**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

**2025**

# 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 short 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 undergraduate Bachelor's students

University Name: University of Baghdad

Faculty/Institute: College of Science

Scientific Department: Biotechnology department.

Academic or Professional Program: Biotechnology

Final Certificate Name: Bachelor's degree in Biotechnology

Academic System: Seasonal

Description Preparation Date: 1–10–2024

File Completion Date: 1–10–2024

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** | 5 | 10 | | Computer skills<br>English language<br>Freedom and Democracy<br>Human rights<br>Baath Party crimes |
| **College Requirements** | 6 | 7 | | Biostatistics<br>Physics<br>Analytical chemistry and instrumental analysis<br>Organic chemistry<br>Biochemistry 1<br>Biochemistry 2 |
| **Department Requirements** | 34 | 102 | | All core and elective subjects for stages 2, 3 and 4 |
| **Summer Training** | 1 | -- | -- | After the third stage |
| **Other** | -- | -- | -- | -- |

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

## 7. Program Description

| Year/Level | Course Code | Course Name | Credit Hours | |
|---|---|---|---|---|
| **3rd stage** | | | | |
| First semester 2023-2024 | BIOT300 | Molecular biology | 2 Theoretical | 2 Practical |
| | BIOT310 | Plant biotechnology | 2 Theoretical | 2 Practical |
| | BIOT215 | Gene and biochemical technique | 2 Theoretical | 2 Practical |
| | BIOT305 | Pathogenic bacteria | 2 Theoretical | 2 Practical |
| | BIOT320 | Fermentation technology | 2 Theoretical | 2 Practical |
| | BIOL330 | Mycology | 2 Theoretical | 2 Practical |

| | | | | |
|---|---|---|---|---|
| Second semester 2023-2024 | BIOT345 | Microbial genetics | 2 Theoretical | 2 Practical |
| | BIOT315 | Food microtechnology | 2 Theoretical | 2 Practical |
| | BIOT325 | Antibiotics | 2 Theoretical | 2 Practical |
| | BIOT330 | Immunology | 2 Theoretical | 2 Practical |
| | BIOT335 | Environmental biotechnology | 2 Theoretical | 2 Practical |
| | BIOT340 | Nanobiotechnology | 2 Theoretical | 2 Practical |
| | 314 GS | English language | 2 Theoretical | -- |
| | | Research methodology | 1 Theoretical | |
| **4th stage** | | | | |
| First semester 2023-2024 | BIOT400 | Principles of genetic engineering | 2 Theoretical | 2 Practical |
| | BIOT405 | Animal tissue culture | 2 Theoretical | 2 Practical |
| | BIOT410 | Plant tissue culture | 2 Theoretical | 2 Practical |
| | BIOT430 | Principles of Immunogenetics | 2 Theoretical | 2 Practical |
| | BIOT435 | Virology and vaccines | 2 Theoretical | 2 Practical |
| | 414 GS | English language | 2 Theoretical | - |
| | PROJ401 | Graduation Project | - | 2 Practical |
| | | | | |
| Second semester 2023-2024 | BIOT415 | Applications of genetic engineering | 2 Theoretical | 2 Practical |
| | BIOT420 | Cytogenetics | 2 Theoretical | 2 Practical |
| | BIOT425 | Industrial biotechnology | 2 Theoretical | 2 Practical |
| | BIOT445 | Genetic diseases and molecular diagnosis | 2 Theoretical | 2 Practical |
| | BIOT350 | Application of Animal tissue culture | 2 Theoretical | 2 Practical |
| | PROJ402 | Graduation Project | - | 2 Practical |
| | | | | |

## 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.<br>2. Memorization and analysis skills.<br>3. Skills of use, application and development.<br>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.<br>2-Recognizing the intrinsic value of all living organisms and considering their well-being in biotechnological endeavors.<br>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<br>4-Ensure equitable distribution of the benefits and burdens of progress in biotechnology across different societies and socio-economic groups.<br>5-Take responsibility for the environmental impacts of biotechnology activities and work to find sustainable solutions.<br>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<br>7-Ensure that patients or participants fully understand the risks, benefits, and alternatives of medical procedures or participation in research studies before providing consent<br>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 |
| **3rd stage 1st semester** | BIOT300 | Molecular biology | Basic | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | BIOT310 | Plant biotechnology | Basic | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | BIOT215 | Gene and biochemical technique | Basic | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | BIOT305 | Pathogenic bacteria | Basic | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | BIOT320 | Fermentation technology | Basic | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | BIOL330 | Mycology | Basic | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| **3rd stage 2nd semester** | BIOT345 | Microbial genetics | Basic | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | BIOT315 | Food microtechnology | Basic | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | BIOT325 | Antibiotics | Basic | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | BIOT330 | Immunology | Basic | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | BIOT335 | Environmental biotechnology | Basic | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | BIOT340 | Nanobiotechnology | Basic | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | 314 GS | English language | Basic | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | | Research methodology | Basic | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| **4th stage 1st semester** | BIOT400 | Principles of genetic engineering | Basic | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | BIOT405 | Animal tissue culture | Basic | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | BIOT410 | Plant tissue culture | Basic | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | BIOT430 | Principles of Immunogenetics | optional | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | BIOT435 | Virology and vaccines | optional | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | 414 GS | English language | Basic | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | PROJ401 | Graduation Project | Basic | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| **4th stage 2nd semester** | BIOT415 | Applications of genetic engineering | Basic | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | BIOT420 | Cytogenetics | Basic | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | BIOT425 | Industrial biotechnology | Basic | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | BIOT445 | Genetic diseases and molecular diagnosis | optional | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | BIOT350 | Application of Animal tissue culture | optional | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | PROJ402 | Graduation Project | Basic | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |

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

# Course Description Form for the 3rd stage subjects

# Molecular biology

| |
|---|
| **1. Course Name:** |
| **Molecular Biology** |
| **2. Course Code:** |
| BIOT300 |
| **3. Semester / Year:** |
| **2nd semester / 2024-2025** |
| **4. Description Preparation Date:** |
| **1-10-2024** |
| **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<br>4 Practical hours/week per section * 15 weeks = 60 hours<br>Total number of hours per section = 90 hours<br>Number of units = 3 units (theoretical 2 + practical 1) |
| **7. Course administrator's name (mention all, if more than one name)** |
| **Name**: Prof. Dr. Nuha Joseph Najeeb Kandala<br>**Email:nuha.najeeb@sc.uobaghdad.edu.iq** |
| **8. Course Objectives** |
| This course covers the concepts of molecular biology, introducing students to one of its fundamental branches, which is molecular biology. This branch entails the study of the molecular nature of large molecules such as DNA, RNA, and proteins, along with the biological information associated with them. The course includes an introduction and a historical overview of the development of molecular biology, a comprehensive understanding of cellular functions at the molecular level in both prokaryotic and eukaryotic cells, types of nucleic acids and their chemical structures, characteristics and features of DNA and RNA, DNA replication, the discovery of the genetic code, gene expression (transcription), the basic steps of transcription, and the enzymes responsible for transcription in prokaryotic and eukaryotic cells. The translation also includes primitive and true nucleus, types of functional and structural proteins, types of RNA, regulation of gene expression in prokaryotic and eukaryotic cells, and an introduction to genetic engineering. This course description provides a concise summary of the main features of the course and the expected learning outcomes for students, ensuring whether they have maximized their learning and educational opportunities. |
| **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 | History of molecular biology | A-Introduction of molecular biology<br>B-Definition of Molecular biology<br>B-Identified DNA as the primary agent of genetic material<br>C-key experiments which identified DNA as the primary genetic material<br>D-The two major piece of evidence supporting DNA as the geneticsmaterial | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| 2nd | 2 | The chemical composition of nucleic acid | A-The chemical composition of nucleic acid<br>B-The structure of DNA and RNA.<br>C-What is the structure of DNA? How is the structure related function?<br>D-Chargaff's Law : the experiment , examples of Chargaff's Law applications .<br>E-Some studies of DNA structure | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |

| | | | | | |
|---|---|---|---|---|---|
| **3rd** | **2** | The Watson and Crick model | A-The Watson and Crickmodel.<br>B-Watson andF.H.C. CrickPhysical characteristics of the model<br>C-Base Pairs and Stacking<br>D-Alternative DNA Structures<br>E-Compare between prokaryotic and eukaryotic cells<br>F-DNA and RNA Molecules in different types of cells | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **4th** | **2** | Structure of DNA in the Cell | A-Different types of nucleic acid<br>B-Supercoiling is Necessary for Packaging of Bacterial DNA<br>C-The Eukaryotic Nucleosome.<br>D-Some examples of genome in different organisms | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **5th** | **2** | Replication process in prokaryotic cells | A-DNA Replication Introduction to Prokaryotic replication<br>B-Mechanism of DNA replication<br>C-Stages of replication process( initiation ,elongation and termination )<br>D-Types of enzymes in stages of replication | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **6th** | **2** | Replication process in Euokaryotic cells | A-Eukaryotic Chromosomes<br>B-Synthesis of Eukaryotic DNA | | |

| | | | | | |
|---|---|---|---|---|---|
| | | | C-Types of enzymes in stages of replication<br>D- Stages of replication process<br>E-Cell Division in Higher Organisms. | | |
| **7th** | **2** | Exam | Exam | | |
| **8th** | **2** | Introduction to Gene Expression | Types of RNA<br>The structure of RNAs<br>Genetic code<br>Characterization of Genetic code | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **9th** | **2** | First process in Gene expression: The transcription process | A-Transcription process in prokaryotic and eukaryotic cells<br>B-Stages of transcription<br>C-Enzymes in transcription stages | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **10th** | **2** | Exam | Exam | | |
| **11th** | **2** | Processing and modification of pre-mRNA in eukaryotic cells | A-Modification methods:<br>1-Add cap in 5UTR<br>2-Add poly A in 3UTR<br>B-Splicing methods | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **12th** | **2** | Protein structure and function | A-Types of proteins<br>B- the types of amino acids<br>C-classification of amino acids according to function and structure<br>D-characteristic of Genetics code | | |
| **13th** | **2** | Translation process | A-Translation process in prokaryotic and eukaryotic cells<br>B-Stages of translation . | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |

| | | | | | |
|---|---|---|---|---|---|
| | | | C-Enzymes in translation stages D-compare between prokaryotes and eukaryotes cells in transcription and translation process | | |
| **14th** | **2** | Types of DNA sequencing in Eukaryotes cells | A-Types of methods for study the sequence of DNA. B-Types of sequences in DNA | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **15th** | **2** | Final exam | | | |
| | | | | | |

**Course Structure: Practical**

| Week | Hours | Unit or subject name | Required Learning Outcomes | Learning method | Evaluation method |
|---|---|---|---|---|---|
| **1st** | **2** | The laboratory apparatus and equipment | **Introduction to the**The laboratory apparatus and equipment | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **2nd** | **2** | Determination of small liquid volumes. | Micro-pipette tool:<br>1. Positive displacement and air displacement.<br>2. Obtaining precise measurements with the micro-pipette.<br>3. Avoiding contamination of the micro-pipette.<br>4. Method of use. | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

| | | | | | |
|---|---|---|---|---|---|
| | | | 5. Verification of the micro-pipette's functionality.<br>6. Cleaning and storage of the micro-pipette." | | |
| **3rd** | **2** | "Preparation of Buffers and Laboratory Solutions." | "Understanding Different Types of Chemical Substances and the Laws Governing Their Preparation." | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **4th** | **2** | Exam | | | |
| **5th** | **2** | "General Introduction to Nucleic Acid Extraction." | "The Basic Steps of Extraction from Various Sources." | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **6th** | **2** | DNA extraction from bacteria | "Preparation of Bacterial Samples and Solutions Used for Extraction, and Understanding the Sequential Steps Involved." | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **7th** | **2** | DNA extraction from blood | "Preparation of blood Samples and Solutions Used for Extraction, and Understanding the Sequential Steps Involved." | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **8th** | **2** | DNA extraction from plant | Preparation of plant Samples and Solutions Used for Extraction, and Understanding the Sequential Steps Involved." | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

| | | | | | |
|---|---|---|---|---|---|
| **9th** | **2** | Exam | | | |
| **10th** | **2** | RNA extraction methods | "The different methods for RNA extraction include preparation techniques for solutions and the use of the manual method as well as the kit-based extraction." | | |
| **11th** | **2** | Measure the concentration and purity of nucleic acid | "Understanding the Wavelengths Used for Measuring Concentration and Purity." | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **12th** | **2** | Gel electrophoresis Part 1 | General understanding to the gel electrophoresis method | | |
| **13th** | **2** | Gel electrophoresis Part 2 | General understanding to the gel electrophoresis method | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **14th** | **2** | "Measuring the Melting Temperature of Deoxyribonucleic Acid (DNA)." | Definition of Melting Temperature (Tm), The Basic Principle of Melting Temperature, Experimental Measurement of Melting Temperature (Tm)." | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **15th** | **2** | Final exam | | | |
| | | | | | |

**11. Course Evaluation**

Overall score out of 100
(Semester grade = 40, including: 25 for theoretical + 15 for practical)
(End-of-semester exam score = 60, including 40 for theory + 20 for practical)

**12. Learning and Teaching Resources**

| | |
|---|---|
| **Required textbo (curricular books, if any)** | Molecular Biology Authored by Dr. Ghalib Al-Bakri" |
| **Main references (sources)** | |
| **Recommended books and references (scientific journals, reports...)** | 1-Analysis of Genes and Genomes .<br>by Richard .J .Reece. . 2004 .<br>2-Genetics .<br>By Leland ,H.Hartwell.;Leroy Hood.;Michael,L.Goldbereg .;Ann,E.Reynolds*et al*., .2000.<br>3-Essential of Genetics .<br>By Williams,S.Klug anMichael,R.Cummings.2002.fifth edition . |
| **Electronic-References, Websites** | https://drive.google.com/file/d/1Ao2R1fWEy02I4ZmcB4hpBJSmLt4s7jMG/view<br>https:\\youtu.be\yYIZgS-L5Sc<br>https:\\youtu.be\q6PP-C4udkA<br>https://www.thermofisher.com/iq/en/home/brands/invitrogen/molecular-biology-technologies<br>https://www.youtube.com/watch?v=DT5CSgNu61Y |

# Plant Biotechnology

| |
|---|
| **1. Course Name:** |
| **Plant Biotechnology** |
| **2. Course Code:** |
| **BIOT310** |
| **3. Semester / Year:** |
| **1st semester / 2024-2025** |
| **4. Description Preparation Date:** |
| **1-10-2024** |
| **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<br>4 Practical hours/week per section * 15 weeks = 60 hours<br>Total number of hours per section = 90 hours<br>Number of units = 3 units (theoretical 2 + practical 1) |
| **7. Course administrator's name (mention all, if more than one name)** |
| **Name**: Assist . Prof. Dr. Majid Rasheed Majeed<br>**Email:** |

## 8. Course Objectives

This course aims to provide a course of study in the plant biotechnology, plant extraction, its role in the medical and pharmaceutical fields .

To develop more practical biological skills in the plant biotechnology.

## 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 biotechnology | definitions, scientific research, | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **2nd** | **2** | What is plant biotechnology (introduction) | General function, types, | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **3rd** | **2** | Secondary metabolites, classification: Terpenoids | General function, types, structure | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **4th** | **2** | Nitrogen containing compounds | General function, , structure | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **5th** | **2** | Phenolics | General function, types, structure | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **6th** | **2** | Production of secondary metabolites in culture | General function, types, structure | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

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| **7th** | **2** | Elicitors and hairy roots | General function, types, structure | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **8th** | **2** | First Mid. Exam. | | | |
| **9th** | **2** | Bioreactors | General function, structure | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **10th** | **2** | Transgenic plants: Agrobacterium, Expression | Learn about the importance of Transgenic plants: Agrobacterium | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **11th** | **2** | Bt, herbicide and virus resistant plants | General function, structure and types | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **12th** | **2** | Methods of DNA transformation to plant cell | Learn about the importance of DNA transformation | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **13th** | **2** | DNA transformation in protoplast | General function, structure and types | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **14th** | **2** | DNA transformation in tissue | General function, structure and types | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **15th** | **2** | Second Mid. Exam. | | | |
| **Course Structure: Practical** | | | | | |
| **Week** | **Hours** | **Unit or subject name** | **Required Learning Outcomes** | **Learning method** | **Evaluation method** |
| **1st** | **2** | Significance of medicinal plants to human being | Learn about the importance of medicinal and industrial plants | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

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| **2nd** | **2** | Extraction techniques of medicinal plants | Extraction of medicinal plants | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **3rd** | **2** | Some of Plant Secondary Metabolites (Terpenoids) | Extraction of Terpenoids | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **4th** | **2** | Some of Plant Secondary Metabolites ( Essential Oils) | Extraction of Essential Oils | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **5th** | **2** | Some of Plant Secondary Metabolites (Alkaloids) | Extraction of Alkaloids | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **6th** | **2** | Some of Plant Secondary Metabolites (Drug application of Alkaloids) | Learn about the importance of Drug application of Alkaloids) | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **7th** | **2** | Some of Plant Secondary Metabolites Phenolic compounds ( phenols) | Extraction of Phenolic compounds | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **8th** | **2** | Some of Plant Secondary Metabolites Tannins | Extraction of Tannins compounds | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **9th** | **2** | Exam | | | |
| **10th** | **2** | Some of Plant Secondary Metabolites (Flavonoids ) | Extraction of Flavonoids | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **11th** | **2** | Separation and isolation techniques | Learn about the importance of Secondary Metabolites | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

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| **12th** | **2** | Cellular Biotechnology for Obtaining Medicinal Plants | Importance Some of Plant Secondary Metabolites for Obtaining Medicinal Plants | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **13th** | **2** | Regulation of synthesis of secondary compounds | Importance of synthesis of Secondary Metabolites | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **14th** | **2** | The relationship of nanotechnology with plant biotechnology | Importance of synthesis of Secondary Metabolites with nanotechnology | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **15th** | **2** | Exam | | | |

| **11. Course Evaluation** | |
|---|---|
| Overall score out of 100<br>(Semester grade = 40, including: 25 for theoretical + 15 for practical)<br>(End-of-semester exam score = 60, including 40 for theory + 20 for practical) | |
| **12. Learning and Teaching Resources** | |
| **Required textbo (curricular books, if any)** | Plant biotechnology , K.G. Ramawat 2008 |
| **Main references (sources)** | PLANT BIOTECHNOLOGY AND TRANSBENIC PLANTS<br>By: KIRSI-MARJA OKSMAH-CALDENTEY and WOLFGANG H. BARZ/ 2002 |
| **Recommended books and references (scientific journals, reports...)** | Plant Biotechnology: Recent Advancements and Developments<br>By:Suresh Kumar Gahlawat • Raj Kumar and Salar Priyanka Siwach/ 2007 |
| **Electronic Referen Websites** | PRINCIPLES OF PLANT BIOTECHNOLOGY<br>ICAR eCourse / 2015 |

# Gene and biochemical technique

| **1. Course Name:** |
|---|
| Gene and biochemical technique |
| **2. Course Code:** |
| BIOT215 |
| **3. Semester / Year:** |
| **1nd semester / 2024-2025** |
| **4. Description Preparation Date:** |
| **1-10-2024** |

**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
4 Practical hours/week per section * 15 weeks = 60 hours
Total number of hours per section = 90 hours
Number of units = 3 units (theoretical 2 + practical 1)

**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 deal with the cellular products of proteins, enzymes, and other living organisms, whether microorganisms, plants, or animals, in order to achieve the maximum benefit from them medically, therapeutically, nutritionally, industrially, agriculturally, and economically.
To prepare students for a number of natural science courses in identifying important methods for purifying the vital materials of all organisms and estimating their weights to benefit from them at all levels.

**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 - Extraction of proteins by different source | - Protein purification | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| 2nd | 2 | Ammonium sulfate precipitation, saturation table, | Precipitation and differential solubilization | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| 3rd | 2 | Removing the ammonium sulphate by Dialysis, | Dialysis Ultracentrifugation | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

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| **4th** | **2** | Examples and applications | Preparing a Purification Table | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **5th** | **2** | Ion exchange resins contain charged groups, Some Biochemically Useful Ion Exchangers. | Column chromatography | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **6th** | **2** | -- | Seasonal Exam | | |
| **7th** | **2** | Types of gels used, Advantages of Gel filtration, Applications of gel filtration | Gel filtration chromatography | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **8th** | **2** | Example and applications | Estimation of molecular weight by gel filtration**:** | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **9th** | **2** | - Reversible Denaturing of DNA, Gene Technology | Structure & Function of DNA | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **10th** | **2** | CsCl (Cesium Chloride) Centrifugation of DNA: -Solid-phase Nucleic Acid Extraction: - oligo(dT) affinity chromatography to isolate mRNA: | Nucleic acid purification | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **11th** | **2** | Comet assay technique, Principle action, | DNA damage detection | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

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| | | Potential applications | | | |
| **12th** | **2** | -- | Seasonal exam | | |
| **13th** | **2** | I. Blotting II-PCR (polymerase chain reaction) -Synthesis PCR cycle is composed of three steps: | Nucleic Acids Detection Techniques | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **14th** | **2** | Types of DNA microarrays, Principles of DNA Microarray experiments | -Microarray technique**:** | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **15th** | **2** | Methods of DNA exchanged, - Electroporation Works | DNA Exchanged, Electroporation technique | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
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**Course Structure: Practical**

| Week | Hours | Unit or subject name | Required Learning Outcomes | Learning method | Evaluation method |
|---|---|---|---|---|---|
| **1st** | **2** | Extraction Techniques | Protein purification Techniques | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **2nd** | **2** | Techniques by salts | Precipitation of proteins | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **3rd** | **2** | Techniques by used Chromatography column | Ion Exchange Chromatography | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **4th** | **2** | Techniques by used Chromatography column | Gel filtration chromatography | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

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| **5th** | **2** | DNA Extraction Techniques | DNA Structure | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **6th** | **2** | Techniques | Polymerase Chain Reaction | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **7th** | **2** | PCR-Techniques | DNA and Protein sequence online databases | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **8th** | **2** | Online databases | Southern Blot | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **9th** | **2** | Techniques | Electroporation Technique | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **10th** | **2** | Techniques | Comet assay | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **11th** | **2** | Techniques of Comet assay(preparation of buffers and slid( | Saturation table | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **12th** | **2** | Saturation table application**,** | Saturation table | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **13th** | **2** | Preparing a Purification Table application | Preparing a Purification Table | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **14th** | **2** | online | Primer design | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **15th** | **2** | | Exam | | |

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| **11. Course Evaluation** | |
| Overall score out of 100<br>(Semester grade = 40, including: 25 for theoretical + 15 for practical)<br>(End-of-semester exam score = 60, including 40 for theory + 20 for practical) | |
| **12. Learning and Teaching Resources** | |
| **Required textbo (curricular books, if any)** | - Book of microbial biotechnology / Prof. Dr. Za Mahmoud Nasser Al-Khafaji - Publication year 2008 |
| **Main references (sources)** | - Palmer P L Bonner Enzymes 2nd Biochemistry, Biotechnology, Clinical Chemistry 2007.<br>Wilson and walkers principles and techniques of biochemistry and molecular biology,8th,2018 |
| **Recommended books and references (scientific journals, reports...)** | - Robert A. Copeland ENZYMESA Pract Introductionto Structure, Mechanism,and Data Analy SECOND EDITION A JOHN WILEY & SONS, IN PUBLICATION,2000 |
| **Electronic Referen Websites** | https://drive.google.com/file/d/101HqrT0NeZ9xBCfQ 5oLjWASOahWJDu69/view?usp=drivesdk |

# Pathogenic bacteria

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| **1. Course Name:** |
| **Pathogenic bacteria** |
| **2. Course Code:** |
| **BIOT305** |
| **3. Semester / Year:** |
| **2nd semester / 2024-2025** |
| **4. Description Preparation Date:** |
| **1-10-2024** |
| **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<br>4 Practical hours/week per section * 15 weeks = 60 hours<br>Total number of hours per section = 90 hours<br>Number of units = 3 units (theoretical 2 + practical 1) |
| **7. Course administrator's name (mention all, if more than one name)** |
| **Name**: Prof. Dr. Suhad Saad Mahmood<br>**Email:** suhad.mahmood@sc.uobaghdad.edu.iq |
| **8. Course Objectives** |

This course aims to provide a course of study in the physiology of mammals, especially humans, based on Knowledge of basic physiological principles of living organisms

To develop more practical biological skills in the field of organismal physiology.

To prepare students for a number of natural sciences courses in physiology, development and neuroscience, as well Pharmacology, pathology and zoology, 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.
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 Bacteriology | Bacteria Compared with, Other Microorganisms . Structure of Bacterial Cell,. Growth, Classification of Medically Important Bacteria | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| 2nd | 2 | Bacterial Pathogenesis and Host Interactions | General features, Pathogenesis, Clinical significance, Laboratory identification | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| 3rd | 2 | Normal flora | General features, Pathogenesis, Clinical significance, Laboratory identification | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| 4th | 2 | Gram positive bacteria- Staphylococci | General features, Pathogenesis, Clinical significance, Laboratory identification | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| 5th | 2 | Streptococci | General features, Pathogenesis, Clinical significance, Laboratory identification | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

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| **6th** | **2** | | Seasonal Exam | | |
| **7th** | **2** | Gram negative rod | General features, Pathogenesis, Clinical significance, Laboratory identification | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **8th** | **2** | Escherichia coli | General features, Pathogenesis, Clinical significance, Laboratory identification | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **9th** | **2** | bacillus species | General features, Pathogenesis, Clinical significance, Laboratory identification | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **10th** | **2** | Neisseria | General features, Pathogenesis, Clinical significance, Laboratory identification | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **11th** | **2** | Salmonella and shigella | General features, Pathogenesis, Clinical significance, Laboratory identification | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **12th** | **2** | -- | Seasonal exam | | |
| **13th** | **2** | Haemophilus influenzae, | General features, Pathogenesis, Clinical significance, Laboratory identification, | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **14th** | **2** | Pseudomonas spp. | General features, Pathogenesis, Clinical significance, Laboratory identification | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **15th** | **2** | Un typical bacteria | General features, Pathogenesis, Clinical significance, Laboratory identification | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
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| **Course Structure: Practical** | | | | | |
| **Week** | **Hours** | **Unit or subject name** | **Required Learning Outcomes** | **Learning method** | **Evaluation method** |

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|---|---|---|---|---|---|
| **1st** | **2** | Introduction in practical bacteriology | practical bacteriology | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **2nd** | **2** | Biosafety in biological laborites | Biosafety principles | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **3rd** | **2** | Staphylococci | General characteristics laboratory identification | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **4th** | **2** | Streptococci | General characteristics laboratory identification | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **5th** | **2** | Gram negative rod | General characteristics laboratory identification | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **6th** | **2** | Exame | | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **7th** | **2** | Neisseria | General characteristics laboratory identification | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **8th** | **2** | Escherichia coli | General characteristics laboratory identification | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **9th** | **2** | SALMONELLA and SHIGELLA | General characteristics laboratory identification | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **10th** | **2** | CLOSTRIDIA | General characteristics laboratory identification | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

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|---|---|---|---|---|---|
| **11th** | **2** | Bacteroides | General characteristics laboratory identification | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **12th** | **2** | Review and rendering all labs | All identifications tests | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **13th** | **2** | Exam | | | |
| **14th** | **2** | Mycobacterium | General characteristics laboratory identification | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **15th** | **2** | Spirochetes | General characteristics laboratory identification | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
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| **11. Course Evaluation** |
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| Overall score out of 100<br>(Semester grade = 40, including: 25 for theoretical + 15 for practical)<br>(End-of-semester exam score = 60, including 40 for theory + 20 for practical) |

| **12. Learning and Teaching Resources** | |
|---|---|
| **Required textbooks (curricu books, if any)** | |
| **Main references (sources)** | |
| **Recommended books and references (scientific journals, reports...)** | |
| **Electronic References, Websites** | |

# Fermentation technology

| **1. Course Name:** |
|---|
| **Fermentation technology** |
| **2. Course Code:** |
| **BIOT320** |
| **3. Semester / Year:** |
| **1st semester-3rd class / 2024-2025** |
| **4. Description Preparation Date:** |
| **1-10-2024** |
| **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
4 Practical hours/week per section * 15 weeks = 60 hours
Total number of hours per section = 90 hours
Number of units = 3 units (theoretical 2 + practical 1)

**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**

1. **Enabling students to gain knowledge and understanding the definition and scope of fermentation technology.**
2. **Students will learn the upstream processing (USP) and downstream processing (DSP).**

**9. Teaching and Learning Strategies**

1. Providing students with the basics and additional topics related to the outputs of thinking and analysis of biotechnologies
2. Forming discussion groups during lectures to discuss topics in biotechnology tha require thinking and analysis.
3. Asking students a set of thinking questions during lectures such as what, how, wh and why for specific topics.
4. Giving student's homework that requires self-explanations in causal ways..

**10. Course Structure: Theory**

| Week | Hours | Unit or subject name | Required Learning Outcomes | Learning method | Evaluation method |
|---|---|---|---|---|---|
| 1st | 2 | An introduction to fermentation technology | An introduction | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| 2nd | 2 | Upstream Processing | Upstream Processing | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| 3rd | 2 | Industrial strains. | Industrial strains. | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

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|---|---|---|---|---|---|
| **4th** | **2** | Media for industrial fermentation. | Media and substrate | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **5th** | **2** | Culture systems: Batch culture. | Culture systems | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **6th** | **2** | Fed batch culture. | Culture systems | | |
| **7th** | **2** | Continuous culture. | Culture systems | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **8th** | **2** | Mid Exam | Mid Exam | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **9th** | **2** | Solid-state fermentation. | Solid-state fermentation. | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **10th** | **2** | Fermenters: definition and types of fermenters. | Fermenters: definition and types of fermenters. | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **11th** | **2** | Fermenter design and construction. | Fermenter | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **12th** | **2** | Fermenter control and monitoring, | Fermenter | | |
| **13th** | **2** | Sterilization of the fermenter: The achievement and maintenance of aseptic conditions. | Fermentor | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

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| **14th** | **2** | Downstream processing | 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 | The Recovery and Purification of Fermentation Products | 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** | Production of ethanol by yeast. | Microbial metabolites | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **2nd** | **2** | Isolation of Industrial Microorganisms from Soil and their Potential to Produce Antibiotics. | Isolation of Industrial Microorganisms | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **3rd** | **2** | The rate of fermentation varies with the type of sugar being metabolized. | Fermentation and carbon source | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **4th** | **2** | Fermentation of lactose by lactic acid producing bacteria: Yoghurt | Fermentation of lactose | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **5th** | **2** | Exam | Exam | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **6th** | **2** | How fermentation varies with changes in temperature. | Fermentation and temperature | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

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| **7th** | **2** | Yeast fermentation with and without aeration | Yeast fermentation | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **8th** | **2** | Anaerobic fermentation | Anaerobic fermentation | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **9th** | **2** | Production of protease by *Aspergillus niger* in liquid culture | Submerged Fermentation | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **10th** | **2** | Production of protease by *Aspergillus niger* in solid state fermentation | Solid- State Fermentation | | |
| **11th** | **2** | Bioreactor: design and construction | Bioreactor | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **12th** | **2** | How to sterilize bioreactor | Bioreactor | | |
| **13th** | **2** | Downstream processing: how to extract and purified a microbial product from fermentation culture. | Downstream processing | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **14th** | **2** | Downstream processing: Purification of enzymes from liquid culture | Downstream processing | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **15th** | **2** | Downstream processing: Purification of enzymes from solid state fermentation | Downstream processing | | |
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| **11. Course Evaluation** | | | | | |

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|---|---|
| Overall score out of 100<br>(Semester grade = 40, including: 25 for theoretical + 15 for practical)<br>(End-of-semester exam score = 60, including 40 for theory + 20 for practical) | |
| **12. Learning and Teaching Resources** | |
| **Required textbo (curricular books, if any)** | - Industreial biotechnology for Dr.Nedam Al-Hydari. |
| **Main references (sources)** | 1. Manual of Industrial Microbiology and Biotechnology (Third edition 2010)<br>By Richard H. Baltz *et. al*<br>2- Principles of fermentation technology (second edition 2003) By Stanbury PF; Whitaker; Hall SJ<br>3- Bioprocess Engineering: Basic concepts<br>by Fikret Kargi ➢ |
| **Recommended books and references (scientific journals, reports...)** | 1. Fermentation Microbiology and Biotechnology<br>A.L Demain *et. al*<br>2. Practical Fermentation Technology<br>Brain Mchneil & Linda M. Harvey |
| **Electronic Referen Websites** | **WWW.Fermentation technology.org** |

# Mycology

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| **1. Course Name:** |
| **Mycology** |
| **2. Course Code:** |
| **BIOL330** |
| **3. Semester / Year:** |
| **2nd semester / 2024-2025** |
| **4. Description Preparation Date:** |
| **1-10-2024** |
| **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<br>4 Practical hours/week per section * 15 weeks = 60 hours<br>Total number of hours per section = 90 hours<br>Number of units = 3 units (theoretical 2 + practical 1) |
| **7. Course administrator's name (mention all, if more than one name)** |

**Name**: Prof. Dr. Abdulkareem Jasim Hashim
**Email:** abdulkareem.hashim@sc.uobaghdad.edu.iq

## 8. Course Objectives

1. This course deals with the basic concept of mycology.
2. To understand the role of mycology in biotechnology field.

## 9. Teaching and Learning Strategies

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

## 10. Course Structure: Theory

| Week | Hours | Unit or subject name | Required Learning Outcomes | Learning method | Evaluation method |
|---|---|---|---|---|---|
| 1st | 2 | Introduction | Introduction, Classification systems of fungi, Morphology of fungi, Sexual and asexual spores | Paper lectures Data show | Daily, semester and final exams |
| 2nd | 2 | Important of fungi and Reprpduction | Important of fungi, Living mode, Elements and environmental requirements for fungi cultivation, Sexual and asexual reproduction, sexual compatibility. | Paper lectures Data show | Daily, semester and final exams |
| 3rd | 2 | Classification of fungi. Division 1: Myxomycota, | Classification of fungi, Division 1: Myxomycota, general characteristics, the classes involved in this division. Myxomycetes and Plasmodiophoromycetes (One example for each class). | Paper lectures Data show | Daily, semester and final exams |

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|---|---|---|---|---|---|
| **4th** | **2** | Division 2: Eumycota | General characteristics, Class 1,Chytridiomycetes and its classification, Order1: Chytridiales, order 2: Blastocladiales , order 3: Monoblepharidales.<br>Class 2, Hyphochytridiomycetes. | Paper lectures Data show | Daily, semester and final exams |
| **5th** | **2** | Division 2: Eumycota | Class 3: Oomyctes , general characteristics, and the classification of this class.<br>Order 1: Saprolegniales Order 2: Peronosporales and the families involved in this order: Family 1:- Pythiaceae, Family2:- Peronosporaceae Family 3:- Albuginaceae. | Paper lectures Data show | Daily, semester and final exams |
| **6th** | **2** | Division 2: Eumycota | Class 4: Zygomycetes, general characteristics, Orders involved in this class. Order 1: Mucorales Order 2: Entomophthorales Order 3: Zoopagales . The role of some strains in production of biomaterials | | |
| **7th** | **2** | | Mid-term Exam. | | |

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| **8th** | **2** | Division 2: Eumycota | Class 5: Ascomycetes, general characteristics, Subclasses involved in this class. Subclass 1: Hemiascomycetidae which classified into Order 1: Endomycetales contains two families. Family 1:- Endomycetaceae and Family 2: Saccharomycetacea e. Order 2: Taphrinales. The role of some strains in production of biomaterials, food manufacturing, plant pathogens, Human pathogens. | Paper lectures Data show | Daily, semester and final exams |
| **9th.** | | Division 2: Eumycota | Class 5: Ascomycetes, Subclass 2**:** Euascomycetidae**,** general characteristics**.** Classification of this subclass which involves three Series: Series 1: Plectomycetes Genus 1: Aspergillus and Genus 2: Penicillium their | | |

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| | | | role in biotechnology. The role of some strains in production of biomaterials, food manufacturing, plant pathogens, Human pathogens.<br>Series 2: Pyrenomycetes: which involve 5 orders**:** Order 1: Erysiphales, Order 2: Chaetomyales, Order 3: Claviceptales, Order 4: Shpaeriales and Order 5: Hypocreales | | |
| **10th** | **2** | Division 2: Eumycota | Class 5: Ascomycetes, Series 3: Discomycetes**:** general characteristics, This Series classified into two groups: Group 1: Hypogean: which presence under the surface of soil.<br>Group 2: Epigean<br>Subclass 3: Loculoascomycetidae | Paper lectures Data show | Daily, semester and final exams |
| **11th** | **2** | Division 2: Eumycota | Class 6: Basidiomycetes, general characteristics, Subclasses involved in this class.<br>Subclass 1: Heterobasidiomycetidae, general characteristics, | Paper lectures Data show | Daily, semester and final exams |

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| | | | This subclass involves two orders:<br>Order 1: Uredinales (Rust fungi)<br>Order 2: Ustilaginales (Smut fungi)<br>These two orders contain very economically important strains. | | |
| **12th** | **2** | Division 2: Eumycota | Class 6: Basidiomycetes, Subclasses 2: Holobasidiomycetidae, general characteristics.<br>The role of some strains in production of enzymes such laccase, peroxidase, cellulose, Edible and poising mushroom. | | |
| **13th** | **2** | | **Exam.** | | |
| **14th** | **2** | Division 2: Eumycota | Class 7: Deutromycetes, general characteristics, Orders involved in this class.<br>Order 1: Moniliales,<br>Order 2: Sphaeropsidales,<br>Order 3: Melanconiales<br>And Order 4: Mycelia sterile | Paper lectures<br>Data show | Daily, semester and final exams |
| **15th** | **2** | Medical mycology and Mycotoxins | Medical mycology which involve: classification of this fundi according to the site of infection.<br>Mycotoxins which involve the main | Paper lectures<br>Data show | Daily, semester and final exams |

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| | | | groups of mycotoxins. | | |
| **Course Structure: Practical** | | | | | |
| **Week** | **Hours** | **Unit or subject name** | **Required Learning Outcomes** | **Learning method** | **Evaluation method** |
| **1st** | **2** | Mycology | Introduction | Paper lectures Algal slides by Data show | Daily, semester and final exams |
| **2nd** | **2** | Mycology | Isolation of fungi | Paper lectures Algal slides by Data show | Daily, semester and final exams |
| **3rd** | **2** | Mycology | Fungal classification (Division: Myxomycota) | Paper lectures Algal slides by Data show | Daily, semester and final exams |
| **4th** | **2** | Mycology | Division: Eumycota Subdivision: Mastigomycotina Class: Chytridiomycetes | Paper lectures Algal slides by Data show | Daily, semester and final exams |
| **5th** | **2** | Mycology | Division: Eumycota Subdivision: Mastigomycotina Class: Oomycetes | Paper lectures Algal slides by Data show | Daily, semester and final exams |
| **6th** | **2** | Mycology | Division: Eumycota Subdivision: Mastigomycotina Class: Zygomycetes | Paper lectures Algal slides by Data show | Daily, semester and final exams |
| **7th** | **2** | Mycology | **Exam.** | | |
| **8th** | **2** | Mycology | Subdivision: Ascomycotina Class: Hemiascomycetes (Protoascomycetes) | Paper lectures Algal slides by Data show | Daily, semester and final exams |
| **9th** | **2** | Mycology | Subdivision: Ascomycotina Class: Ascomycetes Subclass: Plectomycetidae | Paper lectures Algal slides by Data show | Daily, semester and final exams |

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| **10th** | **2** | Mycology | Subdivision: Ascomycotina Class: Ascomycetes Subclass: Loculloascomycetidae | Paper lectures Algal slides by Data show | |
| **11th** | **2** | Mycology | | Paper lectures Algal slides by Data show | Daily, semester and final exams |
| **12th** | **2** | Mycology | Subdivision: Ascomycotina Class: Ascomycetes Subclass: Discomycetida | Paper lectures Algal slides by Data show | |
| **13th** | **2** | Mycology | **Exam.** | | |
| **14th** | **2** | Mycology | Samples collection and fungi isolation, purification and identification | Practical | |
| **15th** | **2** | | Samples collection and fungi isolation, purification and identification | Practical | |

**11. Course Evaluation**

Overall score out of 100
(Semester grade = 40, including: 25 for theoretical + 15 for practical)
(End-of-semester exam score = 60, including 40 for theory + 20 for practical)

**12. Learning and Teaching Resources**

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|---|---|
| **Required textbo (curricular books, if any)** | Introductory mycology by Alexopoulos, C.J and C.W.Mi Third edition. |
| **Main references (sources)** | Introduction to fungi by John Webster and Roland W.S.Weber 2007. Cambridge. |
| **Recommended books and references (scientific journals, reports...)** | Introductory mycology by Alexopoulos, C.J and C.W.Mi Third edition. |
| **Electronic Referen Websites** | https://en.wikipedia.org/wiki/Mycology |

# Microbial genetics

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| **1. Course Name:** |
| **Microbial Genetics** |
| **2. Course Code:** |
| BIOT345 |
| **3. Semester / Year:** |
| **2nd semester / 2024-2025** |
| **4. Description Preparation Date:** |
| **1-10-2024** |
| **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<br>4 Practical hours/week per section * 15 weeks = 60 hours<br>Total number of hours per section = 90 hours<br>Number of units = 3 units (theoretical 2 + practical 1) |
| **7. Course administrator's name (mention all, if more than one name)** |
| **Name**: Prof. Dr. Nuha Joseph Najeeb Kandala<br>**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 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 genetic code, transcription and translation, mutations and their types and everything related to them, the mechanism of gene transfer (conjugation, transformation and connection), means of gene transfer (plasmids, phages and vector elements), re-association and repair of the resulting defect. 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** |
| 1. Clarification and explanation of the study materials by the academic staff through t whiteboard or using PowerPoint.<br>2. Providing students with homework.<br>3. Preparing reports related to academic vocabulary.<br>4. Visit websites to obtain additional knowledge of academic subjects.<br>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 Genetics of Microorganisms | A-Advantages for using bacteria and viruses for genetics study<br>B-Classification of Organisms<br>C-The Bacterial Genome<br>D-Bacteria Were Used for Fundamental Studies of Cell Function<br>E-Viruses and Bacterial Viruses | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **2nd** | **2** | Replication in bacteria and viruses | A-Types and principle of replication.<br>B-The mechanism of replication .<br>C-The role of enzymes in replication.<br>C-Replication in phage and archaebacteria<br>D-Repair Systems | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **3rd** | **2** | Gene expression: Transcription in Bacteria | A-RNA Molecules<br>B-The Structure of RNA<br>C-Transcription: Synthesizing RNA from a DNA Template<br>D-The Substrate for Transcription<br>E-The Process of Bacterial Transcription | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |

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| **4th** | **2** | Translation in Bacteria | A- Bacteria-Synthesizing proteins (amino acids) from RNA<br>B-The Substrate for Translation<br>C-The Process of Bacterial Translation<br>.<br>. | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **5th** | **2** | Exam | exam | | |
| **6th** | **2** | Mutations | A-Definition of mutations<br>B-Classification of mutation .<br>C-Nomenclature of mutatin<br>D-Mechanisms of mutations.<br>E-The influence of chemicals and phiscal agents among mutations | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **7th** | **2** | Inheritance in bacteria | A-Luria and Delbruck experiment.<br>B-The Newcombeexperiment .<br>C-The Lederbergs experiment.<br>D-Mutation rates<br>E-Calculation mutation rates. | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **8th** | **2** | Mobile elements: The Plasmids | A-The Characteristic features of Plasmid<br>B-Classified plasmids according to the function .<br>C-Plasmids replication and control | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **9th** | **2** | Movable Genes | The Nature of Transposable Elements<br>General Characteristics of | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |

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| | | | Transposable Elements Mechanisms of Transposition Transposable Elements in Bacteria | | |
| **10th** | **2** | Exam | Exam | | |
| **11th** | **2** | Viral Genetics | A--Types of cycle in Bacteriophages B-Techniques for the Study of Bacteriophages | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **12th** | **2** | Gene Transfer: Conjugation | A-Mechanism of conjucation B-Fertility plasmid C- Types of conjucation in gram positive and gram negative bacteria | | |
| **13th** | **2** | Transformation | A-types of transformation B-Mechanisms of transformation C- the factors effect of transformation D-transformation in plasmid | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **14th** | **2** | Transduction | Types of transduction Genrlized and specialized transduction C-phages and gene transfer,lytic and lysogenic cycles of bacteria . | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **15th** | **2** | Final exam | | | |

| **Course Structure: Practical** | | | | | |
|---|---|---|---|---|---|
| **Week** | **Hours** | **Unit or subject name** | **Required Learning Outcomes** | **Learning method** | **Evaluation method** |

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|---|---|---|---|---|---|
| **1st** | **2** | مقدمة عامة / طرق انتقال المواد الوراثية بين البكتيريا | مقدمة تعريفية عن وراثة الاحياء المجهرية وطرق انتقال المادة الوراثية فيما بينها | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **2nd** | **2** | جودة التجارب المختبرية | مكونات التجربة<br>1. العينة وتهيئة العينة<br>2. الطريقة<br>3. استخدام سيطرة موجبة وسيطرة سالبة<br>4-تحليل وعرض النتائج | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **3rd** | **2** | تهيئة العينات البكتيرية | الاوساط الزعية لخلايا بكتيرية سليمة<br>1. الاوساط الصلبة والسائلة.<br>2. تهيئة الوساطالزرعية<br>3-فصل الحلايا البكتيرية | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **4th** | **2** | Exam | | | |
| **5th** | **2** | دراسة انتقال المادة الوراثية بطريقة التحول البكتيري | الفهم الكامل لطريقة التحول البكتيري وكيفية تهيئة الخلايا البكتيرية اجراء تجربة عملية توضح ظاهرة التحول | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **6th** | **2** | الاقتران البكتيري | دراسة انتقال المادة الوراثية بطريقة الاقتران البكتيري من خلال اجراء تجربة عملية توضح ظاهرة الاقتران. | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **7th** | **2** | Transduction | دراسة انتقال المادة الوراثية بطريقة الاصابة بالعاثياتالبكتيرية اجراء تجربة عملية توضح ظاهرة التوصيل | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **8th** | **2** | EXAM | EXAM | | |
| **9th** | **2** | الطفرات في البكتريا | الطفرات في البكتريا<br>2-انواع الطفرات<br>3- انواعالمطفرات / الكيمياوية والفيزياوية.<br>4-المستوى الجزيئي في عزل الطفرات<br>5-الطرق الجزيئية للكشف عن الطفرات | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **10th** | **2** | الطفرات في البكتريا الجزء الثاني | الكشف عن الطفرات في البكتريا بااستخدامالمطفراتالكيميائيةا والفيزيائية في الاوساط الصلبة والسائلة . | | |

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| **11th** | **2** | الكشف عن الطفرات المقاومة للمضادات الحيوية في البكتريا | استخدام احد طرق الكشف عن الطفرات المقاومة للمضادات الحيوية . | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **12th** | **2** | استخلاص البلازميدات من البكتريا | استخدام طرق مختلفة لاستخلاص البلازميد<br>1- Alkaline method<br>2- Boiling method<br>3- Phenol – chloroform method<br>4- Using kit in extraction | | |
| **13th** | **2** | تقنية الترحيل الكهربائي في الكشف عن البلازميدات | استخدام الترحيل الكهربائي في الكشف عن البلازميدات المستخلصة بطرق مختلفة | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **14th** | **2** | Polymerase chain reaction | 1-التعرف على مبدا هذه التقنية تقنية تفاعل البلمرة المتسلسل<br>2-خطوات التقنية<br>3- تطبيق عملي على الكشف عن احد الجينات في البكتريا | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **15th** | **2** | Final exam | Exam | | |
| | | | | | |

**11. Course Evaluation**

Overall score out of 100
(Semester grade = 40, including: 25 for theoretical + 15 for practical)
(End-of-semester exam score = 60, including 40 for theory + 20 for practical)

**12. Learning and Teaching Resources**

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|---|---|
| **Required textbooks (curricu books, if any)** | -علم الاحياء المجهرية (ج1,ج2).<br>د. وفاء جاسم رجب<br>2-اساسيات ومبادى الوراثة .<br>أ.د.عبد الخالق مراد<br>3-علم الوراثة ج١ تنظيم وتضاعف المادة الوراثية<br>د.محمد علي الحاجي |
| **Main references (sources)** | |

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|---|---|
| **Recommended books and references (scientific journals, reports...)** | **1-Molecular Genetics of Bacteria.4th EditionJeremy W. Dale and Simon F. Park ,2004.**<br>**2-Genetics.Leland H.Hartwell.( 2000)**<br>**3-Color atlas of genetics**<br>**Eberhad,Passarge. (2001).**<br>**-Microbial Genetics.**<br>**Keya Chaudhari , 2013**<br>**4-Genetics of Bacteria.** Shrivastava**, Sheela ,2013**<br>**5-Modern Microbial Genetics,**<br>**Uldis N. Streips ,Ronald E. Yasbin.(2002 ). Second Edition**<br>**6-Fundamentals of Microbiology**<br>**by Jeffrey Pommerville .( 2014). 10th Edition** |
| **Electronic-References, Websi** | المواقع العديدة التي تعني بـ وراثة احياء مجهرية ومن ضمنها المواقع الطبية واليوتيوب والبحوث العلمية<br>**https://drive.google.com/file/d/1Ao2R1fWEy02I4ZmcB4hpBJSmLt4s7jMG/viewhttps://www.snvdz.com/2019/08/geneticmolecular.html**<br>**https://www.youtube.com/watch?v=tl_u--Ufnkghttps://www.youtube.com/watch?v=URUJD5NEXC8**<br>**https://www.youtube.com/watch?v=2ctmJJmLzuU**<br>**https://www.youtube.com/watch?v=XY0_KBa7y5Q**<br>**https://www.neelwafurat.com/itempage.aspx?id=lbb127823-87950&search=books** |

# Food biotechnology

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|---|
| **1. Course Name:** |
| **Food microtechnology** |
| **2. Course Code:** |
| **BIOT315** |
| **3. Semester / Year:** |
| **2nd semester / 2024-2025** |
| **4. Description Preparation Date:** |
| **1-10-2024** |
| **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<br>4 Practical hours/week per section * 15 weeks = 60 hours<br>Total number of hours per section = 90 hours<br>Number of units = 3 units (theoretical 2 + practical 1) |

**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 a course of study in the physiology of mammals, especially humans, based on Knowledge of basic physiological principles of living organisms

To develop more practical biological skills in the field of organismal physiology.

To prepare students for a number of natural sciences courses in physiology, development and neuroscience, as well Pharmacology, pathology and zoology, 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.
5. Brainstorming during lectures.

**10. Course Structure: Theory**

| Week | Hours | Unit or subject name | Required Learning Outcomes | Learning method | Evaluation method |
|---|---|---|---|---|---|
| 1st | 2 | -History and development of food microbiology<br>-Characteristics of predominant microorganisms in food | -Development of food microbiology<br>- Characteristics of predominant microorganisms in food (mold, yeast, viruses, bacteria)<br>-Important bacterial genera | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| 2nd | 2 | Sources of microorganisms in food | Sources of microorganisms in food: Predominant microorganisms in different sources (Plants, animals, air, soil, sewage, water, humans, food ingredients, equipment, miscellaneous) | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| 3rd | 2 | Microbiological standard of food | -Microbiological standard of food (Adulterated and misbranded food and | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |

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| | | Common Microbial Spoilage of foods | Bacteriological standard of food)<br><br>Common Microbial Spoilage of foods (types of common microbial spoilage) | | |
| **4th** | **2** | Microbial growth characteristics | Microbial growth characteristics: Natural of microbial growth in food (Mixed Population, Sequence of Growth, Growth in Succession, Symbiotic Growth, Synergistic Growth, and Antagonistic Growth) | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **5th** | **2** | Factors influencing microbial growth in food | Factors influencing microbial growth in food:<br>-Intrinsic factors or food environment (Nutrients, Growth Factors and Inhibitors, Water Activity, pH, Redox Potential)<br>- External Factors (Temperature) | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **6th** | **2** | Seasonal Exam | الامتحان الشهري الاول | | |
| **7th** | **2** | Microbial food spoilage<br>-Important factors in microbial food spoilage.<br>-Spoilage of Specific Food Groups | Microbial food spoilage<br>-Important factors in microbial food spoilage (Significance of microorganisms, and (Significance of foods)<br>-Spoilage of Specific Food Groups: Meat (red meat, Poultry, Fish) and eggs | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **8th** | **2** | Microbial food spoilage<br>-Spoilage of Specific Food Groups. | -Spoilage of Specific Food Groups (Milk and their products, Vegetables, fruits and nuts, cereals and their products, canned foods, soft drinks, fruit juices and, vegetable juices, | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

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| | | Food Spoilage by Microbial Enzymes | mayonnaise, salad dressings, and condiments, pickles)<br>-Food Spoilage by Microbial Enzymes (Intracellular and extracellular enzymes) | | |
| **9th** | **2** | Microbial foodborne diseases | -Important Facts in Foodborne Diseases.<br>-Foodborne Intoxications | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **10th** | **2** | Microbial foodborne diseases | -Foodborne Infections.<br>-Foodborne Toxicoinfections. | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **11th** | **2** | Microbial foodborne diseases | - Parasites<br>- Indicators of Bacterial Pathogens. | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **12th** | **2** | الامتحان الشهري الثاني | Seasonal exam | | |
| **13th** | **2** | Control of microorganisms in food | -Control of access (Cleaning and Sanitation).<br>-Control by physical removal.<br>-Control by Heat. | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **14th** | **2** | Control of microorganisms in food | -Control by Low Temperature.<br>-Control by Reduced Aw.<br>Control by Low pH and Organic Acids. | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **15th** | **2** | Control of microorganisms in food | -Control by Modified Atmosphere (or Reducing O–R Potential).<br>-Control by Antimicrobial Preservatives.<br>-Control by Irradiation. | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
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| **Course Structure: Practical** | | | | | |

| Week | Hours | Unit or subject name | Required Learning Outcomes | Learning method | Evaluation method |
|---|---|---|---|---|---|
| 1st | 2 | Preparation of samples | How to prepare and examine samples of canned food: Receipt and storage (Size, handling, containers, transportation, Request for examination, Receipt and description at the laboratory) | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| 2nd | 2 | Methods for Microbiological Examination of Foods Direct Methods Indirect Methods | Train students on how to benefit from the diversity of examination methods and the importance of each method (Microbiological Examination Methods, Microscopic examination, ATP photometry, Rapid Method). Indirect Methods: (Plate count, Culturing Technique, Pour plate) | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| 3rd | 2 | Microbiological Examination of Milk | How to detect milk contaminants and the factors affecting and helping to cause contamination: Milk Examination, Screening the quality of milk, the microbiological tests of milk (Standard Plate Count, Coliform Count, The Breed count), Biochemical tests used to characterize bacteria. | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| 4th | 2 | Microbiological Examination of meat | How to detect meat and the factors affecting its approval | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| 5th | 2 | Microbiological Examination of poultry | How to detect poultry and the factors affecting its approval | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

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| **6th** | **2** | Microbiological Examination of fish | How to detect fish and the factors affecting its approval | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **7th** | **2** | Microbiological examination of eggs | How to detect egg contaminants and the factors affecting them and helping them to become contaminated | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **8th** | **2** | Microbiological examination of Fruit | How to detect fruit contaminants and the influencing factors and help with their contamination | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **9th** | **2** | Microbiological examination of Vegetables | How to detect vegetable contaminants and the influencing factors and help with their contamination | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **10th** | **2** | **الامتحان** | Exam | | |
| **11th** | **2** | Microbiological examination of grains | How to detect grain contaminants and influencing factors and help in their contamination | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **12th** | **2** | Microbiological examination of fruit juices and bottled water | How to detect contaminants in fruit juices and bottled water, and the factors affecting and helping to contaminate them | | |
| **13th** | **2** | The canned food | The health effects of canned food, the materials used in manufacturing the cans, and the preservatives used in canning | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **14th** | **2** | The toxins | Types of toxins and their sources | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **15th** | **2** | | Exam | | |

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| **11. Course Evaluation** | |
| Overall score out of 100<br>(Semester grade = 40, including: 25 for theoretical + 15 for practical)<br>(End-of-semester exam score = 60, including 40 for theory + 20 for practical) | |
| **12. Learning and Teaching Resources** | |
| **Required textbo (curricular books, if any)** | -Fundamental food microbiology (Bibek Ray,2004) |
| **Main references (sources)** | -Food microbiology (Mantrile TY,1987)<br>-Practical food microbiology (D Robert & M Green wood, 2003) |
| **Recommended books and references (scientific journals, reports...)** | -Food microbiology (William GF,1958)<br>-Food Microbiology Laboratory Manual (Venata Vedum-Mai and Melissa J) |
| **Electronic Referen Websites** | https://www.youtube.com/playlist?list=PL5-ECkJGqf8qEwQaE-BpplaV82uYFq75M |

# Antibiotics

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| **1. Course Name:** |
| **ANTIBIOTICS** |
| **2. Course Code:** |
| **BIOT325** |
| **3. Semester / Year:** |
| **2nd semester / 2024-2025** |
| **4. Description Preparation Date:** |
| **1-10-2024** |
| **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<br>4 Practical hours/week per section * 15 weeks = 60 hours<br>Total number of hours per section = 90 hours<br>Number of units = 3 units (theoretical 2 + practical 1) |
| **7. Course administrator's name (mention all, if more than one name)** |
| **Name**: Prof. Dr. Suhad Saad Mahmood<br>**Email:** suhad.mahmood@sc.uobaghdad.edu.iq |
| **8. Course Objectives** |
| This course aims to provide a course of study in the physiology of mammals, especially humans, based on Knowledge of basic physiological principles of living organisms<br>To develop more practical biological skills in the field of organismal physiology. |

To prepare students for a number of natural sciences courses in physiology, development and neuroscience, as well Pharmacology, pathology and zoology, 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.
5. Brainstorming during lectures.

## 10. Course Structure: Theory

| Week | Hours | Unit or subject name | Required Learning Outcomes | Learning method | Evaluation method |
|---|---|---|---|---|---|
| **1st** | **2** | Discovering OF antibiotics | Introduction in antibiotics | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **2nd** | **2** | Biosynthesis of secondary metabolism pathways | Mechanisms of antibiotics synthesis | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **3rd** | **2** | Mechanism of action of antibiotics | Understanding the Mechanism of action of antibiotics on microbes | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **4th** | **2** | Classification of antibiotics | Types of antibiotics groups | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **5th** | **2** | Antibiotics properties | General characters of antibiotics | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **6th** | **2** | Antibiotics that inhibit the action of the bacterial cell wall | Types of groups and mode of action | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| | **2** | Seasonal Exam | Seasonal Exam | | |

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| **7th** | | | | | |
| **8th** | **2** | Beta lactam antibiotics | Pharmaceutical specifications for this group, extent of its effect, and mechanism of action | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **9th** | **2** | Pencillin group | Pharmaceutical specifications for this group, extent of its effect, and mechanism of action | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **10th** | **2** | Cephalosporin es | Pharmaceutical specifications for this group, extent of its effect, and mechanism of action | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **11th** | **2** | Other beta lactam groups | Pharmaceutical specifications for this group, extent of its effect, and mechanism of action | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **12th** | **2** | A group of antibiotics that inhibit protein biosynthesis | Pharmaceutical specifications for this group, extent of its effect, and mechanism of action | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **13th** | **2** | A group of antibiotics that inhibit the biosynthesis of nucleic acids, | Pharmaceutical specifications for this group, extent of its effect, and mechanism of action | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **14th** | **2** | A group of antibiotics that inhibit some metabolic pathways of bacteria Send feedback Side panels | Pharmaceutical specifications for this group, extent of its effect, and mechanism of action | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **15th** | **2** | Resistance to antibiotics | Types and mechanisms of resistance | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
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| **Course Structure: Practical** | | | | | |

| Week | Hours | Unit or subject name | Required Learning Outcomes | Learning method | Evaluation method |
|---|---|---|---|---|---|
| 1st | 2 | Introduction to antimicrobial agents | The scientific history of antibiotics and their scientific definition | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| 2nd | 2 | Antibiotics | Its types and characteristics | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| 3rd | 2 | Evaluation of Disinfectants or comparison of antiseptics used against microorganisms | The practice steps of method | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| 4th | 2 | Test of antibiotic susceptibility (sensitivity) | The practice steps of method | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| 5th | 2 | Minimum inhibition , concentration | The practice steps of method | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| 6th | 2 | Minimum bactericidal concentration | The practice steps of method | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| 7th | 2 | Epsilometer (E ) test to detect bacterial sensitivity to antibiotics | The practice steps of method | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| 8th | 2 | Exam | | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| 9th | 2 | Use alternatives to antibiotics | Define of alternative ways and explain the characters benefit of each | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

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| **10th** | **2** | Antimicrobial Drugs Used in Combination | Explain the combination and the effect of it one antibiotic activity | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **11th** | **2** | Detection of B-lactamases | The practice steps of method | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **12th** | **2** | The Vitek System | The practice steps of method | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **13th** | **2** | Exam | | | |

| **11. Course Evaluation** |
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| Overall score out of 100<br>(Semester grade = 40, including: 25 for theoretical + 15 for practical)<br>(End-of-semester exam score = 60, including 40 for theory + 20 for practical) |

| **12. Learning and Teaching Resources** | |
|---|---|
| **Required textbo (curricular books, if any)** | -Basics of Physiology / Abdul Rahim Ashir and Sal Nasser Al-Alwaji |
| **Main references (sources)** | -A textbook of practical physiology, 2013 (8th edition)<br>-Endocrine secrets, 6th ed., Michael T. McDermott,2013 |
| **Recommended books and references (scientific journals, reports...)** | -Human Physiology/ Stuart Iron Fox/2004 |
| **Electronic Referen Websites** | https://en.wikipedia.org/wiki/Physiology<br>https://www.medicalnewstoday.com/articles/248791 |

# Immunology

| **1. Course Name:** |
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| **Immunology** |
| **2. Course Code:** |
| **BIOT330** |
| **3. Semester / Year:** |
| **2nd semester / 2024-2025** |
| **4. Description Preparation Date:** |
| **1-4-2025** |
| **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
4 Practical hours/week per section * 15 weeks = 60 hours
Total number of hours per section = 90 hours
Number of units = 3 units (theoretical 2 + practical 1)

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

**Name**: Prof. Dr. Mouruj A. Al aubydi
**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.
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 immunology | History and development of immunology | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| 2nd | 2 | Types of Innate immunity | Factors determining innate immunity | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| 3rd | 2 | Cellular factors | Inflammatory response, phagocytosis, and adaptive immunity | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

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| **4th** | **2** | Adaptive passive immunity | Comparison between adaptive active and adaptive passive immunity | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **5th** | **2** | Lymphoid organs | The primary and the secondary lymphoid organs as components of the immune system | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **6th** | **2** | Activation of immune cells | Primary and secondary immune response | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **7th** | **2** | 1st mid exam | | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **8th** | **2** | Antigens | Immunogens, antigenic determinants of proteins | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **9th** | **2** | Human leukocytes antigens | Major histocompatibility complex and blood groups | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **10th** | **2** | General characteristics of antibodies | Maturation of the immune system, theories of antibody formation | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **11th** | **2** | Antibody – antigen interactions (Humeral immunity) | Forces involved in antibody – antigen interactions | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **12th** | **2** | Types of serological reactions | Precipitation and its applications, agglutination, and immunostaining | | |
| **13th** | **2** | Complement | Complement pathways; classical and alternative | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

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| | | | complement pathways | | |
| **14th** | **2** | Hypersensitivity | Hypersensitivity types | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **15th** | **2** | General revision | | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
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**Course Structure: Practical**

| Week | Hours | Unit or subject name | Required Learning Outcomes | Learning method | Evaluation method |
|---|---|---|---|---|---|
| **1st** | **2** | Animals identification | Proper identification of research animals, routes of administration, sampling methods | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **2nd** | **2** | The bactericidal activity of serum | The bactericidal effect of normal serum, and heat-inactivated serum tested on bacteria. | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **3rd** | **2** | Antigen Preparation | Preparation of somatic O antigen and H antigen | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **4th** | **2** | Rosette Forming Cells (RFCs**)** | Quantitation of T cells | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **5th** | **2** | ABO Blood Grouping System | ABO and Rh factor typing procedure, Compatibility testing – The cross matching | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

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| **6th** | **2** | Enumeration of developed activated B cells (plasma cells) | Quantitation of plasma cells | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **7th** | **2** | Phagocytosis | Phagocytic index of different organs | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **8th** | **2** | 1st mid exam | | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **9th** | **2** | Agglutination test | Qualitative and quantitative agglutination | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **10th** | **2** | Precipitation test | Oudin tube test, Ouchterlony plate test | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **11th** | **2** | Complement fixation test | Complement Fixation Test: Principle, Procedure and Results | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **12th** | **2** | Enzyme-Linked Immunosorbent Assays (ELISA) | Types of ELISA | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **13th** | **2** | **2nd mid exam** | | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **14th** | **2** | | | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **15th** | **2** | | Exam | | |
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| **11. Course Evaluation** | | | | | |
| Overall score out of 100 | | | | | |

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| (Semester grade = 40, including: 25 for theoretical + 15 for practical)<br>(End-of-semester exam score = 60, including 40 for theory + 20 for practical) | |
| **12. Learning and Teaching Resources** | |
| Required textbooks (curric books, if any) | |
| Main references (sources) | • Immunology, 2013 (3ed edition)<br>• Clinical immunology and serology,2010 (3ed edition) |
| Recommended books and references (scientific journals, reports...) | |
| Electronic References, Websites | • https://books.google.iq/books/about/Immunology.html?id=fEZrwuvrPKUC&redir_esc=y<br>https://www.youtube.com/watch?v=1KdlU1sQcyc |

# Environmental biotechnology

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| **1. Course Name:** |
| Environmental Biotechnology |
| **2. Course Code:** |
| **BIOT335** |
| **3. Semester / Year:** |
| **Second semester / 2024-2025** |
| **4. Description Preparation Date:** |
| **1-10-2024** |
| **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<br>4 Practical hours/week per section * 15 weeks = 60 hours<br>Total number of hours per section = 90 hours<br>Number of units = 3 units (theoretical 2 + practical 1) |
| **7. Course administrator's name (mention all, if more than one name)** |
| **Name**: Prof. Dr. Nadhim Hasan Hayder<br>**Email:** Nadhim.Haider@sc.uobaghdad.edu.iq |
| **8. Course Objectives** |
| This course aims to:<br>- Application of different environmental techniques and biological systems for removal of pollutants |

- The role of microorganisms in metabolism and manufacturing of differenr organic compounds
- Using of bioremediation techniques for *in situ and ex situ* rendering of pollutants
- Biodegradation of hydrocarbons by microorganisms
- Exploitation of microorganism's potential for production of primary and secondary products such as biosurfactant, bio pesticides, biofuel and organic fertilizer in different fields.

**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 Enninronmental Biotechnology | Importance of Environmental Biotechnology, Biomethylation, Biomagnification, Important terms in Environmental Biotechnology | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **2nd** | **2** | Biological Treatment Process | Techniques used in biological treatment, Process variables used in control of the biological processes, HRT, BOD load, F/ M ratio, Advantages of biological treatment plant, Attached film growth, Trickling filter, Biological disk, Fludized bea reactor | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

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|---|---|---|---|---|---|
| **3rd** | **2** | Waste nature and microbial growth | Source of wastewater, The nature and composition of waste water, Soft and hard organic matter (BOD) digestion, Microbial ecology, Types of bacteria in activated sludge, Bacterial flocs, Metabolism of bacteria, Microbial processes, ingestion, secretion, respiration, Growth of bacteria, the effect of pH, temp. Substrate concentration, toxicity | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **4th** | **2** | Metabolism of Nitrogen , phosphorous and Sulfur compounds | Source of nitrogen compounds, Ammonification, Nitrification of ammonia, denitrification, Metabolism of phosphorous compounds, Metabolism of sulphur compounds, Wastewater treatment (Algal photosynthesis), Algal genera, Eutrofication | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **5th** | **2** | Biodegradation | Difinition of biodegradation process, Factors that effect in biodegradation, Aerobic and anaerobic degradation, The advantage and disadvantages of anaerobic process, Sequential degradation | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **6th** | **2** | First Exam | First Exam | | |

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|---|---|---|---|---|---|
| **7th** | **2** | Biodegradation OF HERBICIDES AND PESTICIDES | Cometaboli of MCA and MCPA,Biodgradation steps of 2,4-D, Biodegradation OF HYDROCARBONS, Aliphatic hydrocarbons, *Aromatic hydrocarbons*, Biodegradation OF SOME SPECIFIC WASTES *Poly cyclic aromatic hydrocarbons* | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **8th** | **2** | Bioremediation of Environmental Pollutants | Principles of Bioremediation, Factors effects the Bioremediation, Characteristics of Microbial Populations for Bioremediation Processes, Mechanisms of oxidation, Environmental Factors, Bioremediation Strategies, Advantages and disadvantage of bioremediation | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **9th** | **2** | Biosurfactant in Microbiolgy and Biotechnology | Definition of Biosurfactants, Biosurfactant Classification and Their Microbial Origin, The mechanisms of biosurfactant interaction, Major biosurfactant classes and microorganisms involved , Physiological Role of Biosurfactants, Factors effecting biosurfactant production, Advantages, | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

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| | | | Applications of Biosurfactants | | |
| **10th** | **2** | Metal Uptake (Recovery) By Microorganisms | Metal recovery by microbes, BIOLEACHING, BIOSORPTSON by Bacteria and Fungi, Microbial Mechanisms for Removal of Metal Ions, *Immobilization, volatilization,* Extracellular Precipitation, *intracellular Accumulation,* | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **11th** | **2** | Secon Exam | Secon Exam | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **12th** | **2** | Microbial Bio pesticides | Definition of Microbial pesticides, Advantages and disadvantages of Microbial pesticides, Bacteria insecticides, Mechanism of action of *Bacillus thuringiensis* on caterpillars, maximize the effectiveness of *Bt* treatments, Mechanisms of biological control, Antibiotic-mediated suppression | | |
| **13th** | **2** | Bioleaching | Introduction – General biological principles – Application of bioleaching: 1. Mining process 2. Environmental protection 3. Bioleaching in conventional reactors. | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **14th** | **2** | Biomethanation | Introduction – Anaerobic process – Microbiological | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

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| | | | requirements – Process design – | | |
| **15th** | **2** | Reactors | Types of reactors – Environmental application | 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** | Production of cellulose by microorganisms | Production of cellulose by microorganisms | Production of cellulose by microorganisms | Production of cellulose by microorganisms |
| **2nd** | **2** | Bioremediation | Bioremediation | Bioremediation | Bioremediation |
| **3rd** | **2** | Biological Oxygen Demand Measurement (BOD) | Biological Oxygen Demand Measurement (BOD) | Biological Oxygen Demand Measurement (BOD) | Biological Oxygen Demand Measurement (BOD) |
| **4th** | **2** | 4. Biofilm | 4. Biofilm | 4. Biofilm | 4. Biofilm |
| **5th** | **2** | **First Exam** | **First Exam** | **First Exam** | **First Exam** |
| **6th** | **2** | 5. Biodegradation | 5. Biodegradation | 5. Biodegradation | 5. Biodegradation |
| **7th** | **2** | 6. Production of biosurfactant by bacteria | 6. Production of biosurfactant by bacteria | 6. Production of biosurfactant by bacteria | 6. Production of biosurfactant by bacteria |
| **8th** | **2** | Bio absorption of heavy metal by microorganism | Bio absorption of heavy metal by microorganism | Bio absorption of heavy metal by microorganism | Bio absorption of heavy metal by microorganism |
| **9th** | **2** | Antibacterial activity of bioactive compounds produced by Streptomyces spp. isolated from agricultural soil | Antibacterial activity of bioactive compounds produced by Streptomyces spp. isolated from agricultural soil | Antibacterial activity of bioactive compounds produced by Streptomyces spp. isolated from agricultural soil | Antibacterial activity of bioactive compounds produced by Streptomyces spp. isolated from agricultural soil |
| **10th** | **2** | Effect of environmental factors on | Effect of environmental factors on microbial growth | Effect of environmental factors on microbial growth | Effect of environmental factors on |

| | | | | | |
|---|---|---|---|---|---|
| | | microbial growth | | | microbial growth |
| **11th** | **2** | **Second Exam** | **Second Exam** | **Second Exam** | **Second Exam** |
| **12th** | **2** | Bioconversion (biotransformation | Bioconversion (biotransformation | Bioconversion (biotransformation | Bioconversion (biotransformation |
| **13th** | **2** | | | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **14th** | **2** | | | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **15th** | **2** | | | | |
| | | | | | |

| **11. Course Evaluation** |
|---|
| Overall score out of 100<br>(Semester grade = 40, including: 25 for theoretical + 15 for practical)<br>(End-of-semester exam score = 60, including 40 for theory + 20 for practical) |

| **12. Learning and Teaching Resources** | |
|---|---|
| **Required text bo (curricular books, if any)** | Not found |
| **Main references (sources)** | 1. Environmental Microbiology Third edition by Ian L. Pepper Charles P. Gerba Terry J. Gentry, (2015).<br>2. Environmental Microbiology<br>Second Edition by Eugene L. Madsen (2016)<br>3. Environmental Biotechnology by T. Srinivas. (2008). |
| **Recommended books and references (scientific journals, reports...)** | |
| **Electronic Referen Websites** | |

# Nanobiotechnology

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| **1. Course Name:** |
| **Nanobiotechnology** |
| **2. Course Code:** |
| BIOT340 |
| **3. Semester / Year:** |
| **2nd semester / 2024-2025** |
| **4. Description Preparation Date:** |
| **1-10-2024** |
| **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<br>4 Practical hours/week per section * 15 weeks = 60 hours<br>Total number of hours per section = 90 hours<br>Number of units = 3 units (theoretical 2 + practical 1) |
| **7. Course administrator's name (mention all, if more than one name)** |
| **Name**: Prof. Dr. Israa Ali Zaidan<br>**Email:** israa.zaidan@sc.uobaghdad.edu.iq |
| **8. Course Objectives** |
| 1. This course deals with the basic concept of nanotechnology<br>2. To understand the important of nanotechnology and its applications in biotechnology. |
| **9. Teaching and Learning Strategies** |
| 1. Clarification and explanation of the study materials by the academic staff through the whiteboard or using PowerPoint.<br>2. Providing students with homework.<br>3. Preparing reports related to academic vocabulary.<br>4. Visit websites to obtain additional knowledge of academic subjects.<br>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 course | Nanotechnology definitions, To know the new properties of nanomaterilas | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

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| **2nd** | **2** | Historical perspective of micro and nano scale | To know the definition and history of nanotechnology | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **3rd** | **2** | Nano manufacturing technology, Advantages and disadvantages | To Describe the different methods of synthesis nanomaterials | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **4th** | **2** | applications of nanotechnology | Determine the applications of nanotechnology in different aspects | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **5th** | **2** | Overview of Nano Fabrication Methods: Top-down and bottom-up approaches | To know the types of synthesis nanomaterials | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **6th** | **2** | Exam 1 | | | |
| **7th** | **2** | Types of nanomaterials organic and inorganic nanomaterials | Explain specific types of nanomaterials | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **8th** | **2** | Quantum dots, etc., Organic compounds and bio-applications of nano materials | To determine the physical base of quantum phenomena | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **9th** | **2** | Characterizatio n Tools, Optical microscopy and Spectrophotome ter, Scanning Electron Microscope, AFM | Explain the characterization of nanomaterial by using different techniques | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **10th** | **2** | Quantum dots, etc., Organic compounds and bio-applications | Applications of nanotechnology in biomedical field | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

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|---|---|---|---|---|---|
| | | of nano materials | | | |
| **11th** | **2** | Characterizatio n Tools, Optical microscopy and Spectrophotome ter, Scanning Electron | Explain Direct and indirect methods of characterization | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **12th** | **2** | Microscope, AFM | Explain Direct methods of characterization | | |
| **13th** | **2** | Application of nano materials, Carbon Nano Tubes | Applications of nanotechnology in biomedical field | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **14th** | **2** | Nanopharmaceu ticals and Nanomedical Device | Applications of nanotechnology in biotechnology field | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **15th** | **2** | Bioengineered Nanomaterials | Learn new technology of using nanomaterials | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **Course Structure: Practical** | | | | | |
| **Week** | **Hour** | **Unit or subject name** | **Required Learning Outcomes** | **Learning method** | **Evaluation method** |
| **1st** | **2** | Introduction | Examples for comparison | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **2nd** | **2** | Synthesis Metal Nanoparticles | Metal salt and reducing agents | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **3rd** | **2** | Synthesis of nanomaterials by chemical method | Metal salt and chemical reducing agents | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **4th** | **2** | Synthesis of nanomaterials by physical method | Laser and substrate | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

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| **5th** | **2** | Synthesis of nanomaterials by biological method | Metal salt and plant extract | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **6th** | **2** | Exam 1 | | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **7th** | **2** | Nanomaterial characterization techniques | Characterization Instruments | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **8th** | **2** | Biological bio-medical applications: Antibacterial activity test | Bacteria and culture media | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **9th** | **2** | Antifungal activity test | Fungal and culture media | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **10th** | **2** | Nanosensers | Glass slide with different materials | | |
| **11th** | **2** | Nanopolymer | Chitosan | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **12th** | **2** | Mechanical method | Glass ball | | |
| **13th** | **2** | Applications of nanomaterials | Biomedical applications | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **14th** | **2** | | | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **15th** | **2** | Exam 2 | | | |
| **11. Course Evaluation** | | | | | |
| Overall score out of 100<br>(Semester grade = 40, including: 25 for theoretical + 15 for practical)<br>(End-of-semester exam score = 60, including 40 for theory + 20 for practical) | | | | | |
| **12. Learning and Teaching Resources** | | | | | |

| | |
|---|---|
| **Required textbooks (curricu books, if any)** | - Textbook of Nanoscience Nanotechnology<br>B S Murty, P Shankar, Baldev Raj, B B Rath and James Murday.2 |
| **Main references (sources)** | - Nanomaterials in Bionanotechnology: Fundamentals and Applications. Singh and Kshitij RB Singh.ISBN: 9780367689445.2021 |
| **Recommended books and references (scientific journals, reports...)** | - Textbook of Nanoscience Nanotechnology<br>B S Murty, P Shankar, Baldev Raj, B B Rath and James Murday.2 |
| **Electronic References, Websit** | https://web.pdx.edu/~pmoeck/phy381/intro-nanotech.pdf |

# Research methodology

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| **1. Course Name:** |
| **Research methodology** |
| **2. Course Code:** |
| |
| **3. Semester / Year:** |
| **2nd semester / 2024-2025** |
| **4. Description Preparation Date:** |
| **1-10-2024** |
| **5. Available Attendance Forms:** |
| **Weekly attendance** |
| **6. Number of Credit Hours (Total) / Number of Units (Total)** |
| 2 Theoretical hours/week, one section * 15 weeks = 15 hours<br>Total number of hours per section = 15 hours<br>Number of units = 1 units (theoretical 1) |
| **7. Course administrator's name (mention all, if more than one name)** |
| **Name**: Prof. Dr. Asmaa Mohammed Saud<br>**Email:** asmaa.saud@sc.uobaghdad.edu.iq |
| **8. Course Objectives** |
| The goal is a general element and its presence is essential in research. Studies emphasize the necessity of including goals in the methodology of scientific research. This element indicates the goal that the researcher seeks to achieve and predicts the results that can be reached. The reader is interested in the goals, so the statements must be motivating and Close to his mind and expectations, and the objectives of scientific research should be set carefully and masterfully.<br>• The research methodology aims at the way in which the researcher writes his research papers after the studies that he has worked on, the experiments that he conducted, and the previous studies from which he extracted his information and data, after collecting all the data that will benefit his study through known data collection tools, the most important of which are Previous studies, which may be information on which the researcher builds his research or uses them to prove a theory, and these studies must be documented at the end of the research as one of the |

conditions for publication in well-known scientific publishing outlets, of which peer-reviewed scientific journals are considered at the forefront.

**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 Research | Research Methodology Course objectives | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **2nd** | **2** | Eight-Step Model | Main components of any research work | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **3rd** | **2** | Considerations in selecting a good research problem, | The Research Problem | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **4th** | **2** | Writing a research report | Preparation of the research | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **5th** | **2** | Meaning of review of literature | Literature review | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **6th** | **2** | -- | Seasonal Exam | | |

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|---|---|---|---|---|---|
| **7th** | **2** | Objectives of review of literature**(** | Problems Identified in Writing a Literature Review | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **8th** | **2** | Types of study designs | Research Methods | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **9th** | **2** | - Types of Research Data | Data collection methods | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **10th** | **2** | Research tools**:** | Methods of Collecting Primary Data | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **11th** | **2** | **-**Meaning and definition of sampling **-**Functions of population and sampling **-**Methods of sampling | Sampling | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **12th** | **2** | -- | Seasonal exam | | |
| **13th** | **2** | Presentation of student research 1 | -Application | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **14th** | **2** | Presentation of student research 2 | -Application | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **15th** | **2** | Presentation of student research 3 | -Application | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **11. Course Evaluation** | | | | | |
| Overall score out of 100<br>(Semester grade = 40 for theoretical)<br>(End-of-semester exam score = (60 theory only) | | | | | |

| 12. Learning and Teaching Resources | |
|---|---|
| **Required textbo (curricular books, if any)** | |
| **Main references (sources)** | Corlien M. Varkevisser, Indra Pathmanathan, and Ann Brownlee. Designing and conducting health systems research projects: Volume 1 Proposal development and fieldwork. KIT/IDRC. 2003 |
| **Recommended books and references (scientific journals, reports...)** | Teaching and Learning Research Methodologies in Education: A Systematic Literature Review, Educ. Sci. 2023, 13(2), 173; https://doi.org/10.3390/educsci13020173 |
| **Electronic Referen Websites** | https://ecpr.eu/Events/AcademicProgramme/Courses?eventID=223&gclid=CjwKCAjwhJukBhBPEiwAniIcNXmKk5qFg1VgiT-UvtF9UlxfAyqkOY |

# Course Description Form for the 4th stage subjects

## Principles of genetic engineering

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|---|
| **1. Course Name:** |
| **Principles of genetic engineering** |
| **2. Course Code:** |
| BIOT400 |
| **3. Semester / Year:** |
| **1St semester / 2024-2025** |
| **4. Description Preparation Date:** |
| **1-10-2024** |
| **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<br>4 Practical hours/week per section * 15 weeks = 60 hours<br>Total number of hours per section = 90 hours<br>Number of units = 3 units (theoretical 2 + practical 1) |
| **7. Course administrator's name (mention all, if more than one name)** |
| -Name: Assist. Prof. Dr. Reema Mohammed Abed<br>Email: Reema. abed@sc.uobaghdad.edu.iq<br><br>-Name: Email: Prof.Dr. Abdulkareem Al-kazaz<br><br>-Name: lecturer Dr. Zaid Ali Hussain |
| **8. Course Objectives** |
| Principles of Genetic Engineering is a field of Biology that deals with the manipulation of DNA and genes of an organism through gene cloning in order to alter or modify a certain characteristic of an organism. An organism's genes are manipulated through artificial synthesis or entering a new DNA strand to the already existing genes of an organism in order to change a specific function or characteristic of that organism. These genetically modified organisms are then used for various purposes, for example, a plant can be genetically modified in order to produce fruits that have a longer shelf life. Genetic Engineering has done some groundbreaking research in the field of agriculture and was one of the key factors in the green revolution. |
| **9. Teaching and Learning Strategies** |
| 1. Clarification and explanation of the study materials by the academic staff through the whiteboard or using PowerPoint.<br>2. Providing students with homework.<br>3. Preparing reports related to academic vocabulary.<br>4. Visit websites to obtain additional knowledge of academic subjects.<br>5. Brainstorming during lectures. |

| 10. Course Structure: Theory | | | | | |
|---|---|---|---|---|---|
| **Week** | **Hours** | **Unit or subject name** | **Required Learning Outcomes** | **Learning method** | **Evaluation method** |
| **1st** | **2** | Genetic Engineering | Introduction to the science of technology and the scientists who discovered this science | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **2nd** | **2** | Cloning Steps | The steps of the cloning process, which are 7 steps, are explained in detail | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **3rd** | **2** | Isolation of total DNA | DNA isolation In different ways | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **4th** | **2** | Isolation of plasmid DNA | Different methods of isolating plasmids | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **5th** | **2** | Restriction enzymes | Introduction to cutting enzymes and how they work | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **6th** | **2** | Types of Restriction enzymes | Types of cutting enzymes, their names, and different cutting methods | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **7th** | **2** | Factor affecting on restriction enzymes | Factors that affect the work of cutting enzymes, such as temperature, concentration, ions, and pH | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **8th** | **2** | Cloning vectors | Introduction to cloning vectors | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

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| **9th** | **2** | Types of cloning vectors | Types of natural and manufactured cloning vectors and their discovery | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **10th** | **2** | plasmids | Types of plasmids, their composition, and the genetic map for each plasmid | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **11th** | **2** | phages | Types of phages, their composition, and the genetic map for each phage | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **12th** | **2** | cosmids | Types of cosmids, their structure, and the genetic map for each cosmid | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **13th** | **2** | expression vectors | Types of expression vectors, their composition, and the genetic map for each vector | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **14th** | **2** | Application of cloning vectors in genetic egineering | Applications of cloning vectors in the medical, agricultural and industrial aspects and benefiting from them | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **15th** | **2** | exam | - | - | - |
| **Course Structure: Practical** | | | | | |
| **Week** | **Hours** | **Unit or subject name** | **Required Learning Outcomes** | **Learning method** | **Evaluation method** |
| **1st** | **2** | Types of buffers used | Solutions and buffers | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

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| **2nd** | **2** | Methods of extraction from prokaryotes | Total DNA extraction from prokaryotic organisms (bacteria) | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **3rd** | **2** | Methods of extraction from humans | Total DNA extraction from eukaryotic organisms (human blood) | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **4th** | **2** | Methods of extraction from plants | Total DNA extraction from eukaryotic organisms (plants) | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **5th** | **2** | Methods for extracting plasmids from bacteria | Extraction of plasmid DNA from prokaryotic organisms (bacteria) | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **6th** | **2** | Different methods of measuring DNA and purity | Measuring the concentration and purity of extracted DNA | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **7th** | **2** | Electrical relay and its types | Electrophoresis of extracted DNA | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **8th** | **2** | Methods for retrieving electrophoresed DNA | Retrieval of electrophoresed DNA | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **9th** | **2** | Restriction enzymes, their types, and ligase | Restriction and ligase | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **10th** | **2** | Exam | - | - | - |
| **11th** | **2** | Explain the conjugation | Insertion of genetic material (conjugation) | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

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| **12th** | **2** | Transformation process | Introduction of genetic material (transformation) | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **13th** | **2** | Introduction to the polymerase reaction and its discovery<br>Types of polymerase reactions and their discovery | Polymerase chain reaction technology (PCR)<br>Types of PCR technology | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **14th** | **2** | Introduction to mutagenesis, different types and its discovery | Types of mutagenesis | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **15th** | **2** | Exam | - | - | - |

| **11. Course Evaluation** | |
|---|---|
| Overall score out of 100<br>(Semester grade = 40, including: 25 for theoretical + 15 for practical)<br>(End-of-semester exam score = 60, including 40 for theory + 20 for practical) | |
| **12. Learning and Teaching Resources** | |
| **Required textbo (curricular books, if any)** | -principle of genetic engineering / Ghalib Al-Bakri |
| **Main references (sources)** | - Puehler, A. *et al*, A.K. 1984.Advanced molecular genetics<br>- Rogen L., 1999. Applied molecular genetics.<br>-Leland, H. *et al.* 2019. Genetics |
| **Recommended books and references (scientific journals, reports...)** | -genetic, genes, genetic engineering |
| **Electronic Referen Websites** | www. Genetic genie.org |

## Animal tissues Culture

| **1. Course Name:** |
|---|
| **Animal tissues Culture** |
| **2. Course Code:** |
| **BIOT420** |
| **3. Semester / Year:** |
| **1st semester / 2024-2025** |

**4. Description Preparation Date:**

**1-10-2024**

**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
4 Practical hours/week per section * 15 weeks = 60 hours
Total number of hours per section = 90 hours
Number of units = 3 units (theoretical 2 + practical 1)

**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**

1-The course aims to introduce the student to everything related to the animal cell and its morphological forms.
2- Familiarize the student with methods of cell development, transplantation, and propagation in ex vivo media.
3- Studying various structures and how to utilize them to direct cells towards specialized growth for a specific type of cell.
4- Introducing the student to how to isolate cells from each other using biological techniques.
5- Evaluating the important methods for evaluating cell growth and the methods used to inhibit the growth of some of them through therapeutic 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 | History of cell culture, Basic and application of cell culture | The major scientist who contribute to development of it | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| 2nd | 2 | Origin of culture cells | From which kind of cells to collect | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

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| **3rd** | **2** | The culture environment | Ph, temperature, osmosis, etc | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **4th** | **2** | Subculture | How to made subculture | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **5th** | **2** | Differentiation of cells | How cell differentiate in culture to have specific function | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **6th** | **2** | | Seasonal Exam | | |
| **7th** | **2** | Cell line | How to prepare cell line | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **8th** | **2** | Cloning and the principle of selection, | Cloning and selection of cells | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **9th** | **2** | Isolation techniques for Monolayer clone | Monolayers | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **10th** | **2** | Cell separation: Suspension &Others | How to select particular cell type form suspension | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **11th** | **2** | Cell Interaction with substrate | Cell to cell interaction to make tissue | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **12th** | **2** | Isolation cell technology :Cell Density and isopytic sedimentation | Separation of cells depending of cell characteristics | Paper lectures Electronic screen Video lectures via electronic classes | |
| **13th** | **2** | | Seasonal exam | | |
| **14th** | **2** | Cell strains | How to made cell strain | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

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|---|---|---|---|---|---|
| **15th** | **2** | Some applications of tissue culture | Drugs , toxins toxic effect study | 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** | Sterilization of glassware and media | -types of media<br>-glassware<br>-media preparation | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **2nd** | **2** | Morphology of cell culture | -Origin of culture<br>-Types of cell | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **3rd** | **2** | Cell culture contamination | -types of contamination | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **4th** | **2** | Primary cell culture | -Preparation primary culture<br>-passage no. | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **5th** | **2** | Secondary cell culture | Methods for culturing | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **6th** | **2** | Material and method | Culture of chick embryo fibroblast | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **7th** | **2** | | Seasonal exam | | |
| **8th** | **2** | Methods for culturing<br>Suspension and adherent cells | Sub- culturing | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

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|---|---|---|---|---|---|
| **9th** | **2** | -Cryopreserve media<br>-cryopreserve process | Cryopreservation | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **10th** | **2** | Methods for culturing Suspension and adherent cells | Transformation | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **11th** | **2** | Methods for culturing Suspension and adherent cells | Immortalization of animal cell | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **12th** | **2** | Surgical procedure Primary culture of bone marrow | Isolation of stem cells | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **13th** | **2** | | Seasonal Exam | | |
| **14th** | **2** | Isolation of stem cells | Isolation of cells classic protocol mesenchymal stem isolation by ficoll or percol | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **15th** | **2** | **seminar** | | | |
| | | | | | |

**11. Course Evaluation**

Overall score out of 100
(Semester grade = 40, including: 25 for theoretical + 15 for practical)
(End-of-semester exam score = 60, including 40 for theory + 20 for practical)

**12. Learning and Teaching Resources**

| | |
|---|---|
| **Required-textbooks (curricular books, if any)** | No required books, only lectures. |
| **Main references (sources)** | Cell Culturing theory and practice , ed. By Tim Walton<br>Animal cell culture and Technology, (2005) 2nd by Michael Butler |
| **Recommended books and references (scientific journals, reports...)** | Any book in animal tissue culture |
| **Electronic Referenc Websites** | www.animaltissueculture .org |

# Plant tissue culture

| |
|---|
| **1. Course Name:** |
| **Plant tissue culture** |
| **2. Course Code:** |
| **BIOT410** |
| **3. Semester / Year:** |
| **1st semester / 2024-2025** |
| **4. Description Preparation Date:** |
| **1-10-2024** |
| **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<br>4 Practical hours/week per section * 15 weeks = 60 hours<br>Total number of hours per section = 90 hours<br>Number of units = 3 units (theoretical 2 + practical 1) |
| **7. Course administrator's name (mention all, if more than one name)** |
| **Name**: lecturer. Dr. zainab farqad Mahmood mukhtar<br>**Email:** zainab.mukhtar@sc.uobaghdad.edu.iq |
| **8. Course Objectives** |
| This course explains the concept of plant tissue culture<br>It aims to deal with the techniques of tissue culture for different plants in order to produce an new whole plant from stem cells, single cells , parts of leaves or roots to produce a new plant on a culture medium supplemented with nutrients and plant growth regulators<br>This science work on producing plants in a short period of time having new traits like GM plants or disease free plants that is important to man kind |
| **9. Teaching and Learning Strategies** |
| 1. Clarification and explanation of the study materials by the academic staff through the whiteboard or using PowerPoint.<br>2. Providing students with homework.<br>3. Preparing reports related to academic vocabulary.<br>4. Visit websites to obtain additional knowledge of academic subjects.<br>5. Brainstorming during lectures. |
| **10. Course Structure: Theory** |

| Week | Hours | Unit or subject name | Required Learning Outcomes | Learning method | Evaluation method |
|---|---|---|---|---|---|
| 1st | 2 | Introduction of P.T.C. | Understanding what P.T.C is and its importance | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |

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|---|---|---|---|---|---|
| **2nd** | **2** | Importance and applications of P.T.C | The development of P.T.C techniques through history | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **3rd** | **2** | P.T.C initiation and applications | Callus production from different plant sources | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **4th** | **2** | Types of P.T.C and their importance | Applications of the different types of P.T.Cs | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **5th** | **2** | Mid exam 1 | | | |
| **6th** | **2** | Totipotency, Cytodifferentiation and organogenesis | Identifying the plants differentiation mechanisms | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **7th** | **2** | Somatic and zygotic embryogenesis | Knowing the differences between types of plant embryos | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **8th** | **2** | Protoplast cultures | Introducing the types, mechanisms and applications of protoplast cultures | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **9th** | **2** | Meristem cultures | What is the meristem and its importance in creating diseases free plants | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **10th** | **2** | Production of secondary metabolites using P.T.C | Mechanisms for increasing the production of S.M through P.T.C | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **11th** | **2** | Artificial seeds | Their definition, importance and production techniques | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **12th** | **2** | Genetically modified plants | What is G.M and how are they produced through P.T.C techniques | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **13th** | **2** | Mid exam 2 | | | |

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| **14th** | **2** | Nanotechnology and P.T.C | The use of nano particles in P.T.C science | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **15th** | **2** | Somatic seeds | Introducing the techniques and importance of somatic seeds | 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** | P.T.C lab | Introducing the main and important tools and equipment used in P.T.C work | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **2nd** | **2** | Initiation of P.T.C cultures | Presenting the basic mediums and techniques used in P.T.C lab | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **3rd** | **2** | Callus cultures | Initiation of callus cultures from different plant origins | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **4th** | **2** | Cell cultures | The production of cell cultures and their importance | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **5th** | **2** | Midterm exam 1 | | | |
| **6th** | **2** | Cytodifferentiation and organogenesis | It's a continuous level after callus production to reach plantlets level | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **7th** | **2** | Somatic embryogenesis | The production of somatic embryos from different plant sources | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **8th** | **2** | Protoplast cultures | The extraction of protoplast for different manipulation aims | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

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| **9th** | **2** | Disease free plants | Using meristem to produce disease free plants through P.T.C techniques | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **10th** | **2** | Midterm exam 2 | | | |
| **11th** | **2** | Secondary metabolites | Using different P.T.C techniques to increase S.M production in callus cultures | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **12th** | **2** | Artificial seeds | Techniques used for the production of artificial seeds | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **13th** | **2** | N.P and P.T.C | Using different nanoparticles in P.T.C for various applications | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **14th** | **2** | G.M plants | Initiating plants with different enhanced traits through P.T.C | 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, including: 25 for theoretical + 15 for practical)
(End-of-semester exam score = 60, including 40 for theory + 20 for practical)

**12. Learning and Teaching Resources**

| | |
|---|---|
| **Required textbo (curricular books, if any)** | Plant biotechnology by Ramawatt K.G 2008 |
| **Main references (sources)** | • Plant tissue culture by S.P.misra 2019 |
| **Recommended books and references (scientific journals, reports...)** | General Techniques of Plant Tissue Culture<br>Dagla, H. R. (2012). Plant tiss culture. Resonance.767-759 ,(8)17 , |
| **Electronic Referenc Websites** | https://scholar.google.com/scholar?q=Plant+Tissue+Culture:+An+Introductory+Text&hl=en&as_sdt=0&as_vis=1&oi=scholart |

# Principles of Immunogenitics

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|---|
| **1. Course Name:** |
| **Principles of Immunogenetics** |
| **2. Course Code:** |
| BIOT415 |
| **3. Semester / Year:** |
| **2nd semester / 2024-2025** |
| **4. Description Preparation Date:** |
| **1-4-2025** |
| **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<br>4 Practical hours/week per section * 15 weeks = 60 hours<br>Total number of hours per section = 90 hours<br>Number of units = 3 units (theoretical 2 + practical 1) |
| **7. Course administrator's name (mention all, if more than one name)** |
| **Name** Ibtihal A . Al-Karaawi ibtihal.Majeed@sc.uobaghdad.edu.iq<br>Wasan Wael Mohammed Ali Wasan.Ali@sc.uobaghdad.edu.iq |
| **8. Course Objectives** |
| This course aims to provide a course of study in human immunogenetics, based on knowledge of basic genetic principles of living organisms , To develop more practical genetic skills in the field of human genetics, autoimmune diseases and related genetics. To prepare students for a number of natural science courses in immunology, genetics and the human genome, and also Pharmacogenomics, disease therapeutics and human genomics, 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.<br>2. Providing students with homework.<br>3. Preparing reports related to academic vocabulary.<br>4. Visit websites to obtain additional knowledge of academic subjects.<br>5. Brainstorming during lectures. |
| **10. Course Structure: Theory** |

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

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|---|---|---|---|---|---|
| **1st** | **2** | –Innate immunity<br>–Adaptive immunity<br>–Principles of ImmunogeneticS | Introduction to the Immunogenetics | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **2nd** | **2** | -The Functions of MHC<br>–MHC Class I ,II,III<br>–Structure of MHC class I,II.III: | The major histocomtpatibility complex | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **3rd** | **2** | -Human MHC Class I Genes<br>-Human MHC Class II Genes<br>-Human Class III Genes | Major histocompatibility complex (MHC) genes | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **4th** | **2** | isoagglutinogen,<br>-Inheritance of A and<br>-B genes<br>-H gene codes | Genetics of ABO and H Antigen | 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** | -Basic Structure<br>-General Functions<br>-Human Immunoglobulin Classes | Immunoglobulins | | |
| **7th** | **2** | Gene class-Inheritance- | Genetics of immunoglobuline gene | | |
| **8th** | **2** | Bacterial diseases-<br>Viral diseases-<br>Parasitic diseases- | HLA and disease infectious | Paper lectures Electronic screen Video lectures via | Daily, semester and final exams |

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|---|---|---|---|---|---|
| | | | | electronic classes | |
| **9th** | **2** | –Innate immunity<br>-Adaptive immunity<br>-Principles of ImmunogeneticS | Introduction to the Immunogenetics | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **10th** | **2** | The Functions of MHC –<br>-MHC Class I<br>-Structure of MHC class I: | The major histocomtpatibility complex | | |
| **11th** | **2** | -Human MHC Class I Genes<br>-<br>Human MHC Class II Genes<br>-Human Class III Genes | Major histocompatibility complex (MHC) genes | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **12th** | **2** | -<br>isoagglutinogen,--<br>-Inheritance of A and<br>-B genes<br>-H gene codes | Genetics of ABO and H Antigen | | |
| **13th** | **2** | | EXAM | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **14th** | **2** | -Basic Structure<br>-General Functions<br>-Human Immunoglobulin Classes | Immunoglobulins | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **15th** | **2** | Gene class-<br>Inheritance- | Genetics of immunoglobuline gene | | |
| | | | | | |
| 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 | | |
| 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 | Immunoassays | Paper lectures | Daily, semester and final exams |

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| | | (ELISA) ELISA Analysis<br>ELISA application | | Electronic screen<br>Video lectures via electronic classes | |
| **8th** | **2** | RFLP Analysis<br>RFLP application | Restriction fragment length polymorphism (RFLP) | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **9th** | **2** | Sanger method<br>Applications | The Comet Assay<br>DNA sequencing | | |
| **10th** | **2** | Immunity types–<br>Innate immunity–<br>Adaptive immunity–<br>Immune cells– | Immunogenetics<br>Introduction and background | | |
| **11th** | **2** | Immunity types–<br>Innate immunity–<br>Adaptive immunity–<br>Immune cells– | Immunogenetics<br>Introduction and background | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **12th** | **2** | Phenol-chloroform method of DNA extraction from blood samples | Manual DNA extraction methods | | |
| **13th** | **2** | -prepare gele<br>-microwave soluble<br>-put gele in ruk and thumb<br>-electrophoreses | Gel Electrophoresis | Paper lectures<br>Electronic screen | Daily, semester and final exams |

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|---|---|---|---|---|---|
| | | | | Video lectures via electronic classes | |
| **14th** | **2** | -prepar raction<br>-master mix -primers<br>-PCR programe | Polymerase chain reaction (PCR | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **15th** | **2** | **exam** | | | |
| | | | | | |

| **11. Course Evaluation** | |
|---|---|
| Overall score out of 100<br>(Semester grade = 40, including: 25 for theoretical + 15 for practical)<br>(End-of-semester exam score = 60, including 40 for theory + 20 for practical) | |
| **12. Learning and Teaching Resources** | |
| **Required textbooks (curricu books, if any)** | "Molecular Biology<br>Authored by Dr. Ghalib Al-Bakri" |
| **Main references (sources)** | 1-Disease Delusion: by Jeffrey S. Bland (Author), Mark Hyman. 2015<br>2- Human Genetic Diseases. Edited by Dijana Plaseska-Karanfilska.2011 |
| **Recommended books and references (scientific journals, reports...)** | **Human Genetic Diseases1-**<br>• **2- The genetic basis of disease. Essays in Biochemistry 62(5):643-723**<br>**DOI: 10.1042/EBC20170053** |
| **Electronic Referenc Websites** | -National human genome research institutes<br>2- Online Degrees \| Blog \| What You Need to Know About 5 Most Common Genetic Disorders |

## Virology and Vaccines

| **1. Course Name:** |
|---|
| **Virology and Vaccines** |
| **2. Course Code:** |
| **BIOT330** |
| **3. Semester / Year:** |
| **2nd semester / 2024-2025** |
| **4. Description Preparation Date:** |
| **1-10-2024** |
| **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
4 Practical hours/week per section * 15 weeks = 60 hours
Total number of hours per section = 90 hours
Number of units = 3 units (theoretical 2 + practical 1)

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

**Name**:Ass. Prof. Dr. Wisal Salman Abd
**Email:** wisal.abd@sc.uobaghdad.edu.iq

**8. Course Objectives**

This course includes coverage of the concepts of (viruses and vaccines) and includes the structures of viral forms, their classification, the rules upon which these classifications are built, the process of viral reproduction and pathogenesis, and how the virus causes diseases based on the precise strategy followed by the virus, the method of diagnosis and treatment, and the foundations upon which the therapeutic process is built. It also includes the foundations Vaccines Then we go into the viral groups individually in detail

**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 Virology | - What is the virus.<br>- Evolutionary origin of the virus.<br>- Classification of the virus.<br>- Principles of virus structure. | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| 2nd | 2 | Introduction to structure | -Chemical composition of viruses<br>- Cultivation assays of viruses | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| 3rd | 2 | Identification | -Purification and identification of viruses | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

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| | | | - Laboratory safety<br>- Reactions to physical and chemical agents | | |
| **4th** | **2** | Replication | - Replication of the viruses | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **5th** | **2** | | امتحان فصلي اول | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **6th** | **2** | Viral genome | - Defective viruses.<br>- Interaction between viruses.<br>- Viral genomes as a vector. | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **7th** | **2** | Pathogenesis | - Pathogenesis and control of viral disease.<br>- Modes of transmission of viruses.<br>- Emerging viral disease. | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **8th** | **2** | Classificatio n of Virus | - DNA enveloped viruses:<br>- Herpes viruses.<br>- Hepatitis B virus.<br>- Pox virus. | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **9th** | **2** | Classificatio n of Virus | - Non enveloped viruses:<br>- Adeno viruses.<br>- Papilloma virus.<br>- RNA enveloped viruses:<br>Respiratory viruses. | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |

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| **10th** | **2** | Immunity &antibody production against viruses | -Host immune response (Defense Mechanisms)<br>-The nonspecific immune defenses<br>-The specific immune defenses Activities of interferon<br>-Humoral immunity<br>-Cellular immunity | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **11th** | **2** | Pathogenes | - Pathogenesis and control of viral disease.<br>- Modes of transmission of viruses.<br>- Emerging viral disease. | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **12th** | **2** | Prevention and treatment of viral infection | Antiviral Drug: Treatment for Flu and other Common Viruses Inhibiting DNA/RNA Synthesis Inhibiting Viral Entry/Exit Inhibiting Viral Spread Virotherapy | | |
| **13th** | **2** | Introduction of Vaccines | :Viral vaccines -<br>Types of viral -<br>.vaccines<br>Perpetration of -<br>.viral vaccines<br>- | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **14th** | **2** | Viral Vaccines | Passive immunization active immunization | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

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| **15th** | **2** | General revision | | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
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**Course Structure: Practical**

| Week | Hours | Unit or subject name | Required Learning Outcomes | Learning method | Evaluation method |
|---|---|---|---|---|---|
| **1st** | **2** | Introduction to virology lab | -History<br>-virology labrotary and diagnosis<br>- | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **2nd** | **2** | Introduction to virology lab | -Biosafety requirement | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **3rd** | **2** | -Direct detection of Virus | -types of microscope used in detection | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **4th** | **2** | Laboratory process | -Collection of specimen<br>-Transport of specimen<br>-Specimen processing and inoculation<br>-Virus Identification | 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** | Virus culture and cultivation | -CPE<br>-Haemagglutination<br>-Plaque assay<br>-TCID50 assay | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **7th** | **2** | Detection of viral antibody | -Haemaglutination<br>-Inhibition test<br>-EIA\ELISA | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **8th** | **2** | Detection of viral Antigen | -Immunofluorescence<br>-EIA\ELISA<br>-Western blot | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

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|---|---|---|---|---|---|
| | | | -Imunopreceptation | | |
| **9th** | **2** | -Immunofluorescence<br>-EIA\ELISA<br>-Western blot<br>-Imunoprecept ation | -PCR<br>-Southern& northen blot | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **10th** | **2** | -PCR<br>-Southern& northen blot | -animal Inoculation<br>-Inoculation of egg | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **11th** | **2** | -animal Inoculation<br>-Inoculation of egg | In vitro cell culture | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **12th** | **2** | In vitro cell culture | Typed of Vaccines | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **13th** | **2** | Typed of Vaccines | Types of preparation methods | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **14th** | **2** | | Vaccin manufacturing process | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **15th** | **2** | | Exam | | |
| | | | | | |

**11. Course Evaluation**

Overall score out of 100
(Semester grade = 40, including: 25 for theoretical + 15 for practical)
(End-of-semester exam score = 60, including 40 for theory + 20 for practical)

**12. Learning and Teaching Resources**

| | |
|---|---|
| Required textbooks (curric books, if any) | |
| Main references (sources) | Medical microbiology<br>• Bailey & Scott's Diagnostic Microbiology |
| Recommended books and references (scientific journals, reports...) | Review of Medical Microbiology and Immunology<br>PUBMed ,Google scholar |
| Electronic References, Websites | PUBMed & Google scholar |

# English Language

| 1. Course Name: |
|---|
| **English Language** |
| **2. Course Code:** |
| **414GS** |
| **3. Semester / Year:** |
| **1s semester / 2024-2025** |
| **4. Description Preparation Date:** |
| **1-10-2024** |
| **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<br>Number of units = 2 units |
| **7. Course administrator's name (mention all, if more than one name)** |
| **Name**:Asst.Lec zahraa Abdulhasan Abdali<br>**Email: zahraa.a** @sc.uobaghdad.edu.iq |
| **8. Course Objectives** |
| To help students further develop their language skill,achieve a high level of proficiency in English,focus on building on the foundation established in the previous levels.To Expand students' vocabulary, grammar, reading, writing, listening, and speaking abilities and to enhance students' understanding of cultural aspects related to the English languag |
| **9. Teaching and Learning Strategies** |
| 1.Communicative Approach: Emphasize communicative activities that promote interaction among students. Encourage pair and group work, role-plays, and discussio to practice language skills in meaningful contexts.<br>2.Integrated Skills: Integrate the four language skills (speaking, listening, reading, and writing) in lessons to create a balanced approach to language learning. Provide opportunities for students to use and develop these skills simultaneously.<br>3.Vocabulary Expansion: Incorporate vocabulary-building exercises and activities throughout the course. Use real-life contexts, visuals, and practical examples to help students learn and remember new words.<br>4.Grammar Focus: Teach and reinforce grammar structures in a systematic and progressive manner. Provide clear explanations, examples, and practice exercises to ensure students understand and can apply the grammar rules correctly. |
| **10. Course Structure: Theory** |

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

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|---|---|---|---|---|---|
| **1st** | **2** | Unit 1<br>Life Stories | •Vocabulary: Describing personalities, relationships, and experiences.<br>•Grammar: Narrative tenses (past simple, past continuous, and past perfect).<br>•Skills: Discussing personal experiences and telling stories. | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **2nd** | **2** | Unit2: Highs and Lows | •Vocabulary: Describing personalities, relationships, and experiences.<br>•Grammar: Narrative tenses (past simple, past continuous, and past perfect).<br>•Skills: Discussing personal experiences and telling stories. | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **3rd** | **2** | Unit 3: Changing Lives | •Vocabulary: Describing personalities, relationships, and experiences.<br>•Grammar: Narrative tenses (past simple, past continuous, and past perfect).<br>•Skills: Discussing personal experiences and telling stories. | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **4th** | **2** | Unit 4: Getting Away | •Vocabulary: Describing personalities, relationships, and experiences.<br>•Grammar: Narrative tenses (past simple, past | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |

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|---|---|---|---|---|---|
| | | | continuous, and past perfect).<br>•Skills: Discussing personal experiences and telling stories. | | |
| **5th** | **2** | Unit 5: Communication Breakdown | VocabularyCommunication problems and strategies.<br>Grammar: Reported speech (statements, questions, and commands) Skills: Dealing with misunderstandings and resolving conflicts. | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **6th** | **2** | Unit 6: The Business World<br>-- | Vocabulary: Business and workplace terminology.<br>Grammar: Zero and first conditionals, expressions for giving advice<br>Skills: Discussing business topics and presenting ideas.<br>. | | |
| **7th** | **2** | Mid-term Exam | | | |
| **8th** | **2** | Unit 7: Technology and Society | Vocabulary: Technology-related wordsandphrases.Grammar: Passive | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

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|---|---|---|---|---|---|
| | | | voice, defining relative clauses.Skills: Discussing the impact of technology on society.<br>. | | |
| **9th** | **2** | Unit 8: The Art of Persuasion | Vocabulary Persuasive language and techniques.<br>Grammar: Modal verbs for deduction and speculation.<br>Skills: Persuading and arguing a point of view. | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **10th** | **2** | Unit 9: Health Matters | •Vocabulary: Health and well-being vocabulary.<br>•Grammar: Unreal past conditionals, expressing hypothetical situations.<br>•Skills: Discussing health issues and giving advice. | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **11th** | **2** | Unit 10: The World of Work | Vocabulary: Work-related vocabulary and collocations.Grammar: Indirect questions, expressing purpose. | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

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| | | | Skills: Discussing career goals and work-related topics | | |
| **12th** | **2** | -- Unit 11: Cross-cultural Encounters | Vocabulary: Cultural differences and customs. Grammar: Third conditional, expressions for giving opinions. Skills: Discussing cultural experiences and adapting to different cultures. | | |
| **13th** | **2** | Unit 11: Cross-cultural Encounters | Vocabulary: Cultural differences and customs. Grammar: Third conditional, expressions for giving opinions. Skills: Discussing cultural experiences and adapting to different cultures. | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **14th** | **2** | Unit 12: The Environment | Vocabulary: Environmental issues and sustainability. Grammar: Future perfect, expressing | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

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| | | | speculation and possibility.<br>Skills: Discussing environmental problems and solutions. | | |
| **15th** | | Preparatory week before the Final Exam | | | |
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| **11. Course Evaluation** | |
|---|---|
| Overall score out of 100<br>Semester grade = 40,<br>End-of-semester exam score = 60 | |
| **12. Learning and Teaching Resources** | |
| **Required textbo (curricular books, if any)** | - Textbook: Soars, Liz and John (2003). *New Headway* Up *Intermediate*. Student's book |
| **Main references (sources)** | - Textbook: Soars, Liz and John (2003). *New Headway* Upper-*Intermediate*. Student's book |
| **Recommended books and references (scientific journals, reports...)** | New Headway Plus provides an integrated skills cou with each unit divided into grammar, vocabulary, sk work and everyday English segments |
| **Electronic Referen Websites** | Oxford University Press: The New Headway series is published by Oxford University Press. Visit their website at www.oup.com and search for "New Headway Plus, Special Edition, Upper-Intermediate" or browse their English language teaching section for information on the course. |

## Application of genetic engineering

| **1. Course Name:** |
|---|
| Application of genetic engineering |
| **2. Course Code:** |
| BIOT415 |
| **3. Semester / Year:** |
| **2nd semester / 2024-2025** |
| **4. Description Preparation Date:** |
| **1-10-2024** |
| **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
4 Practical hours/week per section * 15 weeks = 60 hours
Total number of hours per section = 90 hours
Number of units = 3 units (theoretical 2 + practical 1)

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

-Name: Assist. Prof. Dr. Reema Mohammed Abed
Email: Reema. abed@sc.uobaghdad.edu.iq

-Name: Email: Prof.Dr. Abdulkareem Al-kazaz

-Name: lecturer Dr. Zaid Ali Hussain

**8. Course Objectives**

In this course, students will explore the molecular methods and applications of recombinant DNA technology and the issues regarding their use through case studies on the effect of genetic engineering on medicine, agriculture, biology, forensics and other areas of technology. The course has 3 major components: 1) techniques used in the generation of recombinant molecules, 2) application of recombinant technology to diagnostics and therapeutics and 3) genetically modified organisms. The discussion of potential ethic concerns of genome manipulations will also be included in the course.

**9. Teaching and Learning Strategies**

1. Clarification and explanation of the study materials by the academic staff through th 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 | DNA ligation and joining methods | Types of restriction and ligation enzymes and methods of restriction and ligation | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| 2nd | 2 | Transformation | Introduction to the process of conjugation in bacteria and its discovery | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| 3rd | 2 | Selection of recombinants | Methods of selection of clones cells | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

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| **4th** | **2** | Gene structure | Genetic structure of the gene and the basic components of the gene | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **5th** | **2** | First exam | First exam | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **6th** | **2** | *In vitro* mutagenesis | Types of in vitro mutagenesis and methods of mutagenesis | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **7th** | **2** | Application of genetic engineering in medicine | Introduction to the applications of genetic engineering in the medical field and giving examples such as gene therapy | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **8th** | **2** | Application of genetic engineering in agriculture | Introduction to the applications of genetic engineering in agriculture and giving examples\| | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **9th** | **2** | Application of genetic engineering in industry | Applications of genetic engineering in industry and giving examples | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **10th** | **2** | DNA chips | Introduction to DNA chips and their uses in all aspects | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **11th** | **2** | Probe and primer design | Basics of designing primers and probes using various programs | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **12th** | **2** | PCR ,Real-time PCR, RFLP | Polymerase chain reaction technology and studying its different types | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **13th** | **2** | Genomic mapping | Studying and discovering genetic maps and their types | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **14th** | **2** | Second exam | - | - | - |
| **15th** | **2** | Final exam | - | - | - |

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**Course Structure: Practical**

| Week | Hours | Unit or subject name | Required Learning Outcomes | Learning method | Evaluation method |
|---|---|---|---|---|---|
| **1st** | **2** | Single nucleotide polymorphisms | Types of mutations and single-nucleotide mutations and methods for calculating them in the gene | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **2nd** | **2** | Single nucleotide polymorphisms experiment | Experimenting with the types of mutations and single-nucleotide mutations and methods for calculating them in the gene | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **3rd** | **2** | Sequencing | Sequencing methods and how to mark the form to send it to the sequencing | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **4th** | **2** | Sequencing experiment | Experimenting with the sequence and how to teach the model to send it to the sequencing | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **5th** | **2** | Real time pcr | Introduction to the real-time polymerase chain reaction method | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **6th** | **2** | Real time pcr experimet | Conduct a real-time polymerase chain reaction experiment | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **7th** | **2** | First exam | - | | |

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|---|---|---|---|---|---|
| **8th** | **2** | Multiplex pcr | Introduction to the multiplex method | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **9th** | **2** | Multiplex pcr experiment Part I | Conducting a laboratory multiplex experiment, part one | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **10th** | **2** | Multiplex pcr experiment Part II | Conducting a laboratory multiplex experiment, part two | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **11th** | **2** | Cloning | Introduction to the cloning | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **12th** | **2** | Cloning experiment part I | Conducting a laboratory cloning experiment, part one | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **13th** | **2** | Cloning experiment Part II | Conducting a laboratory cloning experiment Part two | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **14th** | **2** | Second exam | - | - | - |
| **15th** | **2** | **Final exam** | **-** | **-** | **-** |

| **11. Course Evaluation** | |
|---|---|
| Overall score out of 100<br>(Semester grade = 40, including: 25 for theoretical + 15 for practical)<br>(End-of-semester exam score = 60, including 40 for theory + 20 for practical) | |
| **12. Learning and Teaching Resources** | |
| **Required textbo (curricular books, if any)** | -principle of genetic engineering / Ghalib Al-Bakri |
| **Main references (sources)** | - Puehler, A. *et al*, A.K. 1984.Advanced molecular genetics<br>- Rogen L., 1999. Applied molecular genetics.<br>-Leland, H. *et al.* 2019. Genetics |

| | |
|---|---|
| **Recommended books and references (scientific journals, reports...)** | -genetic, genes, genetic engineering |
| **Electronic Referenc Websites** | www. Genetic genie.org |

# Cytogenetic

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|---|
| **1. Course Name:** |
| **Cytogenetic** |
| **2. Course Code:** |
| **BIOT405** |
| **3. Semester / Year:** |
| **2nd semester / 2024-2025** |
| **4. Description Preparation Date:** |
| **1-10-2024** |
| **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<br>4 Practical hours/week per section * 15 weeks = 60 hours<br>Total number of hours per section = 90 hours<br>Number of units = 3 units (theoretical 2 + practical 1) |
| **7. Course administrator's name (mention all, if more than one name)** |
| **Name**: Prof. Dr. Maha Fakhry Altaee<br>**Email:** Maha.Fakhry@sc.uobaghdad.edu.iq |
| **8. Course Objectives** |
| This course includes coverage of the concepts of cytogenetic, which deals with the study of chromosomes in the medical and genetic fields, as well as early investigation of the chromosomes responsible for many hereditary diseases by following modern techniques of genetic and tissue culture of animal cells.<br>. |
| **9. Teaching and Learning Strategies** |
| 1. Clarification and explanation of the study materials by the academic staff through the whiteboard or using PowerPoint.<br>2. Providing students with homework.<br>3. Preparing reports related to academic vocabulary.<br>4. Visit websites to obtain additional knowledge of academic subjects.<br>5. Brainstorming during lectures. |
| **10. Course Structure: Theory** |

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

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|---|---|---|---|---|---|
| **1st** | **2** | Scope of genetics, Level of genetic testing | Types of genetics | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **2nd** | **2** | Cell Division and cell cycle | Stages of cell cycle Interphase and mitosis | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **3rd** | **2** | Mitosis division | Phases of mitosis | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **4th** | **2** | Meiosis division | Phases of two stages of meiosis | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **5th** | **2** | | Seasonal Exam | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **6th** | **2** | Gamete maturation | Oogenesis spermatogenesis | | |
| **7th** | **2** | Mendalin inheritance | Mendel laws of inheritance | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **8th** | **2** | Mode of inheritance | Dominant and recessives | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **9th** | **2** | Chromosome structure and chromosome classification | Classification of chromosomes into seven groups | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **10th** | **2** | Visualization of chromosome | How to use stains and techniques to study chromosomes | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **11th** | **2** | Preparation cells for chromosome observation | Study the material that added to cells to make chromosomes more visible to study | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **12th** | **2** | | Seasonal exam | | |

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| **13th** | **2** | Abnormal chromosome number (autosomal aneuoploidy | Dawn synd.<br>Patau synd.<br>Edward synd. | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **14th** | **2** | Sex-chromosome aneuoploidy | Turner syndrome<br>Klinfelter synd.<br>Jacob synd | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **15th** | **2** | Structural chromosome aberrations | Deletion , insertion , translocation , ring | Paper lectures<br>Electronic screen<br>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** | List of apparatus | Apparatus in cytogenetic laboratory | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **2nd** | **2** | -types of media<br>-material used<br>-media preperation | Specific and component of media used in cell culture | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **3rd** | **2** | -cell cycle<br>-mitosis steps<br>-meiosis steps<br>-differences between mitosis &meiosis | Mitosis and Meiosis showed by slides and video | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **4th** | **2** | Culturing process | Culturing of blood lymphocyte from human | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **5th** | **2** | -Preparation from mice<br>-bone marrow<br>-liver | Preparation of chromosome | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |

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|---|---|---|---|---|---|
| | | -tumor | | | |
| **6th** | **2** | Staining methods | Staining of chromosome and Microscope | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **7th** | **2** | | exam | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **8th** | **2** | -Karyotype -chromosome number | Ordering chromosome as karyotype | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **9th** | **2** | Numerical & structural | Chromosome aberration | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **10th** | **2** | sister chromatide exchange ,MI& MN) | Cytogenetic Analysis | | |
| **11th** | **2** | FISH, Ctyovision | Molecular Cytogenetic | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **12th** | **2** | Diagnostic applications | Modern methods used in cytogenetic tests | Paper lectures Electronic screen Video lectures via electronic classes | |
| **13th** | **2** | Pedigreesymbols Punnett sequare | Pedigree Chart | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **14th** | **2** | Seminars | Seminars | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **15th** | **2** | | Seasonal Exam | | |
| | | | | | |

**11. Course Evaluation**

Overall score out of 100
(Semester grade = 40, including: 25 for theoretical + 15 for practical)
(End-of-semester exam score = 60, including 40 for theory + 20 for practical)

**12. Learning and Teaching Resources**

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|---|---|
| **Required-textbooks (curricular books, if any)** | No required books, only lectures. |
| **Main references (sources)** | Human genetic, 2013 (8th edition) |
| **Recommended books and references (scientific journals, reports...)** | Any book in Human Cytogenetic,<br>Human Chromosome |
| **Electronic Referenc Websites** | www.cytogenetic.org |

## Industrial biotechnology

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| **1. Course Name:** |
| **Industrial biotechnology** |
| **2. Course Code:** |
| **BIOT425** |
| **3. Semester / Year:** |
| **2nd semester-4th class / 2024-2025** |
| **4. Description Preparation Date:** |
| **1-10-2024** |
| **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<br>4 Practical hours/week per section * 15 weeks = 60 hours<br>Total number of hours per section = 90 hours<br>Number of units = 3 units (theoretical 2 + practical 1) |
| **7. Course administrator's name (mention all, if more than one name)** |
| **Name: Prof. Dr. Khalid Jaber Kadhum**<br>**Email:** Khalid.kadhum@sc.uobaghdad.edu.iq |
| **8. Course Objectives** |
| **1-** Preparing specialists familiar with the basics of biotechnology, theoretically and practically, who are able to meet the needs of the labor market.<br>**2-** Integrated fundamental concepts of biosciences and bioprocess engineering for the study of industrial biotechnology.<br>**3-** Familiarisation with the tools used to study and application of microorganisms in industry<br>**4-** Develop a good appreciation of the multidisciplinary aspects of biotechnology<br>**5-** Encouraging scientific research and providing students with basic skills in biotechnologies and their applications in all fields. |
| **9. Teaching and Learning Strategies** |
| 1. Providing students with the basics and additional topics related to the outputs of thinking and analysis of biotechnologies.<br>2. - Forming discussion groups during lectures to discuss topics in industrial biotechnology that require thinking and analysis. |

3. - Asking students a set of thinking questions during lectures such as what, how, when and why for specific topics.
4. - Giving student's homework that requires self-explanations in causal ways.

**10. Course Structure: Theory**

| Week | Hours | Unit or subject name | Required Learning Outcomes | Learning method | Evaluation method |
|---|---|---|---|---|---|
| **1st** | **2** | Industrial Biotechnology | Definition and scope | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **2nd** | **2** | Bioprocess technology | Basic concepts in Bioprocess technology | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **3rd** | **2** | Industrial microorganisms | Strategies of acquisition of an ideal producing microorganism | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **4th** | **2** | Improvement of industrial strains | Optimizing the culture medium and growth conditions: Genetic modification: The selection of induced mutants synthesizing improved levels of primary metabolites: feedback inhibition and repression | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **5th** | **2** | Improvement of industrial strains | The isolation of mutants which do not produce feedback inhibitors or repressors: The isolation of induced mutants producing improved yields of secondary metabolites | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **6th** | **2** | Production of microbial metabolites | Industrial microbiological products as primary and secondary metabolites | | |
| **7th** | **2** | FIRST EXAM | FIRST EXAM | | |

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| **8th** | **2** | Production of Ethanol | Biosyntheses of ethanol; Ethanol Production process; Flocculence and Cell Recycling | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **9th** | **2** | Enzyme technology | Enzymes, Commercial production of enzyme; Improvement of enzyme production; improvement of enzymes production, enzyme immobilization | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **10th** | **2** | Production of antibiotics | Why do microorganisms synthesize antibiotic: Strategies for the improvement of antibiotics production: Production of Penicillin: Commercial production of penicillin | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **11th** | **2** | Microbial biomass production | Single cell protein; The choice of an organism for SCP production; Substrate for SCP production; Single cell protein production processes | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **12th** | **2** | SECOND EXAM | SECOND EXAM | | |
| **13th** | **2** | Production of amino acids | Production glutamic acid; production of Lysine | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **14th** | **2** | Production of organic acids | production of Citric acid: Citric acid biosynthesis, Fermentation processes used in citric acid production | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

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|---|---|---|---|---|---|
| **15th** | **2** | **Exam** | | | |
| **Course Structure: Practical** | | | | | |
| **Week** | **Hours** | **Unit or subject name** | **Required Learning Outcomes** | **Learning method** | **Evaluation method** |
| **1st** | **2** | Isolation of industrial microorganisms | Isolation of industrial microorganisms from the soil and their potential to produce antibiotics | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **2nd** | **2** | industrial strains | Maintenance and preservation of industrial strains | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **3rd** | **2** | single cell protein | Production of single cell protein (SCP) from yeast | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **4th** | **2** | ethanol (biofuel) | Production of ethanol (biofuel) using wastepaper as a feedstock | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **5th** | **2** | First exam | | | |
| **6th** | **2** | Bacterial pigments | Production of prodigiosin by *Serratia marcescens* | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **7th** | **2** | bacteriocin | Production of bacteriocin from *Bacillus* isolate | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **8th** | **2** | protease | Production of protease by *Aspergillus niger* using solid state fermentation | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **9th** | **2** | cellulase | Production of cellulase by soil microorganisms | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **10th** | **2** | Second exam | | | |

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|---|---|---|---|---|---|
| **11th** | **2** | amylase | Production of amylase | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **12th** | **2** | Immobilizatio n | Immobilization of industrial microorganisms | | |
| **13th** | **2** | Immobilizatio n | Immobilization of industrial microorganisms | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **14th** | **2** | Immobilizatio n 2 | Immobilization of industrial microorganisms | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **15th** | **2** | Exam | | | |

**11. Course Evaluation**

Overall score out of 100
(Semester grade = 40, including: 25 for theoretical + 15 for practical)
(End-of-semester exam score = 60, including 40 for theory + 20 for practical)

**12. Learning and Teaching Resources**

| | |
|---|---|
| **Required textbo (curricular books, if any)** | Industreial biotechnology for Dr.Nedam Al-Hydari. |
| **Main references (sources)** | **1.** Manual of Industrial Microbiology and Biotechnology (Third edition 2010) By Richard H. Baltz *et. al*<br><br>2- Principles of fermentation technology (second edition 2003) By Stanbury PF; Whitaker; Hall SJ<br>3- Bioprocess Engineering: Basic concepts by Fikret Kargi ➢ |
| **Recommended books and references (scientific journals, reports...)** | **1.** Fermentation Microbiology and Biotechnology A.L Demain *et. al*<br>2. Practical Fermentation Technology Brain Mchneil & Linda M. Harvey |
| **Electronic Referenc Websites** | **WWW. Industrial technology.org** |

# Genetic disease and molecular diagnosis

**1. Course Name:**

**Genetic disease and molecular diagnosis**

**2. Course Code:**

BIOT415

**3. Semester / Year:**

**2nd semester / 2024-2025**

**4. Description Preparation Date:**

**1-10-2024**

**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
4 Practical hours/week per section * 15 weeks = 60 hours
Total number of hours per section = 90 hours
Number of units = 3 units (theoretical 2 + practical 1)

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

**Name**: Assistant Prof. Dr.Aseel Shaker and Assistant. Prof.Dr.Rasha Al-khalidi
**Email: rasha .ali**@sc.uobaghdad.edu.iq
Aseel.mahmood @sc.uobaghdad.edu.iq

**8. Course Objectives**

1. Understanding the molecular basis of genetic diseases.
2. Learning various molecular diagnostic methods used in identifying genetic mutations and abnormalities.
3. Gaining proficiency in laboratory techniques such as PCR (Polymerase Chain Reaction), DNA sequencing, and other molecular biology assays.
4. Exploring the role of bioinformatics in genetic disease diagnosis, including data analysis and interpretation.
5. Understanding ethical considerations and implications associated with genetic testing and diagnosis. Overall, the course aims to equip students with the knowledge and skills necessary to accurately diagnose genetic disorders using molecular techniques, contributing to improved patient care and genetic counseling.

**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 in Genetics Disease | Introduction in Genetics Disease -History -Genetic Basis of Disease | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **2nd** | **2** | Polycystic kidney disease | Symptoms- -Inheritance Diagnosis- | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **3rd** | **2** | Burkitt's lymphoma | Types- Genetics- Symptoms- -Inheritance Diagnosis Inheritance- | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **4th** | **2** | Multiple endocrine neoplasia | Genetics- Inheritance- -Molecular diagnosis | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **5th** | **2** | Retinoblastoma | Genetics- Inheritance- -Molecular diagnosis | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **6th** | **2** | NEUROFIBROMATOSIS | Genetics- Inheritance- -Molecular diagnosis | | |
| **7th** | **2** | EXAM | | | |
| **8th** | **2** | Congenital hypothyroidism | Genetics- Genetic cause of disease, , mechanism of disease, symptom, diagnosis by enzymatic reaction, diagnosis by sequencing , treatment, diet, fellow up | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **9th** | **2** | cystic fibrosis | Cystic fibrosis, inheritance pattern of cystic fibrosis, mechanism of disease, respiratory sign and symptom, digestive sign and symptom, diagnosis by PCR , diagnosis by real time PCR | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

| | | | | | |
|---|---|---|---|---|---|
| **10th** | **2** | New-born Screening test | Molecular genetics testing, newborn screening test, newborn screen test in USA and Iraq, current molecular testing in newborn screeing test, galacosemia, genetics cause, pathophysiology, clinical feature, diagnosis, diet, fellow up | | |
| **11th** | **2** | Duchenne muscular dystrophy | GeneticsDuchenne muscular dystrophy, characterization of sever DMD, dystrophic gene, dystrophic protein, mutation of DMD gene downstream effect of the absence of dystrophin, DNA diagnosis in BMB/DMD, detection the disease using PCR | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **12th** | **2** | Alzahimer disease | Genetics-<br>Inheritance-<br>-Molecular diagnosis | | |
| **13th** | **2** | Schizophrenia | Genetics-<br>Inheritance-<br>-Molecular diagnosis | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **14th** | **2** | Breast cancer | -Detection braca 1 and braca 2 genes<br>Inheritance-<br>-Molecular diagnosis - | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **15th** | **2** | Final exam | | | |
| **Course Structure: Practical** | | | | | |
| **Week** | **Hours** | **Unit or subject name** | **Required Learning Outcomes** | **Learning method** | **Evaluation method** |

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| **1st** | **2** | Nested PCR polymerase chain reaction detection Polycystic kidney disease | -DNA Extraction<br>-PCR primer for *PKD1* gene<br>-PCR for PKD2 gene<br>- Gele electrophoreses | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **2nd** | **2** | Gene-expression profiling to Burkitt's lymphoma | -RNA extraction<br>-Reat time PCR<br>- detection *Myc*'s gene expression | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **3rd** | **2** | Multiplex PCR to multiple endocrine neoplasia | DNA Extraction-<br>-specific primers to MEN1 gene<br>- Identification of a gene mutation by nucleic acid sequencing | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **4th** | **2** | Genetic diaignosis for nerofibroma | -TNF gene expression by real time<br>- TNF gene sequencing | | |
| **5th** | **2** | Diagnosis of DMD | Method (multiplex PCR)<br>Preparation of multiplex kit<br>Calculation the PCR reaction<br>Preparation of agarose gel<br>Result analysis | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **6th** | **2** | Diagnosis of cystic fibrosis (CFTR gene | Q-PCR<br>Quantitative PCR and melt curve.<br>Result analysis | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **7th** | **2** | Gene detection alzahimer disease | genetic factors and polymerase chain reaction | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **8th** | **2** | Nested PCR polymerase chain reaction detection disease | -DNA Extraction<br>-PCR primer for *braca1* gene<br>-PCR for braca2 gene<br>- Gele electrophoreses | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |

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| **9th** | **2** | Gene expression real time Schizophrinia disease | Detection sequence mutation in genes | | |
| **10th** | **2** | Multiplex PCR to | DNA Extraction--specific primers to gene<br>- Identification of a gene mutation by nucleic acid sequencing | | |
| **11th** | **2** | Sequencing | -detection polymorphisms in gene | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **12th** | **2** | Sequencing 2 | Detectiom types mutation in gene | | |
| **13th** | **2** | Tag-man polymerase chain reaction | -prepar Borb specific<br>-DNA extraction | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **14th** | **2** | Statical analysis poly morphisms | -products tag man PCR<br>-program analysis | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **15th** | **2** | exam | | | |
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| **11. Course Evaluation** | |
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| Overall score out of 100<br>(Semester grade = 40, including: 25 for theoretical + 15 for practical)<br>(End-of-semester exam score = 60, including 40 for theory + 20 for practical) | |
| **12. Learning and Teaching Resources** | |
| **Required textbo (curricular books, if any)** | "Molecular Biology<br>Authored by Dr. Ghalib Al-Bakri" |
| **Main references (sources)** | 1-Disease Delusion: by Jeffrey S. Bland (Author), Mark Hyman. 2015<br>2- Human Genetic Diseases. Edited by Dijana Plaseska-Karanfilska.2011 |
| **Recommended books and references (scientific journals, reports...)** | Human Genetic Diseases1-<br>• 2- The genetic basis of disease. Essays in Biochemistry 62(5):643-723<br>DOI: 10.1042/EBC20170053 |
| **Electronic Referenc Websites** | -National human genome research institutes<br>2- Online Degrees \| Blog \| What You Need to Know About 5 Most Common Genetic Disorders |

# Applications of animal cell culture

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|---|
| **1. Course Name:** |
| **Applications of animal tissue culture** |
| **2. Course Code:** |
| **BIOT350** |
| **3. Semester / Year:** |
| **2nd semester / 2024-2025** |
| **4. Description Preparation Date:** |
| **1-10-2024** |
| **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<br>4 Practical hours/week per section * 15 weeks = 60 hours<br>Total number of hours per section = 90 hours<br>Number of units = 3 units (theoretical 2 + practical 1) |
| **7. Course administrator's name (mention all, if more than one name)** |
| **Name**: Assistant Prof. Dr. Rasha Talib Abdullah<br>Assistant Prof. Dr. Hala Abdulkareem Rasheed<br>**Email: rasha.abdullah@sc.uobaghdad.edu.iq**<br>hala.rasheed@sc.uobaghdad.edu.iq |
| **8. Course Objectives** |
| The course aims to provide a comprehensive understanding of the concepts of animal tissue culture, including the techniques used, basic principles, and challenges associated with them.<br>Study of techniques and tools: The course aims to introduce students to a variety of techniques and tools used in animal tissue culture, including cell culture techniques, molecular analysis, imaging techniques, and bioanalysis.<br>Developing practical skills: The course includes practical work periods that allow students to apply the concepts and techniques learned in practical work. Students are encouraged to acquire the skills necessary to grow animal cells and tissues in the laboratory.<br>Study of practical applications: The course aims to review the practical applications of animal tissue culture in fields such as veterinary medicine, human medicine, and other biological sciences. Successes and challenges in these areas are reviewed and potential benefits and future applications are examined |
| **9. Teaching and Learning Strategies** |
| 1. Clarification and explanation of the study materials by the academic staff through the whiteboard or using PowerPoint.<br>2. Providing students with homework.<br>3. Preparing reports related to academic vocabulary.<br>4. Visit websites to obtain additional knowledge of academic subjects.<br>5. Brainstorming during lectures. |
| **10. Course Structure: Theory** |

| Week | Hour | Unit or subject name | Required Learning Outcomes | Learning method | Evaluation method |
|---|---|---|---|---|---|
| 1st | 2 | Introduction to animal cell culture and its application | -Animal cell culture<br>-Cell Strain<br>-Growth requirement<br>-Growth cycle<br>-Application of cell line | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| 2nd | 2 | Model Systems | -Types of animal cell cultures<br>- Cell cultures provide a good model system for studying<br>)1( Basic cell biology and biochemistry ,<br>a- Visualizing cell signaling<br>b- Recombinant proteins<br>c - Cell culture models for drug permeability screening in early stages of drug development | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| 3rd | 2 | Tissue Repair , Regeneration and Wound healing | -Repair of damaged tissues<br>-Cell and Tissue Regeneration<br>-Connective tissue deposition<br>-Tissue engineering<br>-Tools and Procedures Tissue Engineering<br>-Scaffolds | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| 4th | 2 | Production of β-Interferon | I. Importance of interferon- β<br>II. Industrial Scale Production of β-Interferon<br>III- Growth of Human Fibroblast Cells in Large Scale | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| 5th | 2 | Cancer Research : Toxicity Testing | Cytotoxicity .<br>-Cytotoxicity can lead healthy living cells to three potential cellular fates<br>-Advantages of In vitro cytotoxicity and/or cell viability<br>-How to measure cytotoxicity | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |

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| | | | -Classification of cytotoxicity and cell viability assays<br>-Dye exclusion assays<br>-Colorimetric assays<br>-Fluorometric assays<br>-Luminometric assays | | |
| **6th** | **2** | -- | first Exam | | |
| **7th** | **2** | MONOCLONALANT IBODY<br><br>PRODUCTION | What are antibodies **?**<br>-Characters of Monoclonal Antibodies<br>-History of mAb development<br>-Production process<br>-Applications of Monoclonal antibodies | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **8th** | **2** | Hybridoma Technology | 1-Immunization of specific animal which generate hybridoma cell with spleen cell **.**<br>2**.** Screening of Mice for Antibody Production<br>3 **.**Isolation of Antibody producing Spleen cells **.**<br>4 **.**Isolation of myeloma cells **.**<br>5 **.**Fusion between spleen cell and myeloma cell **.**<br>6 **.**Selection of HAT medium **.**<br>7 **.**Isolation of hybridoma cell **.**<br>8 **.**Screening of hybridoma cell**.** | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **9th** | **2** | Vaccine production | Vaccine Production in Cell Culture<br>Types of animal cell substrates<br>Selecting the Strains for Vaccine Production<br>Batch culture<br>Continuous culture<br>Different Vaccines Produced | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **10th** | **2** | CLONING AND SELECTION | Cell cloning<br>-Uses of cloning<br>-Dilution cloning<br>-Stimulation of plating efficiency | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |

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| | | | -Conditions that improve clonal growth<br>-Suspension cloning<br>-Isolation of clones | | |
| **11th** | **2** | 3-D Technology | Introduction<br>**3** - D vs 2D cell culture<br>-Advantages of 3D cell culture<br>-In vitro tumor microenvironment in **3** D system<br>-Mechanism of formation of spheroids | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **12th** | **2** | -- | Seasonal exam | | |
| **13th** | **2** | 3-D Technology of tumor cells | 3D cell culture techniques for tumor models<br>**3** -D in vitro tumor models<br>-commercially available 3D culture<br>-recent development on tumor models<br>-applications of 3D tumor models | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **14th** | **2** | Recombinant Technology<br>) Plasminogen( | PURIFICATION OF NATURAL HUMAN T-PA<br>-MECHANISM OF ACTION OF T-PA<br>-STRUCTURE-FUNCTION RELATIONS IN T-PA<br>-THROMBOLYTIC PROPERTIES OF NATIVE HUMAN T-PA<br>-CLONING AND EXPRESSION OF THE HUMAN T-PA GENE<br>-THROMBOLYTIC PROPERTIES OF RECOMBINANT T-PA | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |
| **15th** | **2** | Tests for genetic diseases | Amniocentesis, a diagnostic technique that enables doctors to remove and culture fetal cells from pregnant women for | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |

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| | | | the early diagnosis of fetal disorders . 2.Examples of early detection of diseases | | |
| **Course Structure: Practical** | | | | | |
| **Week** | **Hour** | **Unit or subject name** | **Required Learning Outcomes** | **Learning method** | **Evaluation method** |
| **1st** | **2** | Equipment's used in Animal cell culture | Equipment required for animalcell culture Cell culture media Cell Culture Environment | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **2nd** | **2** | Culture of animal cells subculturing | -Confluency -Cell viability -Protocol for Passaging or Subculturing -Protocol subculture on adherent cells Protocol subculture of suspension cells | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **3rd** | **2** | Tissue Engineering | Goals of Tissue Engineering Why Tissue Engineering is Important STEPS: TISSUE ENGINEERING | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **4th** | **2** | Cytotoxicity Testing For adherent cells | -Principle Outline of MTT assays Materials Procedure -Plating out cells -Drug addition -Estimation of surviving cell numbers | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **5th** | **2** | Cytotoxicity For suspension cells Testing | Principle Outline of MTT assays Materials Procedure -Plating out cells -Drug addition -Estimation of surviving cell numbers | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **6th** | **2** | Preliminary -Determination of Colony-Forming Efficiency materials and procedure -Isolation of Clonal Populations Using Cloning Rings | Cloning Animal Cells adherent cells | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

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| **7th** | **2** | First exam | | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **8th** | **2** | Cloning Animal Cells For suspension cells | Cloning Procedure with the Limiting -Dilution Assay material and procedure -Semi-solid Media Cloning material and procedure | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **9th** | **2** | Generation of Hybridoma and isolate the Monoclonal Antibodies | Background Information Purification of antigen - Preparation of Immunogen - In-Vivo Immunization of mice - Determination of Antibody | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **10th** | **2** | Isolation the Monoclonal Antibodies | -Preparation of Spleen cells - -Fusion of spleen and myeloma cells - -Selection of hybridoma cells -Hybridoma Molecular Mechanism of Hybridoma selection -Screening of hybridoma supernatant for presence of antibody - -Harvesting of monoclonal antibody- | | |
| **11th** | **2** | Methods for Production of Vaccines | Types of Vaccines -How does vaccine works **?** -Vaccine manufacturing -General method for vaccine production | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |
| **12th** | **2** | Three dimentional cell culture | What is 3D Cell Culture **?** **2**-D vs 3D Cell Cultures **3**-D Cell Culture Techniques | | |
| **13th** | **2** | Three dimensional cell culture | Applications of 3D cell culture | Paper lectures Electronic screen Video lectures via electronic classes | Daily, semester and final exams |

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| **14th** | **2** | Second exam | | Paper lectures<br>Electronic screen<br>Video lectures via electronic classes | Daily, semester and final exams |

| **11. Course Evaluation** | |
|---|---|
| Overall score out of 100<br>(Semester grade = 40, including: 25 for theoretical + 15 for practical)<br>(End-of-semester exam score = 60, including 40 for theory + 20 for practical) | |
| **12. Learning and Teaching Resources** | |
| **Required textbo (curricular books, if any)** | Practical Tissue Culture Applications 1979 |
| **Main references (sources)** | • Culture of animal cells a manual of basic<br>• technique and specialized applications<br>• Sixth Edition 2010<br>Animal Cell Biotechnology 2015 |
| **Recommended books and references (scientific journals, reports...)** | Searching in medical search engines for applications of animal tissue transplantation, such as Google Scholar and PUBMedSearching in medical search engines for applications of animal tissue transplantation, such as Google Scholar and PUBMed |
| **Electronic Referenc Websites** | There are many websites concerned with animal tissue culture applications<br>Including medical websites, YouTube, and scientific research |