Ministry of Higher Education and Scientific Research
Scientific Supervision and Scientific Evaluation Apparatus
Directorate of Quality Assurance and Academic Accreditation
Accreditation Department

Academic Program and Course Description Guide

2024

Introduction:

The educational program is a well-planned set of courses that include procedures and experiences arranged in the form of an academic syllabus. Its main goal is to improve and build graduates' skills so they are ready for the job market. The program is reviewed and evaluated every year through internal or external audit procedures and programs like the External Examiner Program.

The academic program description is a summary of the main features of the program and its courses. It shows what skills students are working to develop based on the program's goals. This description is very important because it is the main part of getting the program accredited, and it is written by the teaching staff together under the supervision of scientific committees in the scientific departments.

This guide, in its second version, includes a description of the academic program after updating the subjects and paragraphs of the previous guide in light of the updates and developments of the educational system in Iraq, which included the description of the academic program in its traditional form (annual, quarterly), as well as the adoption of the academic program description circulated according to the letter of the Department of Studies T 3/2906 on 3/5/2023 regarding the programs that adopt the Bologna Process as the basis for their work.

In this regard, we can only emphasize the importance of writing an academic programs and course description to ensure the proper functioning of the educational process.

Concepts and terminology:

Academic Program Description: The academic program description provides a brief summary of its vision, mission and objectives, including an accurate description of the targeted learning outcomes according to specific learning strategies.

Course Description: Provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the students to achieve, proving whether they have made the most of the available learning opportunities. It is derived from the program description.

Program Vision: An ambitious picture for the future of the academic program to be sophisticated, inspiring, stimulating, realistic and applicable.

Program Mission: Briefly outlines the objectives and activities necessary to achieve them and defines the program's development paths and directions.

Program Objectives: They are statements that describe what the academic program intends to achieve within a specific period of time and are measurable and observable.

Curriculum Structure: All courses / subjects included in the academic program according to the approved learning system (quarterly, annual, Bologna Process) whether it is a requirement (ministry, university, college and scientific department) with the number of credit hours.

Learning Outcomes: A compatible set of knowledge, skills and values acquired by students after the successful completion of the academic program and must determine the learning outcomes of each course in a way that achieves the objectives of the program.

Teaching and learning strategies: They are the strategies used by the faculty members to develop students' teaching and learning, and they are plans that are followed to reach the learning goals. They describe all classroom and extra-curricular activities to achieve the learning outcomes of the program.

Academic Program Description Form

For Master's students

University Name: University of Baghdad

Faculty/Institute: College of Science

Scientific Department: Biotechnology department.

Academic or Professional Program: Biotechnology

Final Certificate Name: Ph.D degree in Biotechnology

Academic System: Seasonal

Description Preparation Date: 1-10-2023

File Completion Date: 1-10-2023

Signature:

Head of Department name:

Prof. Dr. Nadhim Hasan Hayder

Date:

Signature:

Scientific Associate name:

Prof. Dr. Namir I. A. Haddad

Date:

The file is checked by: Prof. Dr. Israa Ali Zaidan

Department of Quality Assurance and University Performance

Director of the Quality Assurance and University Performance Department:

Date:

Signature:

Approval of the Dean: Assis. Prof. Dr. Raed Falih Hassan

1. Program Vision

The Department of Biotechnology looks forward to using biological systems of various types, cellular or enzymatic, to obtain many of the vital materials that society needs in various agricultural, industrial, medical, or environmental fields. This comes by benefiting from research at the laboratory level and then applied by building strategies for projects. Scientific, and therefore the science of biotechnology depends on specialists in the sciences of biochemistry, microbiology, and engineering sciences, and cooperation among themselves to reach the applied aspects of microbiology and animal and plant cell cultures to benefit from them in the development of industry, agriculture, and the advancement of health and other service institutions.

2. Program Mission

Preparing specialized personnel in the fields of biotechnology and providing them with up-to-date information in various fields of contemporary life, genetically engineering living organisms, searching for sites of modification, medical biotechnologies, producing pharmaceutical compounds, environmental reclamation to get rid of air, soil and water pollutants, and investing microorganisms in extracting valuable materials and biotechnologies. Plants and making full use of plant products and farms. As well as interest in scientific specializations that would employ the characteristics of living organisms to produce biological materials and educate society on how to exploit these capabilities in various areas of life, taking into account preserving the basic characteristics of these organisms and their diversity and not disturbing the natural biological balance.

3. Program Objectives

1.Preparing specialists familiar with the basics of biotechnology, theoretically and practically, who are able to fill the needs of the labor market.
2. Conduct scientific research and try to keep pace with the scientific development of biotechnology.
3. Cooperating with state institutions and the private sector by providing advice and scientific advice and conducting laboratory analyzes in the fields of genetic, environmental, industrial and microbiology engineering.
4. Encouraging scientific research and providing students with basic skills in biotechnology and its applications in all fields.
5. Encouraging the academic staff to participate in scientific forums inside and outside the country.
6. Contributing to solving scientific problems in the service of national development plans.

4. Program Accreditation

None

5. Other external influences

None

6. Program Structure

Program Structure	Number of Courses	Credit hours	Percentage	Reviews*
Institution Requirements				
College Requirements	2			English language Research methodology
Department Requirements	1			Biostatistics
Summer Training				
Other				

* This can include notes whether the course is basic or optional.

7. Program Description

Year/Level	Course Code	Course Name	Credit Hours	
Master's stage				
First semester 2023-2024		Advanced Genetic engineering		
		Bioprocess technology		
		Gene molecular biology		
		Bioseperation		
		English language		
Second semester 2023-2024		Immunobiotechnology		
		Advanced Microbial genetics		
		Biostatistics		
		Research methodology		
		Elective 1		
		Elective 2		

8. Expected learning outcomes of the program

Knowledge

1. Enabling students to obtain knowledge and understanding of the intellectual framework, foundations and applications of bio- and nano-technology
2. Enabling students to obtain knowledge and understanding of industrial, environmental and food microbiology
3. Enabling students to obtain knowledge and understanding of genetics, genetic engineering, and cellular genetics
4. Enabling students to obtain knowledge and understanding of botany, plant and animal tissues and their applications
5. Enabling students to obtain knowledge and understanding of pathology, immunity, and pathogenic bacteria
6. Enable students to obtain knowledge and understanding of cell science and microbiology standards
7. Enabling students to obtain knowledge and understanding of life statistics and the English language

Skills

1. Scientific and practical skills.
2. Memorization and analysis skills.
3. Skills of use, application and development.
4. General and qualifying transferable skills (other skills related to employability and personal development).

Ethics

1-Openness about the methods, intentions, and potential consequences of biotechnology research and applications.
2-Recognizing the intrinsic value of all living organisms and considering their well-being in biotechnological endeavors.
3-Strive to use biotechnology to enhance the well-being of individuals and society while minimizing harm and commit to honesty, accuracy and reliability in conducting and reporting biotechnology research
4-Ensure equitable distribution of the benefits and burdens of progress in biotechnology across different societies and socio-economic groups.
5-Take responsibility for the environmental impacts of biotechnology activities and work to find sustainable solutions.
6-Respect the rights of individuals to make informed decisions about their health care and to participate in medical interventions or clinical trials. Implementing medical treatments or treatments and protecting the privacy and confidentiality of patient information and genetic data in research
7-Ensure that patients or participants fully understand the risks, benefits, and alternatives of medical procedures or participation in research studies before providing consent
8-Upholding strict standards for the safety and effectiveness of pharmaceutical products through transparent research, testing and regulatory processes.

9. Teaching and Learning Strategies

Teaching and learning strategies and methods adopted in the implementation of the program in general.

10. Evaluation methods

Weekly, monthly, daily exams and the end-of-semester exam.

11. Faculty

Faculty Members

Academic Rank	Specialization		Special Requirements/Skills (if applicable)		Number of the teaching staff	
	General	Special			Staff	Lecturer
Professor	**17**				**17**	
Assistant professor	**18**				**18**	
Instructor	**42**				**42**	
Assistant instructor	**50**				**50**	

12. Professional Development

Mentoring new faculty members

Participating in courses on teaching methods, Arabic and English language proficiency, passing the teaching aptitude exam, and other professional teaching courses.

Professional development of faculty members

1. Training in evaluating teaching performance of all types and giving it importance in educational and development courses.
2. Attending training courses.
3. Attending continuing education courses and seminars.
4. Online learning.
5- Discussions inside and outside the work environment, which helps in career development.

13. Acceptance Criterion

Admission to the Biotechnology Department program in the College of Science is based on the grade point average and the student's interest in the department.

14. The most important sources of information about the program

All biotechnology programs combine multiple areas of science and technology with research and development for many types of organisms. Subjects cover a wide range of scientific topics, from microbiology, chemistry and molecular biology to genetic engineering, pharmacology and virology. As well as cloning, fermentation, tissue culture and immunology.

In the practical part in the laboratories, students learn different techniques and processes to work with DNA, bacteria, plant cells and much more. Biotechnology programs are offered as a four-year bachelor's degree, after which the participant obtains a bachelor's degree in biotechnology.

15. Program Development Plan

- Implementing a review and development policy for academic programs and the goals and strategies included in the strategic plan of the Department of Biotechnology, and reviewing programs and courses.
- Work on submitting proposals to begin the review process for programs that have completed four years from the last academic review, and follow up on reviewing courses every two semesters through program officials and course coordinators.
- The department seeks to obtain local or international program accreditation, such as the biotechnology program, audit quality in the institutional program, and review and develop policy procedures for counterpart biotechnology departments in other colleges.
- • Forming a technical committee for quality assurance to follow up on the department’s efforts in preparing evaluation reports against institutional standards as part of the college’s efforts to obtain institutional accreditation.

16. Program Skills Outline

Year/Level 2023/2024	Course Code	Course Name	Basic or optional	Required program Learning outcomes											
				Knowledge				Skills				Ethics			
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4
Master's 1st semester		Advanced Genetic engineering	Basic	√	√	√	√	√	√	√	√	√	√	√	√
		Bioprocess technology	Basic	√	√	√	√	√	√	√	√	√	√	√	√
		Gene molecular biology	Basic	√	√	√	√	√	√	√	√	√	√	√	√
		Bioseperation	Basic	√	√	√	√	√	√	√	√	√	√	√	√
		English language	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Master's 2nd semester		Immunobiotechnology	Basic	√	√	√	√	√	√	√	√	√	√	√	√
		Advanced Microbial genetics	Basic	√	√	√	√	√	√	√	√	√	√	√	√
		Biostatistics	Basic	√	√	√	√	√	√	√	√	√	√	√	√
		Research methodology	Basic	√	√	√	√	√	√	√	√	√	√	√	√
		Advanced Environmental Biotechnology	Elective	√	√	√	√	√	√	√	√	√	√	√	√

		Immunogenetics	Elective	√	√	√	√	√	√	√	√	√	√	√	√
		Advanced enzyme technology	Elective	√	√	√	√	√	√	√	√	√	√	√	√
		Metabolic pathways	Elective	√	√	√	√	√	√	√	√	√	√	√	√
		Medicinal bacteriology	Elective	√	√	√	√	√	√	√	√	√	√	√	√
		Advanced Nanobiotechnology	Elective	√	√	√	√	√	√	√	√	√	√	√	√
		Advanced soil microbiology	Elective	√	√	√	√	√	√	√	√	√	√	√	√
		Topics in genetic engineering	Elective	√	√	√	√	√	√	√	√	√	√	√	√
		Bioinformatics	Elective	√	√	√	√	√	√	√	√	√	√	√	√
		Diagnostics bacteriology	Elective	√	√	√	√	√	√	√	√	√	√	√	√
		Autoimmune disease genetics	Elective	√	√	√	√	√	√	√	√	√	√	√	√
		Advanced genetics	Elective	√	√	√	√	√	√	√	√	√	√	√	√
		Clinical cytogenetics	Elective	√	√	√	√	√	√	√	√	√	√	√	√
		Advanced medicinal plant biotechnology	Elective	√	√	√	√	√	√	√	√	√	√	√	√

Please tick the boxes corresponding to the individual program learning outcomes under evaluation.

Course Description Form

Advanced Genetic engineering

1. Course Name:

Advanced Genetic engineering

2. Course Code:

3. Semester / Year:

1st semester / 2023-2024

4. Description Preparation Date:

1-10-2023

5. Available Attendance Forms:

Weekly attendance

6. Number of Credit Hours (Total) / Number of Units (Total)

2 Theoretical hours/week, one section * 15 weeks = 30 hours
Total number of hours per section = hours
Number of units =

7. Course administrator's name (mention all, if more than one name)

Name: Prof. Dr. Abdulkareem Alkazaz
Email: abdulkareem .alkazaz @sc.uobaghdad.edu.iq

8. Course Objectives

Study in the set of technologies that directly manipulate an organism's genes, change the genetic makeup of cells, and add new traits that are not found in that organism. Topics include gene targeting, nuclear transplantation, transfection of synthetic chromosomes, or viral insertion. The emphasis is given to the design of the tools and the related applications in agriculture, medicine, and biological research.

9. Teaching and Learning Strategies

1. Clarification and explanation of the study materials by the academic staff through the whiteboard or using PowerPoint.
2. Providing students with homework.
3. Preparing reports related to academic vocabulary.
4. Visit websites to obtain additional knowledge of academic subjects.
5. Brainstorming during lectures.

10. Course Structure: Theory

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	2	Gene cloning	Gene cloning and applications	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

2nd	**2**	Cloning Steps	Cloning Steps and stratiegies	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
3rd	**2**	collections of cloned	Libraries are collections of cloned fragments	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
4th	**2**	Cdna cloning	Cdna cloning , isolation of mrna, reverse transcriptase	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
5th	**2**	Selection of recombinants	Types of Selection of recombinants	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
6th	**2**	Expression	Expression of cloned DNA	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
7th	**2**	Probes designs	Probes designs in different programs	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
8th	**2**	In vitro mutagenesis	Site –directed mutagenesis	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
9th	**2**	sequencing	DNA sequencing	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
10th	**2**	PCR	PCR, PT-PCR, (RADP-PCR)	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
11th	**2**	RFLP	Restriction fragment length polymorphism (RFLP) and application	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
12th	**2**	Real time -PCR	Real time -PCR and application		

13th	**2**	Genetic engineering applications in medicine , industry and agriculture	Genetic engineering applications in medicine , industry and agriculture	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
14th	**2**	seminars	seminars	-	-
15th	**2**	Mid exam	Mid exam	-	-

11. Course Evaluation	
Overall score out of 100 (Semester grade = 40) (End-of-semester exam score = 60)	
12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	-
Main references (sources)	- Puehler, A. *et al*, A.K. 1984.Advanced molecular genetics - Rogen L., 1999. Applied molecular genetics. - Leland, H. *et al*. 2019. Genetics.
Recommended books and references (scientific journals, reports...)	-
Electronic References, Websites	https://catalog.ucmerced.edu/preview_course_nopop.php?catoid=20&coid=51867

Course Description Form

Bioprocess Technology

1. Course Name:
Bioprocess Technology
2. Course Code:
3. Semester / Year:
1st semester / 2023-2024
4. Description Preparation Date:
1-10-2023
5. Available Attendance Forms:
Weekly attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
2 Theoretical hours/week, one section * 15 weeks = 30 hours Total number of hours per section = hours Number of units =

7. Course administrator's name (mention all, if more than one name)

Name: Prof. Dr. Khalid Jaber Kadhum
Email: khalid.kadhum@sc.uobaghdad.edu.iq

8. Course Objectives

This course aims to provide students with a comprehensive understanding of the fundamental concepts, theories, and practical applications within the Bioprocess technology field. Through engaging lectures, interactive discussions, and hands-on activities, students will develop the knowledge, skills, and critical thinking abilities necessary to analyze, evaluate, and solve problems related to Bioprocess technology. Additionally, the course aims to foster a deep appreciation for the importance and relevance of Bioprocess technology] in various real-world contexts, encouraging lifelong learning and professional development

9. Teaching and Learning Strategies

6. Clarification and explanation of the study materials by the academic staff through the whiteboard or using PowerPoint.
7. Providing students with homework.
8. Preparing reports related to academic vocabulary.
9. Visit websites to obtain additional knowledge of academic subjects.
10. Brainstorming during lectures.

10. Course Structure: Theory

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	2	: Basic concepts in Bioprocess and fermentation technology	Introduction	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
2nd	2	Scale Up and Scale Down of bioprocesses and fermentation	Scale Up and Scale Down	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
3rd	2	Variables to be Considered when Changing Fermentation Scale	Scale Up and Scale Down	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
4th	2	Inoculum preparation in fermentation process	Scale Up and Scale Down	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
5th	2	Media design for fermentation process	**Bioprocess**		

6th	**2**	Exam	First Exam		Daily, semester and final exams
7th	**2**	introductio - n and basic concepts, - Types of fermenters	fermentor	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
8th	**2**	Fermenter design and construction aspect	Fermenter	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
9th	**2**	Control and monitoring	fermenter	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
10th	**2**	batch culture	Mode of fermenter operation:	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
11th	**2**	Fed batch culture	Mode of fermenter operation:	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
12th	**2**		Second Exam		
13th	**2**	Continuous culture	Mode of fermenter operation:	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
14th	**2**	**The Recovery and** Purification of **Fermentation** Products	Downstream processing:	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
15th	**2**	**The Recovery and** Purification of **Fermentation** Products	Downstream processing:	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
11. Course Evaluation					
Overall score out of 100 (Semester grade = 40) (End-of-semester exam score = 60)					

12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	Bioprocess Engineering: Basic concepts
Main references (sources)	Fermentation Microbiology and Biotechnology
Recommended books and references (scientific journals, reports...)	Manual of Industrial Microbiology and Biotechnolog
Electronic References, Websites	

Course Description Form

Molecular biology of gene

1. Course Name:
Molecular biology of gene
2. Course Code:
3. Semester / Year:
1st semester / 2023-2024
4. Description Preparation Date:
1-10-2023
5. Available Attendance Forms:
Weekly attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
2 Theoretical hours/week, one section * 15 weeks = 30 hours Total number of hours per section = hours Number of units =
7. Course administrator's name (mention all, if more than one name)
Name:Assistant Prof. Dr. Nuha Joseph Najeeb Kandala **Email:**nuha.najeeb@sc.uobaghdad.edu.iq
8. Course Objectives
This course includes coverage of the concepts of molecular biology of the gene, which is the science that studies biology at the level Molecular. Molecular biology is concerned with the study of nucleic acids that carry genetic information and chemical composition Nucleic acids (DNA, RNA) and DNA replication, in addition to studying the most important characteristics of the genetic code and expression Genetics and its organizing mechanism, which leads to the preparation of advanced cadres towards the various career paths of technical sciences Biotechnology and providing society with graduates from postgraduate studies to work in research, educational and health institutions Protecting and sustaining the environment and leading civil society, capable of keeping pace with the developments of the times.
9. Teaching and Learning Strategies
11. Clarification and explanation of the study materials by the academic staff through the whiteboard or using PowerPoint.

12. Providing students with homework.
13. Preparing reports related to academic vocabulary.
14. Visit websites to obtain additional knowledge of academic subjects.
15. Brainstorming during lectures.

10. Course Structure: Theory

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	**2**	Introduction to molecular biology of the gene	General Introduction and development of molecular biology of the gene	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
2nd	**2**	Structure of Nucleic acids, their chemical composition, DNA replication theories	Types of Nucleic acids that carry genetic information, Chemical structure of nucleic acids, DNA, RNA, and DNA replication	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
3rd	**2**	DNA forms and topoisomerases	Chromosomal and plasmid DNA forms and topoisomerases	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
4th	**2**	Division of genes based on genetic product	Structural genes, protein-coding genes, and genes coding for different types of RNA	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
5th	**2**	First exam			
6th	**2**	prokaryotic and eukaryotic promoters and regulatory elements	Identification of the most important promoters regions in prokaryotes and eukaryotes		Daily, semester and final exams
7th	**2**	Removal of introns from DNA and formation of mature RNA	Identify the main steps in removing introns	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
8th	**2**	The most important characteristics of the genetic code	Identifying the genetic code, how to determine its sequences, and the theoretical and	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

			practical calculation of these sequences		
9th	**2**	. Identify the most important stages of gene expression and the mechanism of regulation for each stage	Identify the most important stages of gene expression and the mechanism of regulation of each stag	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
10th	**2**	Reproduction in eukaryotes	Identify the main steps of replication in eukaryotes	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
11th	**2**	Second exam		Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
12th	**2**	Transcription of genes encoding different types of RNA in prokaryotes and eukaryotes	Transcription of rRNA and tRNA genes in eukaryotes		
13th	**2**	transcription of protein-coding genes in eukaryotes.	Identify the main steps in transcription protein-coding genes in eukaryotes	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
14th	**2**	Transcription and charging of tRNA with amino acids	Steps for charging tRNA with amino acids	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
15th	**2**	Mutations and their types.	Identify the types of mutations and the factors that cause them	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
11. Course Evaluation					

Overall score out of 100 (Semester grade = 40) (End-of-semester exam score = 60)	
12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	البكري حمزة غالب الوراثية الهندسة مبادئ
Main references (sources)	1-Molecular Biology / David Clark . 2005 2-Genetics / Benjamin A pierce .,2002 3-Molacular Biology,David Clark, Carbondale, Illinois, January 2005
Recommended books and references (scientific journals, reports...)	Molecular Genetics of Bacteria / 4th ed by Jeremy .W.D and Simon F Park. 2004. - Color Atlas of Gene /EberhadPassarge . 2001 Iraqi Journal of Science, 2(Bioinformatic Journal Human immunology Journal
Electronic References, Websites	NCBI –gene ,NCBI-Blast,NCBI-pubmed,NCBI-protein Meta gene Journal

Course Description Form

Bioseperation

1. Course Name:
Bioseparation
2. Course Code:
3. Semester / Year:
First semester / 2023-2024
4. Description Preparation Date:
1-10-2023
5. **Available Attendance Forms**:
Weekly attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
2 Theoretical hours/week, one section * 15 weeks = 30 hours Total number of hours per section = hours Number of units =
7. Course administrator's name (mention all, if more than one name)
Name: Prof. Dr. Gazi M.Aziz, Assistant Prof. Dr. Sahar I.Hussein Email: ghaziaziz@sc.uobaghdad.edu.iq, sahar.hussein@sc.uobaghdad.edu.iq
8. Course Objectives
• Expanding students' awareness to globally recognized modern technologies. • Contributing to fostering students' scientific thinking to solve obstacles in scientific research fields. • Supplying the job market with experienced and competent graduates in applied fields of biotechnology.

9. Teaching and Learning Strategies

A - Cognitive Objectives:

A1 - Empowering students to acquire knowledge and understanding of the intellectua framework and applications of biotechnological techniques.

A2 - Empowering students to acquire knowledge and understanding of industrial, environmental, and food microbiology.

A3 - Empowering students to acquire knowledge and understanding of genetics, gene engineering, and cellular genetics.

A4 - Empowering students to acquire knowledge and understanding of botany, plant tissues, and animal biology.

A5 - Empowering students to acquire knowledge and understanding of pathology, immunity, and pathogenic bacteria.

A6 - Empowering students to acquire knowledge and understanding of cellular biolo and microbiology standards.

A7 - Empowering students to acquire knowledge and understanding of biological statistics and the English language.

B - Program-Specific Skills Objectives:

B1 - Scientific and practical skills.

B2 - Remembering and analytical skills.

B3 - Usage and development skills.

10. Course Structure: Theory

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	2	- Definition of bio separation. - History of bio separation	Introduction on bio separation	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
2nd	2	- Factor affecting on bio products extraction. - choice of raw materials. -extraction methods. -pH, temperature, buffer salts, detergents, reducing	Bioproduct extraction	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

		agents, proteolytic inhibitors, bacteriostatics			
3rd	2	-chemical methods (osmotic shock, enzyme digestion, solubilization, alkali treatment. - mechanical methods (homogenization, ultrasonication)	Cell disruption	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
4th	2	- Protein or enzyme activity - specific activity - purification table -fold of purification, yield (recovery%)	How is purification measured	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
5th	2	-precipitation by salt -Organic solvent - isoelectric point precipitation -non ionic hydrophilic polymers -thermal precipitation, dialysis, ultrafiltration, microfiltratio	Precipitation of protein		

		n, crystilization			
6th	2	- synthetic and natural ion exchangers -cation and anaion exchangers -batch wase and column chromatography	Ion exchange chromatography		Daily, semester and final exams
7th	First examination				
8th	2	-Some parameters effecting on IEF technique. - choromatofocusing	Isoelectric focusing	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
9th	2	separation of non polar substances. - Hydroxyapatite chromatography -Paper chromatography -Separates small polar molecules. -thin layer chromatography -RF measured	Adsorption chromatography	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
10th	2	-Principles of separation technique - Gels types - how is MW measured	Gel filtration	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

11th	2	-steps of affinity chromatography - ligands binding - immunoglobulin binding protein. --magnetic affinity chromatography - Hydrophobic affinity chromatography	Affinity chromatography	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
12th	2				
13th	2	-covalent binding - chelation -coordinate bond	Covalent affinity chromatography metal chelation chromatography	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
14th	2	-Affinity partitioning of protein using aqueous two phase systems. - determination of degree separation (G)	aqueous two phase systems	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
15th	2	-Dye chromatography - poly (U) sepharose	Technique of DNA and RNA separation	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
16th	Final Examination				
Course Structure: Practical					

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	2	- Definition of bio separation. - History of bio separation	Introduction on bio separation	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
2nd	2	- Factor affecting on bio products extraction. - choice of raw materials. -extraction methods. -pH, temperature, buffer salts, detergents, reducing agents, proteolytic inhibitors, bacteriostatics	Bioproduct extraction	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
3rd	2	-chemical methods (osmotic shock, enzyme digestion, solubilization, alkali treatment. - mechanical methods (homogenization, ultrasonication)	Cell disruption	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
4th	2	- Protein or enzyme activity	How is purification measured	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

		- specific activity - purification table -fold of purification, yield (recovery%)			
5th	2	-precipitation by salt -Organic solvent - isoelectric point precipitation -non ionic hydrophilic polymers -thermal precipitation, dialysis, ultrafiltration, microfiltration, crystilization	Precipitation of protein		
6th	2	- synthetic and natural ion exchangers -cation and anaion exchangers -batch wase and column chromatography	Ion exchange chromatography		Daily, semester and final exams
7th	First examination				
8th	2	-Some parameters effecting on IEF technique. - choromatofocusing	Isoelectric focusing	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

9th	2	separation of non polar substances. - Hydroxyapatite chromatography -Paper chromatography -Separates small polar molecules. -thin layer chromatography -RF measured	Adsorption chromatography	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
10th	2	-Principles of separation technique - Gels types - how is MW measured	Gel filtration	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
11th	2	-steps of affinity chromatography - ligands binding - immunoglobulin binding protein. --magnetic affinity chromatography - Hydrophobic affinity chromatography	Affinity chromatography	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
12th	2				
13th	2	-covalent binding - chelation	Covalent affinity chromatography	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

		-coordinate bond	metal chelation chromatography		
14th	2	-Affinity partitioning of protein using aqueous two phase systems. - determination of degree separation (G)	aqueous two phase systems	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
15th	2	-Dye chromatography - poly (U) sepharose	Technique of DNA and RNA separation	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
16th	Final Examination				

11. Course Evaluation

Overall score out of 100
(Semester grade = 40)
(End-of-semester exam score = 60)

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	
Main references (sources)	1. Janson, J.C and Ryden, L.(1998).Protein purification principles, high resolution methods, and application second Edition,Ajohn wiley and sons, Inc., publication. 2. Belter, P.A., Cussler, E.L. and Shouttu, W. (1988).Bioseparation. Downstream processing for Biotechnology. Awiley-Intersciencepublication
Recommended books and references (scientific journals, reports...)	Palmer, T . and Bonner, P. (2007). Enzymes, Biochenis Biotechnology,Clinical Chemistry. Second editi Reprinted by Woodhead Publishing Limited, 2011.
Electronic References, Websites	The numerous platforms that deal with biology, including medical websites, YouTube, and scientific research.

Course Description Form

English language

1. Course Name:
English Language
2. Course Code:
3. Semester / Year:
1st semester / 2023-2024
4. Description Preparation Date:
1-10-2023
5. Available Attendance Forms:
Weekly attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
2 Theoretical hours/week, one section * 15 weeks = 30 hours Total number of hours per section = hours Number of units = 2
7. Course administrator's name (mention all, if more than one name)
Name: Lec.Dr.Ramina Mekhael Khoshaba **Email:** ramina.khoshaba@sc.uobaghdad.edu.iq
8. Course Objectives
1. Contribute to the student's intellectual, personal, and professional development. 2. Encourage students to acquire primary language skills (listening, speaking, reading, and writing). 3. Develop students' understanding of the importance of English as a means of international communication. 4. Develop students' positive attitudes towards learning English. 5. Enable students to acquire the essential linguistic competence required in various life situations. 6. Enable students to acquire the linguistic competence required in various professions. 7. Develop students' understanding of their community's cultural, economic, and social issues and prepare them to participate in their solutions.
9. Teaching and Learning Strategies
16. Clarification and explanation of the study materials by the academic staff through the whiteboard or using PowerPoint. 17. Providing students with homework. 18. Preparing reports related to academic vocabulary. 19. Visit websites to obtain additional knowledge of academic subjects. 20. Brainstorming during lectures.
10. Course Structure: Theory

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method

1st	**2**	International student	Introducing students to the importance of following instructions (on forms, essay question, etc)	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
2nd	**2**	Where in the world	Giving students furtherpractice in skimming and scanning,	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
3rd	**2**	Newspaper articles	Show students how to get an overview of a text before reading it intensively, and increase student readingspeed by practicing strategies for dealing with unknown words ina text.	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
4th	**2**	Modern technology	Helping students better understand a text when skimming by drawing their attention to their position and the role of topic sentences. This will help select the parts of a text they needin their academic studies more quickly and efficiently.	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
5th	**2**	Conferences andvisits	improving students' ability to assess a text for its usefulness by identifying its purpose	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
6th	**2**	Exam1	Student will have the firstexam to test their ability about what have been taken in the class		Daily, semester and final exams
7th	**2**	Science and ourworld	Introduce students to different techniques for making notes and help them determine the essential information in a	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

			text by distinguishing between speculation and fact.		
8th	**2**	People past present	Improving student's use of sources on the Internet. Students are shown that they need not understand everything on the site, and there are many sites for information, some of which may be easier to understand.	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
9th	**2**	The world of IT	Helping students identify ways of explaining words or rephrasing language in a text and showing how pronouns work can help them understand the text and avoid repetition.	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
10th	**2**	Inventions, discoveries, andprocesses	Introducing students to techniques to improve their intensive reading, including using discourse markers to indicate steps in a process.	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
11th	**2**	Travel and tourism	Helping students to interpret data in the form of a graph or chart, and to use	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

			that data to better understand a written text		
12th	**2**	Reading enhancement	Reading is crucial in passing information from one person to another over time or a given distance. Undoubtedly, reading allows one to read the words of someone who lived hundreds of years ago. However, acquiring and constructing subject details also play a considerably broader role in academic development and success. It enables students to interact with and make connections and judgments between texts, question contributions, and challenge inherent biases and	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
13th	**2**	Exam2	Student will have the first exam to test their ability about what have	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

			been taken in the class		
14th	**2**	Reviewing	Students will review chapters that have been taken to be prepared for the final exam	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
15th	**2**	Final Exam	The final exam aims to distinguish the student based on their effort spent during the semester.	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

11. Course Evaluation	
Overall score out of 100 (Semester grade = 40) (End-of-semester exam score = 60)	
12. Learning and Teaching Resources	
Required textbooks (curricula books, if any)	Philpot, S. (2007). *Academic Skills: Reading, Writing, Study Skills. Teacher's Guide. Level 2*. Oxford Univers Press.
Main references (sources)	Philpot, S. (2007). *Academic Skills: Reading, Writing, andStudy Skills. Teacher's Guide. Level 2*. Oxford University Press.
Recommended books and references (scientific journals, reports...)	Philpot, S. (2007). *Academic Skills: Reading, Writing, andStudy Skills. Teacher's Guide. Level 2*. Oxford University press.
Electronic References, Websit	British Council , English club , YouTub BBC Learning English, Duolingo

Course Description Form

Immunobiotechnology

1. Course Name:
Immunobiotechnology
2. Course Code:
3. Semester / Year:
2nd semester / 2023-2024
4. Description Preparation Date:

15-2-2024

5. Available Attendance Forms:

Weekly attendance

6. Number of Credit Hours (Total) / Number of Units (Total)

2 Theoretical hours/week, one section * 15 weeks = 30 hours
Total number of hours per section = hours
Number of units =

7. Course administrator's name (mention all, if more than one name)

Name: Prof. Dr. Mouruj A, Alaubydi
Email: mouruj.najeeb@sc.uobaghdad.edu.iq

8. Course Objectives

This course aims to provide a course of study in the immunology of mammals, especially humans, based on knowledge of basic immunological principles of living organisms.
To develop more practical biological skills in the field of organisms related immunology.
To prepare students for a number of natural science courses in autoimmunity, acquired immunology, and various immunological tests among others.

9. Teaching and Learning Strategies

1. Clarification and explanation of the study materials by the academic staff through the whiteboard or using PowerPoint.
2. Providing students with homework.
3. Preparing reports related to academic vocabulary.
4. Visit websites to obtain additional knowledge of academic subjects. Brainstorming during lectures.

10. Course Structure: Theory

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	2	Antigens and Receptors	Types of antigens and their relation with different types of receptors	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
2nd	2	Innate Immune function	Types of innate immune system and its molecules and cells that have an effective role in the first line of defense	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
3rd	2	Molecules of adaptive Immunity	Explain the clls and molecules related with adaptive immune system . and how the adaptive immune occure	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

4th	**2**	Generation of Immune Diversity: Lymphocyte Antigen Receptors.	Molecular diversity of humoral immune system, and the specifity generation against the specific antigen	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
5th	**2**	Lymphocyte development	Explain the types of lymphocytes and their generation and development through positive and negative selection		
6th	**2**	Examination	Examination	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
7th	**2**	Lymphocyte activation	Explain how lymphocytes are become activated and the routes of activation	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
8th	**2**	Lymphocyte effector functions	The role of effector lymphocytes to eradicate different types of antigens	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
9th	**2**	Regulation of adaptive responses	The routs of regulation throughout activation, suppression and tolerance	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
10th	**2**	How Innate and adaptive immune responses maintain health	The relation between innate and adaptive immune systems to maintaining the health		
11th	**2**	Hypersensitivity reactions	Types of hypersensitivity reaction, and how the immune system	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
12th	**2**	Examination	Examination	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
13th	**2**	Autoimmunity	Types of autoimmune diseases , and the mode of disease action	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

14th	**2**	Immunophar-macotherapy	Types of Immune pharmacotherapy, and the mode of Immune pharmacotherapy action	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
15th	**2**	Immune reaction tests	Different immune reactions included; agglutination, precipitation, Immuno- florescent techniques, etc..	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

11. Course Evaluation
Overall score out of 100 (Semester grade = 40) (End-of-semester exam score = 60)

12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	No Required textbooks
Main references (sources)	• Immunology, 2013 (3ed edition) • Clinical immunology and serology,2010 (3ed edition)
Recommended books and references (scientific journals, reports...)	Any book in immunology and clinical immunology
Electronic References, Websites	Many websites that correlated with clinical immunology

Course Description Form

Advanced microbial genetics

1. Course Name:
Advanced Microbial Genetics
2. Course Code:
3. Semester / Year:
2nd semester / 2023-2024
4. Description Preparation Date:
1-10-2023
5. Available Attendance Forms:
Weekly attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
2 Theoretical hours/week, one section * 15 weeks = 30 hours Total number of hours per section = hours Number of units =

7. Course administrator's name (mention all, if more than one name)

Name: Prof. Dr.Nuha Joseph Najeb kandala **Email:**nuha.najeeb@sc.uobaghdad.edu.iq

8. Course Objectives

The course aims to introduce students to one of the branches of genetics, which is the Advance Microbial Genetics, and to study all the factors that participate in revealing the facts about the genetics of microorganisms. It includes a historical overview of the genetics of microorganisms, the use of bacteria and viruses in genetic studies, the replication of the nuclear material of bacteria, and bacteriophages (prokaryotes), the repair system, mutations and their types and everything related to them, the regulation of gene expression , Molecular Mechanisms of Recombination , Bacterial Genetic Analysis:Fundamentals and Current Approaches, Mechanism of genetic exchange, Gene mapping using different methods, Genetics of viruses,Techniques for the Study of Bacteriophages

and Techniques for the Study of Bacteria.This course aims to develop students' competence providing them with the basic skills related to genetics and the more precise ones related to microbiology and biotechnology and their applications in all fields to make them able to fill the work need and keep pace with scientific development by employing them in research centers.

9. Teaching and Learning Strategies

21. Clarification and explanation of the study materials by the academic staff through t whiteboard or using PowerPoint.
22. Providing students with homework.
23. Preparing reports related to academic vocabulary.
24. Visit websites to obtain additional knowledge of academic subjects.
25. Brainstorming during lectures.

10. Course Structure: Theory

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	2	Introduction to the microbial genetics	The Biological Universe -The Bacteria -The Archaea -The Eukaryotes -Speculations on the Origin of the Three Domains of Life	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

			B-What Is Genetics? -Bacterial Genetics -A Brief History of BacterialMolecular Genetics - Phage Genetics		
2nd	**2**	Physical organization of Bacterial and phages genome .	A-Classification according to genetics content B-The Bacterial Chromosome: C-DNA Structure, Replication, and Segregation D-Antibiotics That Affect Replication and DNA Structure	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
3rd	**2**	Replication Errors Impediments to DNA Replication	A-DNA Repair system -Five types of DNA Repair Mechanisms: 1-Methyl Directed Mismatch Repair – repairs rep. mistakes 2) Photoreactivation – repairs thymidine dimers from UV 3) Nucleotide Excision Repair – recognizes bulges in DNA 4) Recombinational Repair – repairs regions that prevent Replication 5) SOS Inducible Repair – replicates past extreme damage. B- Bacteriophage Repair Pathways	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
4th	**2**	Recombination	A-types of recombination B-Molecular Mechanisms of Homologous Recombination	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

			-The Molecular Basis for Recombination in*E. coli* - Recombination between Different DNAs in Bacteria -Recombineering: Gene Replacements in *E. coli* with Phage λ Recombination Functions -Genetic Analysis of Recombination in Bacteria -Other Types of Double-Strand Break Repair in Bacteria - Site-Specific Recombination		
5th	**2**	First exam			
6th	**2**	Regulation of Gene expression	Genes and Operons -Transcriptional Regulation in Bacteria -Genetic Evidence for Negative and Positive Regulation -Negative Regulation of Transcription -Positive Regulation of Transcription -Regulation by Transcription Attenuation B-Regulation of Translation -Posttranslational Regulation C-Why Are There So Many Mechanisms of Gene Regulation?		Daily, semester and final exams
7th	**2**	Global Regulation	Regulons and Stimulons A-Carbon Catabolite Regulation -Regulation of Nitrogen Assimilation -Regulation of Ribosome and tRNA Synthesis	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

			- Stress Responses in Bacteria -Regulation of Virulence Genes in Pathogenic Bacteria B-From Genes to Regulons to Networks		
8th	**2**	Bacterial Genetic Analysis: Fundamentals and Current Approaches	A-Inheritance in Bacteria ,Mutations and Variation \ Genetic Names\ mechanisms of mutation Types of mutation \ Mutagenic agents \ B-Genetic Analysis in Bacteria C- Statistical Analysis of the Number of Mutants per Culture -Frequency and rate of mutation	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
9th	**2**	Mechanism of genetic exchange	Transposable elements , Integrons, Mobile Cassettes, Pathogenicity Islands	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
10th	**2**	Bacteriophages	Lytic Development, Genetics, andGeneralized Transduction -Regulation of Gene Expression during Lytic Development -Phage DNA Genome Replication and Packaging\ Phage Lysis \Phage Display - Phage Defense Mechanisms -Lambda Phage Genetics, Lambda Lytic Life Cycle	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

			,Lambda Lysogenic Life Cycle - Lambda Control Mechanisms. Genetic Analysis of Phages Uses of Lysogeny in Genetic Analysis and Biotechnology		
11th	**2**	Second exam		Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
12th	**2**	Bacterial Genetics	Reproduction versus Gene Transfer Fate of the Incoming DNA after Uptake Transformation and Horizontal Transfer of Genes Transformation is Gene Transfer by Naked DNA Transformation as Proof that DNA is the Genetic Material Transformation in Nature		
13th	**2**	Bacterial Genetics	Conjugation Transfer of Plasmids between Bacteria Transfer of Chromosomal Genes Requires Plasmid Integration Gene Transfer among Gram-Positive Bacteria and negative bacteria Archaebacterial Genetics	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
14th	**2**	Gene mapping using different methods	interrupted conjugation be used to map bacterial genes transformation can be used to map bacterial genes.	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

			Natural Gene Transfer and Antibiotic Resistance Gene Mapping in Phages Using bacteriophage to mapping bacteria		
15th	**2**	Genetics of viruses	Techniques for the Study of Bacteriophages	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

11. Course Evaluation	
Overall score out of 100 (Semester grade = 40) (End-of-semester exam score = 60)	
12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	Molecular Genetics of Bacteria.4th Edition Jeremy Larry Snyder , Joseph E. Peters, Tina M. Henkin and Wendy Champness .2014.
Main references (sources)	Analysis of Genes and Genomes .
Recommended books and references (scientific journals, reports...)	Genetics by Benjamine
Electronic References, Websi	There are many websites concerned with the genetics of microorganisms, including medical websites, YouTube, and scientific research.

Course Description Form

Biostatistics

1. Course Name:
Biostatistics
2. Course Code:
3. Semester / Year:
2nd semester / 2023-2024
4. Description Preparation Date:
1-10-2023
5. Available Attendance Forms:
Weekly attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
2 Theoretical hours/ 15 weeks = 30 hours Number of units = 2

7. Course administrator's name (mention all, if more than one name)

Name: Assistant Prof. Dr. Fadhaa Othman Sameer
Email: fadhaa.sameer@sc.uobaghdad.edu.iq

8. Course Objectives

This course aims to provide students with a comprehensive understanding of the fundamental concepts, theories, and practical applications within the [biostatistics] field. Through engaging lectures, interactive discussions, and hands-on activities, students will develop the knowledge, skills, and critical thinking abilities necessary to analyze, evaluate, and solve problems related to [applied statistics]. Additionally, the course aims to foster a deep appreciation for the importance and relevance of [biostatistics] in various real-world contexts, encouraging lifelong learning and professional development

9. Teaching and Learning Strategies

26. Clarification and explanation of the study materials by the academic staff through the whiteboard or using PowerPoint.
27. Providing students with homework.
28. Preparing reports related to academic vocabulary.
29. Visit websites to obtain additional knowledge of academic subjects.
30. Brainstorming during lectures.

10. Course Structure: Theory

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	**2**	Introduction to the biostatistics	What is statistics 1- Definition of statistics and its benefits 2- Definition of population and sample with	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
2nd	**2**	How to obtain data and its types	1- Types of data 2-Data sources 3- Design studies	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
3rd	**2**	Types of variables used in the study	1- Types of variables 2- Optimization for each type	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
4th	**2**	Methods of representing data	1- Representing data with graphics 2- Methods of representing data with tables	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

5th	**2**	Measures of central tendency	1- Average 2- The mode 3- The median 4-weight mean 5-geomatric mean 6- harmonic mean	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
6th	**2**	Measures of dispersion and deviation	1-Variance 2-Standard deviation 3- Coefficient of variation	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
7th	**2**	First Exam	First Exam		
8th	**2**	Testing hypotheses	. Identifying statistical tests and their types	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
9th	**2**	Types of errors in hypothesis testing	1- Errors of the first and second types 2- Decision matrix	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
10th	**2**	types of tests and degree of significance	Average and variance tests	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
11th	**2**	statistical tests	Knowing how to conduct statistical tests, explaining the t-test, chi-test.z-test	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
12th	**2**	Random variables	Definition and types of random variable.	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
13th	**2**	permutations	Definition of permutations and explanation of permutations examples.	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
14th	**2**	combinations	Explaining combinations and explaining examples of combinations	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
15th	**2**	**Second Exam**	**Second Exam**		
11. Course Evaluation					

Overall score out of 100 (Semester grade = 40) (End-of-semester exam score = 60)	
12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	Statistics (muaed Unis)
Main references (sources)	Principles of Biostatictics(Marcello pagano 2018) ➢
Recommended books and references (scientific journals, reports...)	Principles of statictics(M.G.Bulmer) ➢
Electronic References, Websites	Arabian statisticians website

Course Description Form

immunogenetics

1. Course Name:
immunogenetic
2. Course Code:
3. Semester / Year:
2nd semester / 2023-2024
4. Description Preparation Date:
1-10-2023
5. Available Attendance Forms:
Weekly attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
2 Theoretical hours/week, one section * 15 weeks = 30 hours Total number of hours per section = hours Number of units =
7. Course administrator's name (mention all, if more than one name)
Name: Assistant Prof. Dr. Aseel shakir mahmood **Email:** Aseel.mahmood @sc.uobaghdad.edu.iq
8. Course Objectives
This course aims to provide students with a comprehensive understanding of the fundamental concepts, theories, and practical applications within the [subject name] field. Through engaging lectures, interactive discussions, and hands-on activities, students will develop the knowledge, skills, and critical thinking abilities necessary to analyze, evaluate, and solve problems related to [subject area]. Additionally, the course aims to foster a deep appreciation for the importance and relevance of [subject area] in various real-world contexts, encouraging lifelong learning and professional development
9. Teaching and Learning Strategies

1. Clarification and explanation of the study materials by the academic staff through the whiteboard or using PowerPoint.
2. Providing students with homework.
3. Preparing reports related to academic vocabulary.
4. Visit websites to obtain additional knowledge of academic subjects.
5. Brainstorming during lectures.

10. Course Structure: Theory

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	2	– Immune system: an introduction	–Innate immunity –Adaptive immunity –Principles of ImmunogeneticS	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
2nd	2	The basic concepts of immunogenetics	The Functions of MHC - -MHC Class I -Structure of MHC class I:	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
3rd	2	The major histocompatibility complex	-Human MHC Class I Genes - Human MHC Class II Genes -Human Class III Genes	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
4th	2	The human leukocyte antigen (HLA) system.	- isoagglutinogen,-- -Inheritance of A and -B genes -H gene codes	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
5th	2				
6th	2	HLA-class I and -class II molecules	-Basic Structure -General Functions -Human Immunoglobulin Classes		Daily, semester and final exams
7th	2	Function of HLA molecules	Gene class- Inheritance-	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

8th	**2**	Significance of HLA system: HLA and disease association.	Bacterial diseases- Viral diseases- Parasitic diseases-	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
9th	**2**	Mid-term examination	-	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
10th	**2**	Other significances of HLA system	anthropological studies- **Histocompatibility-Clinical Application-**	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
11th	**2**	T-cell receptor: structure and genetic basis.	Disease - Denetics inheriitance	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
12th	**2**	Structure and function of immunoglobulins	-Innate immunity -Adaptive immunity -Principles of Immunogenetics		
13th	**2**	Genetic bases of immunoglobulin diversity	The Functions of MHC - -MHC Class I -Structure of MHC class I:	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
14th	**2**	Cytokines: Introduction to genetic polymorphism	-fORENSIC MEDICIEN -- ANTHROPOLOGY - PRACTICAL MEDICIN	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
15th	**2**	Blood group systems	– Major thalasimia - Dupuytren's Contracture - Schizophrenia	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

		and their polymorphisms	- Manic-Depressive Disorder		
			–Innate immunity –Adaptive immunity –Principles of ImmunogeneticS		
Course Structure: Practical					
Week	**Hours**	**Unit or subject name**	**Required Learning Outcomes**	**Learning method**	**Evaluation method**
1st	**2**	Immunity types– Innate immunity– Adaptive immunity– Immune cells–	Immunogenetics Introduction and background	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
2nd	**2**	Sources for DNA isolation Basic Steps in DNA Extraction DNA isolation from Blood Blood Collection DNA Isolation Procedure using a kit	DNA Extraction	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
3rd	**2**	Phenol-chloroform method of DNA extraction from blood samples	Manual DNA extraction methods	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
4th	**2**	-prepare gele -microwave soluble -put gele in ruk and thumb -electrophoreses	Gel Electrophoresis	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
5th	**2**	-prepar raction -master mix -primers -PCR programe	Polymerase chain reaction (PCR	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

6th	**2**	HLA typing Methods for HLA typing HLA typing applications	Human leukocyte antigen (HLA)	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
7th	**2**	The enzyme-linked immunosorbent assay (ELISA) ELISA Analysis ELISA application	Immunoassays	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
8th	**2**	RFLP Analysis RFLP application	Restriction fragment length polymorphism (RFLP)	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
9th	**2**	Sanger method Applications	The Comet Assay DNA sequencing	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
10th	**2**	Immunity types– Innate immunity– Adaptive immunity– Immune cells–	Immunogenetics Introduction and background		
11th	**2**	Sources for RNA isolation Basic Steps in RNA Extraction RNA isolation from Blood Blood Collection RNA Isolation Procedure using a kit	RNA Extraction	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
12th	**2**	Phenol-chloroform method of RNA extraction from blood samples	Manual RNA extraction methods		
13th	**2**	-prepare PRIMER -REACTION SOLUTION -ANALYSIS DATA	REAL TIME qPCR	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

14th	**2**	-prepar raction -RAPID POLYT PRIMERS -master mix -ENZYM revers transcreptase -PCR programe	**RT PCR Polymerase chain reaction (PCR**	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
15th	**2**				

11. Course Evaluation	
Overall score out of 100 (Semester grade = 40) (End-of-semester exam score = 60)	
12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	Basic Applied Bioinformatics book
الكتب المقررة المطلوبة (المنهجية ان وجدت)	HLA and Disease - A Comprehensive Review William E. Braun, M.D. Director, Histocompatibility Laboratory Chief, Medical Renal Transplantation Service The Cleveland Clinic Cleveland, Ohio 2-HLA and Associated Important Disease.s Edited by Yongzhi Xi Published 19 March, 2014 ISBN-10 9535112309 ISBN-13 978-9535112303
المراجع الرئيسية (المصادر)	Immunogenetics books Immunogenetics association diseases books
تب و المراجع الساندة التي يوصى بها (المجلات العلمية و التقارير....)	Immunogenetics: Methods and Applications in Clinical Practice Book. **Christiansen**, Frank T., **Tait**, Brian D.2012. **2- Human Immunogenetics. S. D. Litwin (Author).1989**
المراجع الالكترونية ، مواقع الانترنيت	١ **Unlinking Tumor Necrosis Factor Biology from the Major Histocompatibility Complex: Lessons from Human Genetics and Animal Models**

Course Description Form

Advance enzyme technology

1. Course Name:
Advance enzyme technology
2. Course Code:
3. Semester / Year:
2nd semester / 2023-2024
4. Description Preparation Date:
1-10-2023
5. Available Attendance Forms:
Weekly attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
2 Theoretical hours/week, one section * 15 weeks = 30 hours Total number of hours per section = hours Number of units =
7. Course administrator's name (mention all, if more than one name)
Name: Assistant Prof. Dr. Ali Jabbar Reshak **Email: ali.reshak@sc.uobaghdad.edu.iq**
8. Course Objectives
This course aims to provide students with a comprehensive understanding of the fundamental concepts, theories, and practical applications within the Advance enzyme technology field. Through engaging lectures, interactive discussions, and hands-on activities, students will develop the knowledge, skills, and critical thinking abilities necessary to analyze, evaluate, and solve problems related to Advance enzyme technology. Additionally, the course aims to foster a deep appreciation for the importance and relevance of Advance enzyme technology in various real-world contexts, encouraging lifelong learning and professional development
9. Teaching and Learning Strategies
31. Clarification and explanation of the study materials by the academic staff through the whiteboard or using PowerPoint. 32. Providing students with homework. 33. Preparing reports related to academic vocabulary. 34. Visit websites to obtain additional knowledge of academic subjects. 35. Brainstorming during lectures.
10. Course Structure: Theory

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method

1st	**2**	-Advantages of using the microorganisms in enzyme production. -Food technology. -Organic chemicals.	Use of microorganisms in enzyme production	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
2nd	**2**	-Isolation of enzymes from sources and their application. -Alcoholic beverages -Meat tenderizing -Sweeteners -Enzyme therapy	Industrial Processes of isolated enzyme	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
3rd	**2**	-Immobilization methods of enzymes -Physical adsorption -Inclusion in the Supports of a polymerized gel -Cross-linking -Covalent binding -Entrapment materials	Immobilized Enzymes	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
4th	**2**	-Kinetic Properties Km, Vmax, Ea	Properties of Immobilized enzymes	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
5th	**2**	-Enzyme stability -Effect on Thermal stability -PH	Effect of Immobilization on the enzyme Properties		Daily, semester and final exams

		-Enzyme storage			
6th	**2**	First examination			
7th	**2**	Historical aspects.- -Specificity. -Induced fit theory.	Enzymes	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
8th	**2**	- Determination of enzymes activities for clinical diagnosis -Clinical enzymology of liver disease -Clinical enzymology of heart disease	Clinical aspects of Enzymology	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
9th	**2**	-α-amylase -Creatin Kinase -Fructose – bisphosphate aldolase.	Enzymes activities which become elevated in serum in disease states	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
10th	**2**	-Blood glucose -Uric acid and Urea -Cholesterol, Cholesterols esters, Triglycerides -Other metabolites (creatine)	Determination of metabolites concentration by Enzymes	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
11th	**2**	-Cancer enzyme therapy - Asparaginase -Glutaminase	Enzyme Therapy and nanotechnology	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

12th	**2**	-ELISA -Some Enzyme used in ELIZA (peroxidase)	Enzyme immunoassay	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
13th	**2**	Second examination			
14th	**2**	-Enzymes linked to insoluble matrix are used as chemical reactors -Bioreactors	Enzymes and reactors	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
15th	**2**	-Biological Kits -Glucose and Urea determinatio n	Biosensors and Enzymes Second semester exam	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
			Final examination		

11. Course Evaluation

Overall score out of 100
(Semester grade = 40)
(End-of-semester exam score = 60)

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Basic Applied enzymology book
Main references (sources)	➢ Lihnenger, A.I., Nelson, D.L., Cox, M.M. Principles of biochemistry, 2nd edition. Worth Publishers. 1993. ➢ Zubay, G.L., Parson, W.W., Vance, D.E. Principles of biochemistry. Wm.c. Brown Publishers.1995.
Recommended books and references (scientific journals, reports...)	Palmer, T . and Bonner, P. (2007). Enzymes, Biochenis Biotechnology,Clinical Chemistry. Second edition. Reprir by Woodhead Publishing Limited,2011.
Electronic References, Websites	Database website (NCBI),Uniprot.Esmble

Course Description Form

Metabolic Pathway

1. Course Name:
Metabolic Pathway
2. Course Code:
3. Semester / Year:
Second semester / 2023-2024
4. Description Preparation Date:
1-2-2023
5. Available Attendance Forms:
Weekly attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
2 Theoretical hours/week, one section * 15 weeks = 30 hours Total number of hours per section = hours Number of units =
7. Course administrator's name (mention all, if more than one name)
Name :Assistant Prof. Dr. Sahar I.Hussein Email: sahar.hussein@sc.uobaghdad.edu.iq
8. Course Objectives
• Expanding students' awareness to globally recognized modern technologies. • Contributing to fostering students' scientific thinking to solve obstacles in scientific research fields. • Supplying the job market with experienced and competent graduates in applied fields of biotechnology.
9. Teaching and Learning Strategies
A - Cognitive Objectives: A1 - Empowering students to acquire knowledge and understanding of the intellectua framework and applications of biotechnological techniques. A2 - Empowering students to acquire knowledge and understanding of industrial, environmental, and food microbiology. A3 - Empowering students to acquire knowledge and understanding of genetics, gene engineering, and cellular genetics. A4 - Empowering students to acquire knowledge and understanding of botany, plant tissues, and animal biology. A5 - Empowering students to acquire knowledge and understanding of pathology, immunity, and pathogenic bacteria. A6 - Empowering students to acquire knowledge and understanding of cellular biolog and microbiology standards. A7 - Empowering students to acquire knowledge and understanding of biological statistics and the English language.

B - Program-Specific Skills Objectives:
B1 - Scientific and practical skills.
B2 - Remembering and analytical skills.
B3 - Usage and development skills.

10. Course Structure: Theory

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	2	What is Metabolism? -Anabolism -Catabolism	Metabolism: Understanding the interactions and transformations in living cells	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
2nd	2	- -How Do Enzymes Work? - How Do Coenzymes Work? The Three Primary Classes of Enzymes in the Human Body -Metabolic Enzymes - Digestive Enzymes	Metabolic Enzymes	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
3rd	2	-The Main Functions of Metabolic Enzymes in the Body 1.Formation of macromolecules 2.Change in the form of molecules 3.Breakdown of large to small molecules 4. Enhancing the solubility or Convert	Food Enzymes	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

		lipophilic molecules to hydrophilic ones. 5. Minimizing the toxicity of substances			
4th	2	•Adenosine Triphosphate (ATP) •Overview of energy metabolism •The breakdown of glucose (Glycolysis)	Food Enzyme	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
5th	2	-The Citric Acid Cycle is the Final Step in Glucose Oxidation -Electrons to the Electron Transport Chain			
6th	2	-Cellular Respiration -Total Net Yield of ATP from Glucose Oxidation			Daily, semester and final exams
7th	First Examination				
8th	2	Fatty acid oxidation occur in the mitochondrial matrix	-Tallying Total ATP Production by Fatty Acid Oxidation -Fat versus Glucose - ATP Production and Oxygen Consumption	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
9th	2		•Aerobic Versus Anaerobic Glycolysis •Ketogenesis	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

10th	2		•Amino acid metabolism •Alcohol metabolism - how is MW measured	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
11th	2		-Feasting and Fasting Cycle – Coordination Metabolic Adaptation in Pathways of Energy Metabolism - Alcohol Absorption and Metabolism •In born errors of metabolism	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
12th	2		- Examples of Metabolic Pathways | Their Role in Cell and Body 1.Respiration 2. Photosynthesis 3. Glycogenesis		
13th	2		4. Gluconeogenesis 5 .Mevalonic acid pathway 6. Sedoheptulose pathway	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
14th	Second examination				
15th	Final Examination				

11. Course Evaluation

Overall score out of 100
(Semester grade = 40)
(End-of-semester exam score = 60)

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	
Main references (sources)	1. Janson, J.C and Ryden, L.(1998).Protein purification principles, high resolution methods, and application second Edition,Ajohn wiley and sons, Inc., publication.

	2. Belter, P.A., Cussler, E.L. and Shouttu, W. (1988).Bioseparation. Downstream processing for Biotechnology. Awiley- Intersciencepublication
Recommended books and references (scientific journals, reports...)	Palmer, T . and Bonner, P. (2007). Enzymes, Biochenis Biotechnology,Clinical Chemistry. Second edition. Reprir by Woodhead Publishing Limited, 2011.
Electronic References, Websites	The numerous platforms that deal with biology, including medical websites, YouTube, and scientific research.

Course Description Form

Medical bacteriology

1. Course Name:
Medical bacteriogy
2. Course Code:
3. Semester / Year:
2nd semester / 2023-2024
4. Description Preparation Date:
1-4-2024
5. Available Attendance Forms:
Weekly attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
2 Theoretical hours/week, one section * 15 weeks = 30 hours Total number of hours per section = hours Number of units =
7. Course administrator's name (mention all, if more than one name)
Name: professor suhad saad mahmood **Email:** suhad.mahmood@sc.uobaghdad.edu.iq
8. Course Objectives
This course aims to provide students with a comprehensive understanding of the fundamental concepts, theories, and practical applications within the [subject name] field. Through engaging lectures, interactive discussions, and hands-on activities, students will develop the knowledge, skills, and critical thinking abilities necessary to analyze, evaluate, and solve problems related to [subject area]. Additionally, the course aims to foster a deep appreciation for the importance and relevance of [subject area] in various real-world contexts, encouraging lifelong learning and professional development
9. Teaching and Learning Strategies
36. Clarification and explanation of the study materials by the academic staff through the whiteboard or using PowerPoint. 37. Providing students with homework. 38. Preparing reports related to academic vocabulary. 39. Visit websites to obtain additional knowledge of academic subjects.

40. Brainstorming during lectures.					
10. Course Structure: Theory					
Week	**Hours**	**Unit or subject name**	**Required Learning Outcomes**	**Learning method**	**Evaluation method**
1st	**2**	Bcaterial structure ,growth and metabolism	Structurar of bacteria and study growth conditions and metabolism pathways	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
2nd	**2**	Pathogenesis of Bacterial	Study bacterial pathogenesis , the virulence factors etc	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
3rd	**2**	Staphylococci	staphylococci: group characteristics of staph aureus, structure toxin etc	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
4th	**2**	Streptococci and Enterococci	Group Characteristic, classification, etc	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
5th	**2**	First exam			
6th	**2**	Corynebacterium, Listeria, and Bacillus	Group Characteristic, classification, etc		Daily, semester and final exams
7th	**2**	Mycobacteria	Group Characteristic, classification, etc	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
8th	**2**	Clostridium, Peptostreptococcus,Bacteroides, and Other Anaerobes	Group Characteristic, classification, etc	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
9th	**2**	Neisseria	Group Characteristic, classification, etc	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
10th	**2**	Haemophilus and Bordetella	Group Characteristic, classification, etc	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

11th	**2**	Second exam		Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
12th	**2**	Vibrio, Campylobacter, and Helicobacter	Group Characteristic, classification, etc		
13th	**2**	Enterobacteria ceae	Group Characteristic, classification, etc	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
14th	**2**	Legionella and Coxiella	Group Characteristic, classification, etc	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
15th	**2**	Pseudomonas and Other Opportunistic Gram-negative Bacilli	Group Characteristic, classification, etc	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

11. Course Evaluation
Overall score out of 100 (Semester grade = 40) (End-of-semester exam score = 60)

12. Learning and Teaching Resources	
Required textbooks (curricula books, if any)	Basic Applied Bioinformatics book
Main references (sources)	Bioinformatics sequence and genome analysis
Recommended books and references (scientific journals, reports...)	
Electronic References, Websit	Database website (NCBI),Uniprot.Esmble

Course Description Form

Nanobiotechnology

1. Course Name:
Advanced Nanobiotechnology
2. Course Code:
3. Semester / Year:
2nd semester / 2023-2024

4. Description Preparation Date:

1-10-2023

5. Available Attendance Forms:

Weekly attendance

6. Number of Credit Hours (Total) / Number of Units (Total)

2 Theoretical hours/week, one section * 15 weeks = 30 hours
Total number of hours per section = hours
Number of units = 2

7. Course administrator's name (mention all, if more than one name)

Name: Assistant Prof. Dr. Laith Ahmad Yaaqoob
Email: laith.yaaqoob@sc.uobaghdad.edu.iq

8. Course Objectives

• Understanding basic concepts: Teaching nanotechnology aims to provide students with a basic understanding of the basic concepts and principles in nanobiotechnology.
• Developing laboratory skills: Nanotechnology lessons enhance students' abilities to manufacture, experiment with, and apply nanotechnology in the medical, industrial, and environmental fields.
• Identifying tools and techniques: The lessons aim to introduce students to a variety of laboratory tools and equipment involved in the preparation, diagnosis and characterization of nanoparticles.

9. Teaching and Learning Strategies

41. Clarification and explanation of the study materials by the academic staff through the whiteboard or using PowerPoint.
42. Providing students with homework.
43. Preparing reports related to academic vocabulary.
44. Visit websites to obtain additional knowledge of academic subjects.
45. Brainstorming during lectures.

10. Course Structure: Theory

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	2	Definition of nanoscience	Introduction to Nanoparticles	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
2nd	2	An explanation of the types of nanoparticles	Types of Nanoparticles	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
3rd	2	An explanation of	Preparation of Nanoparticles by Biological methods	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

		the preparation of nanoparticles by biological methods			
4th	**2**	An explanation of the preparation of nanoparticles by Chemical methods	Preparation of Nanoparticles by Chemical methods	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
5th	**2**	An explanation of the preparation of nanoparticles by Physical methods	Preparation of Nanoparticles by Physical methods	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
6th	**2**	Exam 1	Exam 1		
7th	**2**	Nanoparticle Characterization Assays (Part 1): TEM, SEM, AFM	Determination the properties of Nanoparticles (part I): TEM, SEM, AFM	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
8th	**2**	Nanoparticle Characterization Assays (part II): FTIR, Zeta potential, UV-Visible Spectrophotometer	Determination the properties of Nanoparticles (part II): FTIR, Zeta potential, UV-Visible Spectrophotometer	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
9th	**2**	Applications of nanoparticles in microbiology	Applications of Nanoparticles In Microbiology	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

10th	**2**	Applications of Nanoparticles In Plant	Applications of Nanoparticles In Plant	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
11th	**2**	Applications of Nanoparticles In Mammals	Applications of Nanoparticles In Mammals	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
12th	**2**	Applications of Nanoparticles In Environment	Applications of Nanoparticles In Environment	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
13th	**2**	Exam 2	Exam 2		
14th	**2**	Toxicity of Nanoparticles	Toxicity of Nanoparticles	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
15th	**2**	Seminar	Seminar		
Course Structure: Practical					
Week	**Hours**	Unit or subject name	Required Learning Outcomes	**Learning method**	**Evaluation method**
1st	**2**	Nanoscale effects on chemical and physical properties Quantum effect and surface area	Outline of Nanotechnology Elements, Definitions & terms	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
2nd	**2**	Toxicity of nanomaterials Exposure pathways and safety measures	Outline of Best Practices for Safe Handling of Nanomaterials in research	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

3rd	**2**	Synthesis of nanoparticles- Chemical Synthesis	Synthesis of nanoparticles- part one	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
4th	**2**	Synthesis of nanoparticles- physical Synthesis	Synthesis of nanoparticles- part two	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
5th	**2**	1st Exam	1st Exam		
6th	**2**	Different methods used to identify and characterized nanoparticles	Equipment and tools for nanoparticles Characterization, Imaging, and Analysis	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
7th	**2**	Applications of nanoparticles in medicine	Nanoparticles Applications	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
8th	**2**	The antibacterial test for nanoparticles (AgNPs)	Applied Nanoparticles	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
9th	**2**	2nd Exam	2nd Exam		
10th	**2**	Learn how to synthesis biodegradable materials	Preparation of nanoliposomes part 1	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
11th	**2**	Learn how to synthesis biodegradable materials	Preparation of nanoliposomes part 2	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
12th	**2**	Discussion of students' reports	Class Presentation	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
13th	**2**	Discussion of students' reports	Class Presentation	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
14th	**2**	Discussion of students' reports	Class Presentation	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
15th	**2**		Seminar		

		Seminar			

11. Course Evaluation
Overall score out of 100 (Semester grade = 40) (End-of-semester exam score = 60)

12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	Basic Applied Bioinformatics book
Main references (sources)	Bioinformatics sequence and genome analysis
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	Database website (NCBI),Uniprot.Esmble

Course Description Form

Advanced soil microbiology

1. Course Name:
Advanced soil microbiology
2. Course Code:
3. Semester / Year:
2nd semester / 2023-2024
4. Description Preparation Date:
1-10-2023
5. Available Attendance Forms:
Weekly attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
2 Theoretical hours/week, one section * 15 weeks = 30 hours Total number of hours per section = hours Number of units =
7. Course administrator's name (mention all, if more than one name)
Name: Prof. Dr. Hutaf Abd Almalik Ahmed Alsalim **Email: hutaf.alsalim@sc.uobaghdad.edu.iq**
8. Course Objectives
This course aims to provide students with a comprehensive understanding of the fundamental concepts, theories, and practical applications within the [subject name] field. Through engaging lectures, interactive discussions, and hands-on activities, students will develop the knowledge, skills, and critical thinking abilities necessary to analyze, evaluate, and solve problems related to [subject area]. Additionally, the course aims to foster a deep appreciation for the importance and relevance of [subject

area] in various real-world contexts, encouraging lifelong learning and professional development

9. Teaching and Learning Strategies

46. Clarification and explanation of the study materials by the academic staff through the whiteboard or using PowerPoint.
47. Providing students with homework.
48. Preparing reports related to academic vocabulary.
49. Visit websites to obtain additional knowledge of academic subjects.
50. Brainstorming during lectures.

10. Course Structure: Theory

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	**2**	The soil habitat	Introduction, Definition of Soil Microbiology & soil in view of Microbiology, Components of soil, Scope and Importance of Soil Microbiology	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
2nd	**2**	Soil biology and microbiology	Soil Biota, Microbiota (Bacteria, Actinomycetes, Fungi, Cyanobacteria and Algae, Protozoa), Metabolism of Micro-organisms, Mesobiota, Macrobiota	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
3rd	**2**	Biogeochemical Cycles and microbes	Carbon cycle (The long-term Carbon cycle, The short-term Carbon cycle, Ecosystem C cycling), The nitrogen transformation (Nitrogen mineralization and immobilization,	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

			Nitrification, Denitrification)		
4th	**2**	Biogeochemical Cycles and microbes	PHOSPHORUS (The soil phosphorus cycle, Nature and forms of phosphorus in soil, Biological importance of phosphorus, Microbial transformations of phosphorus), SULFUR (The soil sulfur cycle, Nature and forms of sulfur in soil, Biological importance of sulfur, Microbial transformation of sulfur)	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
5th	**2**	Biogeochemical Cycles and microbes	Micronutrient and trace metal cycling in soil, Nature and forms in soil, Biological importance (Fe, Zn, Mn, Mo, Co, Cu, Ni, Sc), Microbial transformations		Daily, semester and final exams
6th	**2**	First exam			
7th	**2**	Biofertilizers	Biofertilizers: Types of bio fertilizers, Advantages and disadvantages of biofertilizers, Carrier material	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
8th	**2**	Biofertilizers	Biofertilizers: Nitrogen fixing biofertilizers,	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
9th	**2**	Biofertilizers	Biofertilizers: Phosphate solubilizing bio fertilizer	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

10th	**2**	Soil-Related Bacterial and Fungal Infections	Bacterial Infections (Bacterial types and their diseases)	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
11th	**2**	Soil-Related Bacterial and Fungal Infections	Fungal Infections (Fungal types and their diseases)	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
12th	**2**	Second exam			
13th	**2**	Mycorrhiza	Importance, Classification, Root colonizing AM, isolation, production, benefits, application	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
14th	**2**	Trichoderma	Trichoderma characters, Mechanisms of action, Mycoparasitism, Antibiosis, plant growth promoter	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
15th	**2**	Biopesticides	Biopesticides: their definition, importance and types	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

11. Course Evaluation
Overall score out of 100 (Semester grade = 40) (End-of-semester exam score = 60)

12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	Basic Applied Bioinformatics book
Main references (sources)	Bioinformatics sequence and genome analysis
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	Database website (NCBI),Uniprot.Esmble

Course Description Form

Topics in Genetic engineering

1. Course Name:
Topics in Genetic engineering
2. Course Code:
3. Semester / Year:
2nd semester / 2023-2024
4. Description Preparation Date:
1-10-2023
5. Available Attendance Forms:
Weekly attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
2 Theoretical hours/week, one section * 15 weeks = 30 hours Total number of hours per section = hours Number of units =
7. Course administrator's name (mention all, if more than one name)
Name: Prof. Dr. Abdulkareem Alkazaz **Email:** abdulkareem .alkazaz @sc.uobaghdad.edu.iq
8. Course Objectives
Study in the set of technologies that directly manipulate an organism's genes, change the genetic makeup of cells, and add new traits that are not found in that organism. Topics include gene targeting, nuclear transplantation, transfection of synthetic chromosomes, or viral insertion. The emphasis is given to the design of the tools and the related applications in agriculture, medicine, and biological research.
9. Teaching and Learning Strategies
1. Clarification and explanation of the study materials by the academic staff through the whiteboard or using PowerPoint. 2. Providing students with homework. 3. Preparing reports related to academic vocabulary. 4. Visit websites to obtain additional knowledge of academic subjects. 5. Brainstorming during lectures.
10. Course Structure: Theory

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	**2**	Cloning	Cloning strategy in eukaryotes and steps	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

2nd	**2**	Cutting the DNA	Cutting the DNA by restriction enzymes	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
3rd	**2**	Cloning vectors	Cloning vectors, Types of cloning vectors (plasmids , phages , cosmids , expression vectors)	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
4th	**2**	DNA ligation	DNA ligation and joining methods and factors	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
5th	**2**	Introducing DNA fragments	Introducing DNA fragments in to hosts and monitering	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
6th	**2**	selection clones	Identifying and selection clones of interest	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
7th	**2**	DNA expression	Expression of cloned DNA	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
8th	**2**	sequencing	Library construction ,in vitro translation ,DNAsequencing	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
9th	**2**	PCR	PCR ,Real-time PCR, RFLP	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
10th	**2**	DNA chips	DNA chips and applications	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
11th	**2**	Genomic mapping	Genomic mapping and applications	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
12th	**2**	Probe and primer design	Probe and primer design in differenr programs		

13th	**2**	Genetic engineering application	Genetic engineering application in medicine, industry and agriculture	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
14th	**2**	seminars	seminars	-	-
15th	**2**	Mid exam	Mid exam	-	-

11. Course Evaluation
Overall score out of 100 (Semester grade = 40) (End-of-semester exam score = 60)

12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	-
Main references (sources)	- Puehler, A. *et al*, A.K. 1984.Advanced molecular genetics - Rogen L., 1999. Applied molecular genetics. - Leland, H. *et al*. 2019. Genetics.
Recommended books and references (scientific journals, reports...)	-
Electronic References, Websites	https://catalog.ucmerced.edu/preview_course_nopop.php?catoid=20&coid=51867

Course Description Form

Bioformatics

1. Course Name:
Bioinformatics
2. Course Code:
3. Semester / Year:
2nd semester / 2023-2024
4. Description Preparation Date:
1-10-2023
5. Available Attendance Forms:
Weekly attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
2 Theoretical hours/week, one section * 15 weeks = 30 hours Total number of hours per section = hours Number of units =
7. Course administrator's name (mention all, if more than one name)
Name: Assistant Prof. Dr. Rasha Abd Ali Al-khalidi **Email:** rasha.ali @sc.uobaghdad.edu.iq
8. Course Objectives

This course aims to provide students with a comprehensive understanding of the fundamental concepts, theories, and practical applications within the [subject name] field. Through engaging lectures, interactive discussions, and hands-on activities, students will develop the knowledge, skills, and critical thinking abilities necessary to analyze, evaluate, and solve problems related to [subject area]. Additionally, the course aims to foster a deep appreciation for the importance and relevance of [subject area] in various real-world contexts, encouraging lifelong learning and professional development

9. Teaching and Learning Strategies

1. Clarification and explanation of the study materials by the academic staff through the whiteboard or using PowerPoint.
2. Providing students with homework.
3. Preparing reports related to academic vocabulary.
4. Visit websites to obtain additional knowledge of academic subjects.
5. Brainstorming during lectures.

10. Course Structure: Theory

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	**2**	Introduction to the bioinformatics	Bioinformatics,goal of bioinformatics, using different online database to retrieve the biological information	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
2nd	**2**	Biological database	Introduction to the biological database	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
3rd	**2**	alignment	Sequence alignment, goal of alignment, homology and similarity, pairwise alignment, FASTA and BLAST	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
4th	**2**	Human genetic varation	Sequencing result analysis using megaX Bioedit,and data analysis	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
5th	**2**	First exam			
6th	**2**	Primer design1	primer design for PCR, role of design primer, the validation of primer		Daily, semester and final exams

7th	**2**	Primer design 2	Primer design for real time PCR, the role of design primer, the validation of primer, design primer for sybr ggreen and TaqMan experiment	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
8th	**2**	Primer design 3	Design primer for SNP using SNPGENE software	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
9th	**2**	Primer design miRNA	Using different sotware for design primer to microRNA	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
10th	**2**	Gene prediction	Gene prediction software, gene prediction in prokaryotic and eukaryotic	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
11th	**2**	Second exam		Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
12th	**2**	Molrcular docking	Target receptor section and preparation location of the binding site ligand seclection and preparation		
13th	**2**	Sanger sequencing	Principle of sequencing , analysis the result	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
14th	**2**	Next generation sequencing	What is the ngs, the ngs application, ngs from studydesign to data analysi	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
15th	**2**	Phylogenetic tree	Construction phylogenetic tree	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
Course Structure: Practical					

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	**2**	Introduction to the database	Online access to PubMed and find the publication information	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
2nd	**2**	Biological database	Online access to find the gene information, sequence, map and all related in NCBI	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
3rd	**2**	Biological database	Online access to find the protein information, sequence, map and all related in RCSB PDB	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
4th	**2**	alignment	Align two fragment of gene of protein using BLAST in NCBI	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
5th	**2**	exam		Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
6th	**2**	Primer design	Design primer using primer design BLAST form in NCBI	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
7th	**2**	Primer design 2	Validation primer design using Blast format and oligoanalyser IDT	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
8th	**2**	Primer design 3	Design primer for SNP using SNPGENE software	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
9th	**2**	Sanger sequencing	Analysis the data using megaX and bioedit	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
10th	**2**	Second exam			

11th	**2**	Molecular docking .	find the best binding poses of the receptor–ligand complex using Sanjeevani; GOLD; ICM**;** AUTO DOCK; GLIDE; GRAMM-X; FlexX; and SwissDock	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
12th	**2**	Gene prediction	Prediction of transcription site using TRANSFAC and MATCH tools		
13th	**2**	Sanger sequencing	Principle of sequencing , analysis the result	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
14th	**2**	Next generation sequencing	What is the ngs, the ngs application, ngs from studydesign to data analysi	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
15th	**2**	Phylogenetic tree	Construction phylogenetic tree		

11. Course Evaluation
Overall score out of 100 (Semester grade = 40) (End-of-semester exam score = 60)

12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	Basic Applied Bioinformatics book
Main references (sources)	Bioinformatics sequence and genome analysis
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	Database website (NCBI),Uniprot.Esmble

Course Description Form

Diagnostic bacteriology

1. Course Name:
Diagnostic bacteriology
2. Course Code:
3. Semester / Year:
2nd semester / 2023-2024
4. Description Preparation Date:
1-10-2023
5. Available Attendance Forms:
Weekly attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
2 Theoretical hours/week, one section * 15 weeks = 30 hours Total number of hours per section = hours Number of units =
7. Course administrator's name (mention all, if more than one name)
Name: Assistant Prof. Dr. Aida Hussain Ibrahim **Email:** aida.h@sc.uobaghdad.edu.iq
8. Course Objectives
- This course aims to provide a course of study in bacterial diagnostics, based on knowledge of the basic principles of bacteriology and the diagnostic methods adopted to investigate and diagnose them accurately and in the ways that confirm this. - To develop more basic science skills in the field of bacterial diagnostics. - To prepare students for a number of natural science courses, especially in the field of bacterial diagnosis with all its details, including routine methods, in addition to modern diagnostic methods.
9. Teaching and Learning Strategies
1. Clarification and explanation of the study materials by the academic staff through the whiteboard or using PowerPoint. 2. Providing students with homework. 3. Preparing reports related to academic vocabulary. 4. Visit websites to obtain additional knowledge of academic subjects. 5. Brainstorming during lectures.
10. Course Structure: Theory

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method

1st	**2**	Introduction to clinical bacteriology	The first lecture includes an introduction to clinical bacteriology	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
2nd	**2**	Control of microorganisms . Specimen collection, processing and isolation techniques	The second lecture includes methods for controlling microorganisms. - Sample collection, processing and isolation techniques	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
3rd	**2**	Performance improvement in the microbiology and Microscopic examination of all infected materials.	The third lecture includes: Improving performance in microbiology. - Microscopic examination of all infected materials	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
4th	**2**	Use of colonial morphology for the presumptive identification of bacterial ssp.	The fourth lecture includes using the phenotypic appearance of bacterial colonies to identify bacterial species.	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
5th	**2**	Biochemical identification of Gram - positive and negative bacteria. + Applications of molecular diagnosis.	The fifth lecture includes: Biochemical tests for gram positive and negative bacteria, their types and uses in bacterial laboratory diagnosis. - Molecular diagnostic applications.		
6th	**2**	Antibiotic mechanisms of action and resistance + Antimicrobial susceptibility testing	The sixth lecture includes: mechanisms of action of antibiotics and their resistance. - Antimicrobial susceptibility testing		Daily, semester and final exams
7th	**2**	Seasonal exam	Conducting seasonal exam	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

8th	**2**	Laboratory diagnosis and microbiological aspects of clinical samples (Urine).	The eighth lecture includes: laboratory diagnosis and microbiological aspects of clinical samples (urine).	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
9th	**2**	Laboratory diagnosis and microbiological aspects of clinical sample (stool).	The ninth lecture includes: laboratory diagnosis and microbiological aspects of the clinical sample (stool).	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
10th	**2**	Laboratory diagnosis and microbiological aspects of clinical sample (blood)	This lecture includes a comprehensive explanation of flatworms that infect humans, and also includes their location, reproduction, forms, life cycle, and epidemiology, as well as methods of diagnosis, treatment, and prevention.	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
11th	**2**	Laboratory diagnosis and microbiological aspects of clinical sample (sputum and respiratory secretion).	The eleventh lecture includes: laboratory diagnosis and microbiological aspects of the clinical sample (sputum and respiratory secretions)	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
12th	**2**	Seasonal exam	Seasonal exam		
13th	**2**	Laboratory diagnosis and microbiological aspects of clinical sample (Cerebrospinal fluid (CSF))	The thirteenth lecture includes: laboratory diagnosis and microbiological aspects of the clinical cerebrospinal fluid (CSF) sample.	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
14th	**2**	Laboratory diagnosis and microbiological aspects of clinical sample (Wounds, pus, burns and ear swab)	Laboratory diagnosis and microbiological aspects of clinical specimen (wounds, pus, burns, ear swab)	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
15th	**2**	--	Exam	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

11. Course Evaluation	
Overall score out of 100 (Semester grade = 40) (End-of-semester exam score = 60)	
12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	- Gillies R.R. & Dodds, 1984: Bacteriology illustrated, edition. Long man group limited. USA. (Text book).
Main references (sources)	1- Katherine N. Ward, A. Christine McCartney & Bishan Thakker 2009: Notes On Medical Microbiology, 2nd edition. Churchill Livingstone Elservier. UK. 2- Morello, Mizer & Granato 2006: Laboratory manual and Workbook in Microbiology "Application to patient care", Eighth edition. The McGraw-Hill Companies Inc., USA. 3- Whitman, William B; Rainey, Fred; Kämpfer, Peter; Trujillo, Martha; Chun, Jonsik; Devos, Paul; Hedlund, Brian; Dedysh, Svetlana (eds.) (2015). *Bergey's Manual of Systematics of Archaea and Bacteria*. John Wiley and Sons. 4- Richard A. Harvey, Cynthia Nau Cornelissen and Bruce D. Fisher. Microbiology. (Lippincott's Illustrated Reviews) 3rd edition. 2014 5- Bailey and Scott's.(2014). Diagnostic microbiology.Elseiver,2014. 6- Brock TD.Madigan M. Martinko J. et al.editors: Biology of microbiology. Upper Saddle River, NJ.2009. Prentice Hall
Recommended books and references (scientific journals, reports...)	- Scientific journals, periodicals and research in the field
Electronic References, Websites	• https://en.wikipedia.org/wiki/Microbiology • https://en.wikipedia.org/wiki/Medical_microbiology. • https://rlmc.edu.pk/themes/images/gallery/library/books/Microbiology/Text_Book_of_Microbiology.pdf.

Course Description Form

Genetic of autoimmune diseases

1. Course Name:
Genetic of autoimmune diseases
2. Course Code:
3. Semester / Year:
2nd semester / 2023-2024
4. Description Preparation Date:
1-10-2023
5. Available Attendance Forms:
Weekly attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
2 Theoretical hours/week, one section * 15 weeks = 30 hours Total number of hours per section = hours Number of units =
7. Course administrator's name (mention all, if more than one name)
Name: Assistant Prof. Dr. Reema Mohammed Abed **Email:** Reema.Abed @sc.uobaghdad.edu.iq
8. Course Objectives
The aim of teaching the genetics of autoimmune diseases is to provide students with a basic understanding of the basic concepts and principles of immunogenetics. The students are taught the concept by understanding the condition in which the body's immune system thinks that its healthy tissues are foreign tissues and attacks them. Most autoimmune diseases cause inflammation that can affect many parts of the body. The parts of the body affected depend on the autoimmune disease the person suffers from. Students understand the common signs and symptoms that a person suffers from, such as fatigue, fever, muscle pain, joint pain and swelling, skin problems, abdominal pain, digestive problems, and swollen glands. Symptoms often come and go and can be mild or severe. There are many different types of autoimmune diseases. It is more common in women and can run in families. It is also called an autoimmune condition. In addition to teaching the inheritance of these diseases and understanding the genes that contribute to their occurrence
9. Teaching and Learning Strategies
1. Clarification and explanation of the study materials by the academic staff through the whiteboard or using PowerPoint. 2. Providing students with homework. 3. Preparing reports related to academic vocabulary. 4. Visit websites to obtain additional knowledge of academic subjects. 5. Brainstorming during lectures.
10. Course Structure: Theory

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	**2**	Major histocompatibility complex (MHC)	Major histocompatibility complex (MHC):classification, nomenclature, structure and function	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
2nd	**2**	Genetic of MHC	Genetic of MHC Genetic of mhcI , mhcII and mhcIII	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
3rd	**2**	History of autoimmune diseases	History of autoimmune diseases Types of autoimmunodisease	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
4th	**2**	HLA and autoimmune diseases	HLA and autoimmune diseases (association and mechanisms of action)	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
5th	**2**	Genomic variation	Genomic variation of autoimmune diseases and how occur	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
6th	**2**	Examples of Autoimmune Diseases in Immunogenetics studies	Examples of Autoimmune Diseases in Immunogenetics studies: Immunogenetics of Rheumatoid Arthritis, history and genetics	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
7th	**2**	Immunogenetics of diabetes mellitus type1	Immunogenetics of diabetes mellitus type1 history and genetics	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
8th	**2**	Immunogeneics of systemic lupus erythematosus	\Immunogeneics of systemic lupus erythematosus (SLE) history and genetics	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

9th	**2**	Immunogenetics of systemic sclerosis	Immunogenetics of systemic sclerosis history and genetics	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
10th	**2**	Diseases related to autoimmune system	Diseases related to autoimmune system history and genetics	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
11th	**2**	Autoimmune diseases and interlukin	Autoimmune diseases and interlukin history and genetics	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
12th	**2**	Autoimmune diseases and cancers	Autoimmune diseases and cancers history and genetics	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
13th	**2**	-	Exam 1	-	-
14th	**2**	-	seminars	-	-
15th	**2**	-	Exam 2	-	-

11. Course Evaluation

Overall score out of 100
(Semester grade = 40)
(End-of-semester exam score = 60)

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	-
Main references (sources)	▪ Principle of immunogenetic, 2017 Ivan Roitt, 2016. Immunology
Recommended books and references (scientific journals, reports...)	Immunogenetics
Electronic References, Websites	https://www.ncbi.nlm.nih.gov/books/NBK459433/

Course Description Form

Advanced Genetics

1. Course Name:

Advanced Genetics

2. Course Code:

3. Semester / Year:

2nd semester / 2023-2024

4. Description Preparation Date:

1-10-2023

5. Available Attendance Forms:

Weekly attendance

6. Number of Credit Hours (Total) / Number of Units (Total)

2 Theoretical hours/week, one section * 15 weeks = 30 hours
Total number of hours per section = hours
Number of units = 3

7. Course administrator's name (mention all, if more than one name)

Name: Prof. Dr. Asmaa Mohammed Saud
Email: asmaa.saud @sc.uobaghdad.edu.iq

8. Course Objectives

This course aims to provide students with a comprehensive understanding of the fundamental concepts, theories, and practical applications within the [Advanced Genetics] field. Through engaging lectures, interactive discussions, and hands-on activities, students will develop the knowledge, skills, and critical thinking abilities necessary to analyze, evaluate, and solve problems related to [genetics]. Additionally, the course aims to foster a deep appreciation for the importance and relevance of [genetics] in various real-world contexts, encouraging lifelong learning and professional development

9. Teaching and Learning Strategies

1. Clarification and explanation of the study materials by the academic staff through the whiteboard or using PowerPoint.
2. Providing students with homework.
3. Preparing reports related to academic vocabulary.
4. Visit websites to obtain additional knowledge of academic subjects.
5. Brainstorming during lectures.

10. Course Structure: Theory

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	2	Principle of Mendel's Experiments	Following the Inheritance of One Gene	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

2nd	**2**	Single-Gene Inheritance Is Rare	Terms and Tools to Follow Segregating Genes	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
3rd	**2**	Examples 0f genetic diseases	Mendel's Second Law	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
4th	**2**	Solving a Problem in Following Multiple Genes	Following the Inheritance of More Than One Gene	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
5th	**2**	First exam	First exam		
6th	**2**	Criteria for an Autosomal Dominant Trait	Modes of Inheritance	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
7th	**2**	Criteria for an Autosomal Recessive Trait	Modes of Inheritance	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
8th	**2**	Solving a Problem in Following a Single Gene	Modes of Inheritance	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
9th	**2**	Examples And application	Pedigree Analysis	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
10th	**2**	When Gene Expression Appears to Alter Mendelian Ratios	Beyond Mendel's Laws	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
11th	**2**	Second exam	Second exam	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
12th	**2**	Complete dominance	Different Dominance Relationships	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

		Incomplete dominance			
13th	**2**	Examples	Genetic Heterogeneity	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
14th	**2**	Classification of Birth Defects , Genetic Causes of Malformations , Environmental Agents	Congenital Abnormalities, Dysmorphic Syndromes, and Learning Disability	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
15th	**2**	Principles, Ethical Dilemmas in the Genetics Clinic , Ethical Dilemmas and the Public Interest	Ethical and Legal Issues in Medical Genetics General	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

11. Course Evaluation	
Overall score out of 100 (Semester grade = 40) (End-of-semester exam score = 60)	
12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	Basic Genetics book
Main references (sources)	Human Genetics- Concepts and Application/ Ricki Lewis/ ELEVENTH EDITION/2015
Recommended books and references (scientific journals, reports...)	Medical Genetics-Fourth Edition/ Lynn B. Jorde, Pl John C. Carey, MD, MPH/ Michael J. Bamshad, MD/2(
Electronic References, Websites	Numerous websites have identified advanced genetics, including medical websites, YouTube, and scientific research

Course Description Form

Clinical Cytogenetic

1. Course Name:
Clinical Cytogenetic
2. Course Code:
3. Semester / Year:
2nd semester / 2023-2024
4. Description Preparation Date:
15-2-2024
5. Available Attendance Forms:
Weekly attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
2 Theoretical hours/week, one section * 15 weeks = 30 hours Total number of hours per section = hours Number of units =
7. Course administrator's name (mention all, if more than one name)
Name: Prof. Dr. Maha Fakhry Altaee **Email:** maha.fakhry@sc.uobaghdad.edu.iq
8. Course Objectives
This course aims to provide students with a comprehensive understanding of the fundamental concepts, theories, and practical applications within the [**Clinical Cytogenetic**] field. Through engaging lectures, interactive discussions, and hands-on activities, students will develop the knowledge, skills, and critical thinking abilities necessary to analyze, evaluate, and solve problems related to [subject area]. Additionally, the course aims to foster a deep appreciation for the importance and relevance of [subject area] in various real-world contexts, encouraging lifelong learning and professional development
9. Teaching and Learning Strategies
1. This course includes coverage of the concepts of cytogenetics, as it deals with the study of the role of chromosomes in the medical and genetic fields. 2. As well as early detection of the chromosomes responsible for many genetic diseases by following modern technologies. 3. Studying the inheritance of genetic material from parents to children, the patterns of this inheritance, and how to correct genetic defects.

10. Course Structure: Theory

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	2	History	Major scientists how attributed to development of clinical cytogenetic	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams

2nd	**2**	Human chromosome nomenclature	How to name, karyotype and classify chromosomes	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
3rd	**2**	Sex chromosome	How to karyotype the sex chromosome	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
4th	**2**	Sex-chromosome abnormalities	The correlation of sex chromosomes with genetic disease	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
5th	**2**	Exam	First exam		
6th	**2**	Autosomal chromosome	How to karyotype the Autosomal chromosomes	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
7th	**2**	Autosomal chromosome	The correlation of Autosomal chromosomes with genetic disease	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
8th	**2**	chromosome abnormalities abnormality part 1	Numerical abnormalities	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
9th	**2**	chromosome abnormalities abnormality part 2	Structural abnormalities	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
10th	**2**	Second exam	----		
11th	**2**	DNA repair system	The most involved genes in repairing DNA damage	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
12th	**2**	Infertility	The cytogenetic causes of infertility	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
13th	**2**	Diagnosis techniques in clinical cytogenetic	FISH technique	Paper lectures Electronic screen Video lectures via electronic classes	Daily, semester and final exams
11. Course Evaluation					
Overall score out of 100					

(Semester grade = 40) (End-of-semester exam score = 60)	
12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	No Required textbooks
Main references (sources)	Clinical cytogenetic/2015 fourth edition...
Recommended books and references (scientific journals, reports...)	Any book in clinical cytogenetic
Electronic References, Websites	Many websites that correlated with clinical cytogenetic

Course Description Form

Advanced medicinal plant biotechnology

1. Course Name:
Advanced medicinal plant biotechnology
2. Course Code:
3. Semester / Year:
2nd semester / 2023-2024
4. Description Preparation Date:
1-10-2023
5. Available Attendance Forms:
Weekly attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
2 Theoretical hours/week, one section * 15 weeks = 30 hours Total number of hours per section = hours Number of units =
7. Course administrator's name (mention all, if more than one name)
Name: Assistant Prof. Dr. Majed Rasheed Majeed **Email:** majid.majeed @sc.uobaghdad.edu.iq
8. Course Objectives
This course aims to provide students with a comprehensive understanding of the fundamental concepts, theories, and practical applications within the [Advanced Medicinal Plant Biotechnology] field. Through engaging lectures, interactive discussions, and hands-on activities, students will develop the knowledge, skills, and critical thinking abilities necessary to analyze, evaluate, and solve problems related to [Secondary Plant Products]. Additionally, the course aims to foster a deep appreciation for the importance and relevance of [Medicinal plant and Their Applications] in various real-world contexts, encouraging lifelong learning and professional development
9. Teaching and Learning Strategies

1. Clarification and explanation of the study materials by the academic staff through the whiteboard or using PowerPoint.
2. Providing students with homework.
3. Preparing reports related to academic vocabulary.
4. Visit websites to obtain additional knowledge of academic subjects.
5. Medicinal plants during lectures.

10. Course Structure: Theory

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	**2**	Introduction	Historical brief of medicinal plants	Paper lectures Electronic screen Video lectures	**Beginning of Semester**
2nd	**2**	General Review	Classification and distribution of Medicinal Plants	Paper lectures Electronic screen Video lectures	**Quiz**
3rd	**2**	Classification Roles	The Classification according to Chemical distribution , part of plants and treatment (drugs)	Paper lectures Electronic screen Video lectures	
4th	**2**	Effective factors	Impact factors on Medicinal plants	Paper lectures Electronic screen Video lectures	**Quiz**
5th	**2**	The Extraction	The extraction of Medicinal plants	Paper lectures Electronic screen Video lectures	
6th	**2**		First Midterm Exam.		**20% of total degree**
7th	**2**	Secondary Metabolites	Secondary plants products (active materials)	Paper lectures Electronic screen Video lectures	
8th	**2**	The Separation	The separation techniques of plant active materials	Paper lectures Electronic screen Video lectures	**Quiz**
9th	**2**	Natural production	Natural Synthesis for active materials of plants	Paper lectures Electronic screen Video lectures	
10th	**2**	The Characterization	The characterization techniques of plant active materials	Paper lectures Electronic screen Video lectures	**Quiz**
11th	**2**	Types of Techniques	Increasing techniques of plant active materials	Paper lectures Electronic screen Video lectures	
12th	**2**		Second Midterm Exam.		**20% of total degree**

13th	**2**	Application and Using	Application technology of medicinal plants	Paper lectures Electronic screen Video lectures	
14th	**2**	Enhancement Methods	Enhancement of medicinal plant products	Paper lectures Electronic screen Video lectures	**Quiz**
15th	**2**	For Evaluation	Seminars	Paper lectures Electronic screen Video lectures	**End of Semester**

11. Course Evaluation
Overall score out of 100 (Semester grade = 40) (End-of-semester exam score = 60)

12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	Biotechnology of Plant Secondary Metabolites
Main references (sources)	Medicinal Plants Biotechnology
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	Many websites dealing with Medicinal plant biotechnology, including Phytocemicals, Plant Byproducts and Pharmaceuticals websites, Agricultural websites, YouTube, and scientific research