Lab11: Sequncing detection methods for NEUROFIBROMATOSIS
Week12	Lab12: Nested PCR for Retinoblastoma diagnosis
Week13	Lab13: multiplex PCR for Genetics liver disease
Week14	Lab14: Diabetes diseases Gene expression
Week15	Lab15: HRM methods for cancer disease

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Disease Delusion: by Jeffrey S. Bland (Author), Mark Hyman. 2015 2- Human Genetic Diseases. Edited by Dijana Plaseska-Karanfilska.2011	Yes
Recommended Texts	The genetic basis of disease. Essays in Biochemistry 62(5):643-723 DOI: 10.1042/EBC20170053	No
Websites	National human genome research institutes	

	2- Online Degrees | Blog | What You Need to Know About 5 Most Common Genetic Disorders

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 DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	APPLICATION OF ANIMAL TISSUE CULTURE			**Module Delivery**	
Module Type	Core			**Theory** **Lecture** **Lab** **Practical** **Seminar**	
Module Code	BIOT48040				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level		JGx11 UGIV	**Semester of Delivery**		8
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Assoc. prof. Dr. Hala Abdulkareem Rasheed Assoc. prof. Dr,.Rasha Talib Abdullah		**e-mail**	hala.rasheed@sc.uobaghdad.edu.iq rasha.abdullah@sc.uobaghdad.edu.iq	
Module Leader's Acad. Title		Dr.Rasha Talib Abdullah	**Module Leader's Qualification**		Ph.D.
Module Tutor	None		**e-mail**	None	
Peer Reviewer Name			**e-mail**		
Review Committee Approval		6/8/2025	**Version Number**		

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	1. Cell isolation and culture: The aim of this module is to isolate and culture cells from animal tissues. This includes selecting appropriate tissues, optimizing isolation techniques, and maintaining the cells in culture. 2. Cell identification and characterization: The aim of this module is to identify and characterize the cells in culture. This includes using techniques such as microscopy and flow cytometry to determine cell type, viability, and purity. 3. Cell culture maintenance: The aim of this module is to maintain healthy cell cultures over a period of time. This includes optimizing culture conditions such as temperature, humidity, and nutrient levels, and monitoring for contamination. 4. Cell differentiation: The aim of this module is to induce cells to differentiate into specific cell types. This includes using growth factors, hormones, or other chemical cues to promote differentiation. 5. Cell-based assays and drug screening: The aim of this module is to use cell cultures to perform assays and screen drugs for therapeutic potential. This includes using cell-based assays such as proliferation assays, apoptosis assays, and reporter gene assays to test the effects of drugs on cells. 6. Tissue engineering and regenerative medicine: The aim of this module is to use animal tissue culture to engineer tissues or organs for transplantation or to develop new regenerative therapies. This includes using scaffolds, growth factors, and other techniques to promote tissue growth and differentiation. 7. Disease modeling: The aim of this module is to use animal tissue culture to model diseases and study disease mechanisms. This includes using cells from patients with genetic or acquired diseases to study disease development and test new therapies.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Learning techniques for the growth and maintenance of cells in culture, including optimization of culture conditions and media. 2. Understanding the importance and different types of animal cell culture technology, including 2D and 3D culture systems. 3. Understanding the cell phenotype at different stages of development, examined by CD markers, and how to use these markers to identify specific cell types. 4. Learning about intracellular activity, extracellular flux, and cellular metabolism, and how to measure and analyze these processes in cultured cells. 5. Understanding the regulation of gene expression, and learning techniques for genomic and proteomic analysis in animal cells. 6. Learning about bioreactor design and scaling up animal cell culture for biotechnology applications. 7. Learning about the preparation of hybridoma and the sources of antibodies for immunology research. 8. Learning about the production of clinical products, such as plasminogen activators, interferons, and viral vaccines, using animal cell culture. 9. Understanding tissue regeneration and transplantation, and how animal cell culture can be used to develop new therapies. 10. Learning about cell therapy, including techniques such as liposome-based delivery systems, recombinant vectors, and nanotechnology targeting to specific cell parts.
Indicative Contents المحتويات الإرشادية	animal cell culture, importance, 2D culture, 3D culture, primary cells, immortalized cells, transformed cells, applications, drug discovery, biomanufacturing, tissue engineering, ethics, regulation. cell culture, growth, maintenance, media, aseptic technique, environmental conditions. cell phenotype, development, CD markers, cell identification.

	activity, extracellular flux, cellular metabolism, examination. gene expression, regulation, genomic analysis, proteomic analysis, techniques. bioreactor design, scaling up, animal cell culture, biotechnology. immunology, hybridoma, antibodies, sources. activators, interferons, viral vaccines, pharmacology, production. tissue regeneration, transplantation, animal cell culture, applications. liposome, recombinant vector, nanotechnology, targeting, cell parts, applications.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Lectures: Lectures can provide an overview of the concepts and techniques involved in application of animal tissue culture. 2. Hands-on laboratory sessions: Hands-on laboratory sessions can provide students with practical experience in animal tissue culture techniques, including cell isolation and culture, maintaining cell cultures, and inducing cell differentiation. These sessions can also help students develop their laboratory skills and critical thinking abilities. 3. Group work: Group work can provide students with the opportunity to collaborate and work together on projects related to animal tissue culture, such as designing experiments or developing new therapies. 4. Case studies: Case studies can be used to illustrate the real-world applications of animal tissue culture in areas such as drug development, tissue engineering, and disease modeling. These can help students to understand the relevance of the material and how it can be applied in practice.

	5. Online resources: Online resources such as videos, interactive simulations, and quizzes can provide students with additional opportunities to learn and reinforce their understanding of animal tissue culture concepts and techniques. Overall, a combination of different learning and teaching strategies can be used to enhance the learning experience for students in the application of animal tissue culture. By using a variety of methods, students can engage with the material in different ways and develop a deeper understanding of the concepts and techniques involved. It is important to provide opportunities for hands-on learning and practical experience, as well as opportunities for critical thinking and problem solving. Additionally, incorporating real-world examples and case studies can help students to understand the relevance of the material and how it can be applied in a variety of contexts.

Student Workload (SWL) الحمل الدراسي للطالب			
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				
As	**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	
	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	
Week	**Material Covered**
Week 1	Animal Cell Culture: Introduction, Types, Methods, and Applications
Week 2	Growth and maintenance of cells in culture (2D & 3D)
Week 3	Tissue Repair, Regeneration, and Wound Healing
Week 4	Cancer Research: Toxicity Testing
Week 5	Cell Cloning and Selection
Week 6	Monoclonal Antibody Production and Hybridoma Technology
Week 7	Mid examination
Week 8	Production of β-Interferon & Scaling up
Week 9	Vaccine Production in Cell Culture
Week 10	Cellular Metabolism
Week 11	Regulation of gene expression, genomic and proteomic analysis

Week 12	Production of clinical products: a-Plasminogen activators, Interferons
Week 13	Cell therapy: dependent on 1-liposome
Week 14	Recombinant vector
Week 15	Nanotechnology targeting to cell parts
	Seminar

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
Week	**Material Covered**
Week 1	Lab 1: What test can be used to identify a cell line? Used in cell culture
Week 2	Lab 2: Cell types
Week 3	Lab 3: Where to obtain cells? Sources
Week 4	Lab 4: Genetic Engineering of animal cells in culture
Week 5	Examination
Week 6	Lab 5: Modes of culture for high cell densities: Batch culture -Fed Batch culture -continuous culture
Week 7	Lab 6: Production from cell culture
Week 8	Lab 7: Monoclonal antibodies,
Week 9	Lab 8: Transforming Proteins, clotting factors
Week 10	Assignments
Week 11	Lab 9: Application of cell culture in Toxicology
Week 12	Lab 10: In vitro fertilization
Week 13	seminar

Week 14	Seminar
Week 15	Preparation Week
Week 16	Final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Verma, Anju, Megha Verma, and Anchal Singh. "Animal tissue culture principles and applications." In *Animal Biotechnology*, pp. 269-293. Academic Press, 2020.	NO
Recommended Texts	Martínez-Monge, I., R. Roman, P. Comas, A. Fontova, M. Lecina, A. Casablancas, and J. J. Cairó. "New developments in online OUR monitoring and its application to animal cell cultures." *Applied microbiology and biotechnology* 103 (2019): 6903-6917.	No
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	**FX –** Fail	مقبول بقرار	(45-49)	More work required but credit awarded
(0 – 49)	**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.