University Name: Al-Muthanna University

Faculty/Institute: Sciences

Scientific Department: Biology

Academic or Professional Program Name: PhD. degree in science

Final Certificate Name: PhD. Biology Sciences

Academic System: Semester (courses)

Description Preparation Date: October 2025

File Completion Date: 2026/2/23

Signature:

Head of Department Name:

Bassim Abdullah Jassim

Date:23/2/2026

Signature:

stant Dean for Scientific Affairs

l Graduate Studies

Salah A. Hassan

Date:23/2/2026

The file is checked by:

Department of Quality Assurance and University Performance

Date: 23/2/2026

Signature:

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

2025/2026

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.

1. **Program Vision**
Spreading awareness and knowledge in the fields of life sciences by providing the country with researchers and professors capable of dealing with the latest developments and advancements in the world and contributing to our scientific, health, industrial, environmental and ecological development in solving the problems that are still available.

2. **Program Mission**
Contributing to keeping pace with the rapid scientific developments and breakthroughs taking place in our time by developing our educational and research outputs in accordance with global and regional standards and contributing effectively to putting clear scientific touches in society.

3. **Program Objectives**
1. To study biological sciences comprehensively, including their theoretical, scientific, and applied applications in society. 2. To prepare specialized scientific personnel in the medical, health, agricultural, food processing, and biological fields. 3. To equip students with the scientific techniques for using equipment and instruments applicable to their theoretical and applied studies. 4. To provide students with academic and practical knowledge of biological sciences across their various disciplines and specializations. 5. To supply government institutions and the mixed and private sectors (medical, industrial, and laboratory institutions) with specialized personnel.

6. To research and study new developments in biological sciences, keep abreast of scientific advancements in this field, and integrate them into the curriculum.

7. To provide the job market with numerous graduates who work in various government institutions, such as health, education, environment, electricity, and oil, thus enriching government departments with specialized staff.

8- Pumping the highest competencies from the sons of the governorate into the state departments to contribute to the development of their work, through the introduction of postgraduate studies, doctorate, in addition to PhD studies, which helped to increase the workforce in our university by appointing holders of higher degrees in accordance with the labor market.

4. Program Accreditation

Does the program have program accreditation? And from which agency?

5. Other external influences

Is there a sponsor for the program? Ministry of Higher Education and Scientific Research / Al-Muthanna University / College of Science.

6. Program Structure

Program Structure	Number of Courses	Credit hours	Percentage	Reviews*
Department Requirements / Biology	**2**	**14**	**25%**	

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

7.Program Description		
الساعات المعتمدة practical	Course Code	Year/Level
2	Adv. Histology	PhD. first semester
2	Adv. physiology	PhD. first semester
2	Adv. Aquatic environment	PhD. first semester
2	Advanced microbiology	PhD. first semester
2	Advanced Plant Growth	PhD. first semester
2	Adv. Molecular biology	PhD. first semester
1	Advanced English	PhD. first semester
2	Adv. Bio separation	PhD. first semester
2	Adv. Genetic engineering	PhD. Second semester
2	Bacterial Toxins	PhD. Second semester
2	Advance Histochemistry	PhD. Second semester
2	Plasmids	PhD. Second semester
2	Research Methodology	PhD. Second semester
2	Advanced English	PhD. Second semester
1	Plant tissue culture	PhD. Second semester
2	Endocrine glands	PhD. Second semester

8. Expected learning outcomes of the program

Knowledge

1. **Research & Technical Skills: Independently formulate hypotheses, design experiments, and use advanced laboratory or field techniques.**
2. **Critical Thinking & Analysis: Evaluate primary literature, interpret complex data sets, and apply statistical or computational tools.**
3. **Communication: Produce scholarly, publishable-quality writing and present findings to professional audiences.**
4. **Expertise: Demonstrate deep knowledge in a specific sub-discipline (e.g., molecular biology, ecology).**
5. **Scientific Integrity: Understand and adhere to ethical standards in research and data management**

Skills

Program Skill Objectives

6. **Research & Methodological Skills: Designing and conducting independent research, including hypothesis formulation and applying advanced, specialized techniques (e.g., molecular, field techniques).**

7. **Analytical & Data Skills: Analyzing and interpreting complex datasets using appropriate statistical methods and software.**
8. **Scientific Communication: Writing in scientific journal format and delivering professional oral reports.**
9. **Critical Thinking & Information Literacy: Critically evaluating scientific literature, understanding the limitations of technology, and synthesizing information.**
10. **Professionalism & Collaboration: Working independently or in teams, demonstrating ethical behavior, and understanding the societal impact of biological research.**

Ethics

1. **PhD of Research Ethics: Demonstrating a deep understanding of ethical standards for conducting research, particularly regarding human subjects and animal welfare.**
2. **Scientific Integrity and Responsibility: Recognizing and implementing ethical guidelines in data management, avoiding plagiarism, ensuring reproducibility, and proper authorship.**
3. **Ethical Evaluation of Biology: Critically evaluating the social, environmental, and ethical implications of biotechnological advancements (e.g., genetic engineering, CRISPR).**
4. **Regulatory Compliance: Understanding, adhering to, and navigating legal and regulatory frameworks governing biological research.**
5. **Professionalism and Bioethics: Developing a professional, responsible, and ethical approach to professional conduct, including managing potential conflicts of interest.**
6. **Communication of Ethics: Ability to articulate and justify research decisions based on ethical reasoning to both scientific peers and the public.**

9. Teaching and Learning Strategies

1) Deep understanding and critical thinking

- **Active reading**: Before lectures, skim papers or chapters to identify hypotheses, methods, results, and conclusions. Ask questions like: What was the main question? What methods were used? Do the data support the conclusions?
- **Assimilate, don't memorize**: Focus on understanding mechanisms, pathways, and experimental logic. Create concept maps linking ideas (e.g., signaling pathways, metabolic networks).
- **Ask "why" and "how"**: For every result, explain the rationale of the experiment and predict what would happen if a variable changes.

2) Experimental design and data analysis

- **Learn the workflow**: Formulate a biological question → design a hypothesis-driven experiment → determine controls and variables → plan data collection → outline analysis and interpretation.
- **Statistics literacy**: Ensure comfort with common tests (t-tests, ANOVA, chi-square), confidence intervals, p-values vs. effect sizes, and basic bioinformatics approaches (e.g., differential expression analysis).
- **Reproducibility**: Practice writing methods sections (even for personal notes) so experiments can be replicated.

3) Literature PhD

- **Paper triage**: Learn to quickly assess a paper's significance, novelty, and methodological soundness.
- **Critical appraisal checklist**: Sample size adequacy, controls, potential biases, alternative explanations, and limitations.
- **Summarize succinctly**: Write a 1-page synthesis that includes the question, approach, key results, and implications.

4) Laboratory and field skills

- **Hands-on practice**: Prioritize PhD cores techniques relevant to your field (e.g., molecular biology workflows, imaging, chromatography, computational pipelines).
- **Protocol optimization**: When a protocol fails, document variables, troubleshoot systematically, and iterate.
- **Safety and ethics**: Stay current with safety regulations and ethical considerations for animal/human-derived samples, environmental impacts, and data privacy.

5) Data literacy and computation

- **Programming fundamentals**: Python or R for data analysis; version control with Git.
- **Bioinformatics pipelines**: Learn how to process sequencing data, align reads, perform quality control, and interpret results.
- **Visualization**: Create clear, informative figures that tell a story (think about axes, scales, legends, and statistical annotations).

6) Time management and productivity

- **Structured study blocks**: Use focused sessions (e.g., 25–50 minutes) with short breaks; apply the two-pass approach for literature review.
- **Prioritize tasks**: Use a dashboard (projects, experiments, papers) and weekly goals.
- **Mindful reflection**: Regularly review what you learned, what remains unclear, and adjust plans accordingly.

7) Communication and presentation

- **Storytelling in science**: Build a narrative from question to method to result to implication.
- **Improved writing**: Practice concise, precise writing; maintain a consistent structure (Introduction, Methods, Results, Discussion).
- **Presentations**: Tailor depth to the audience; practice with a time limit; anticipate questions and prepare concise answers.

8) Collaboration and mentorship

- **Peer learning**: Form study groups to discuss papers, critique experiments, and share code/scripts.

- **Seek mentorship**: Regular meetings with supervisors to align on milestones and receive feedback.
- **Ethical collaboration**: Define roles, credit contributions, and manage data sharing transparently.

10.Evaluation methods

1) Examinations

- **Formats:** Midterm/final written exams, open-book vs. closed-book, data interpretation, case-based questions.
- **What they assess:** Core knowledge, problem-solving, data literacy, and the ability to apply concepts to new scenarios.
- **Strengths:** Standardized, scalable; good for comparing across cohorts.
- **Pitfalls:** May underrepresent experimental design, collaboration, or reproducibility skills; stress impact.

2) Coursework assignments

- **Formats:** Problem sets, data analyses/replication of analyses, literature reviews, critical essays, protocol design exercises.
- **What they assess:** Technical proficiency, analytical thinking, synthesis of literature, and planning abilities.
- **Strengths:** Encourages practical skills and reproducible thinking.
- **Pitfalls:** Grading consistency; rubric clarity is essential.

3) Presentations and scientific communication

- **Formats:** Oral talks, poster sessions, grant pitches, written reports/manuscripts.
- **What they assess:** Data storytelling, clarity, audience adaptation, and Q&A performance.
- **Strengths:** Key professional skill; observable through performance.
- **Pitfalls:** Q&A can be subjective; require clear rubrics and practice time.

4) Journal clubs and seminars

- **Formats:** Critical appraisal of papers; lead discussions; brief write-ups.
- **What they assess:** Critical thinking, evaluation of methods/statistics, and ability to communicate critique.
- **Strengths:** Fosters a culture of rigorous analysis.
- **Pitfalls:** Uneven participation; ensure rotation and clear expectations.

5) Biostatistics and data analysis assessment

- **Formats:** Short tests, hands-on data tasks, interpretation questions, or take-home analyses.
- **What they assess:** Statistical reasoning, proper method selection, interpretation of results, and awareness of assumptions.
- **Strengths:** Directly relevant to research integrity and conclusions.
- **Pitfalls:** Requires foundational training; consider offering formula sheets or calculators.

Professional Development

Mentoring new faculty members

Briefly describe the process used to orient new, visiting, full-time, and part-time faculty members at the institutional and departmental levels. Workshops and Training Courses: Courses are organized on modern teaching methods, classroom management, and the use of educational technologies. Participation in Academic Seminars: New faculty members are encouraged to attend conferences and seminars to expand their knowledge and build academic networks.
Evaluation and Feedback: Regularly provide constructive feedback to improve academic performance. Promoting Academic Research and Publication: Supporting new faculty members in preparing and publishing their research and participating in research teams within the department or college. Participation in Committees: New faculty members are provided the opportunity to participate in departmental committees to enhance their understanding of administrative and academic systems.

Professional development of faculty members

Personal development is planned through reviewing modern scientific resources and participating in training courses both inside and outside the country in the field of scientific specialization. The Scientific Department pays special attention to the continuous professional development of faculty members, with the aim of enhancing their teaching and research competencies and keeping pace with academic developments. This includes:

• Organizing advanced workshops and training courses in teaching methods, student assessment, and the use of modern educational technology.

• Encouraging scientific research and academic publishing by supporting participation in conferences, scientific journals, and joint research projects.

• Participating in quality and academic accreditation programs to raise awareness of educational standards and develop institutional performance.

• Academic exchange and cooperation with other universities, both internally and externally, to exchange experiences and expand horizons of knowledge.

• Contributing to the development of curricula and courses to keep pace with scientific developments and labor market needs.

• Self-evaluation and continuous feedback to identify strengths and opportunities for improvement in academic performance.

• Encouraging the use of innovative teaching methods such as active learning and project-based learning.

2. Acceptance Criterion

Central: The program follows the central admission regulations set by the ministry

3. The most important sources of information about the program

1- Student Guide for Admission issued by the Ministry of Higher Education and Scientific Research.
2- • Student Guide issued by the College of Science, Al-Muthanna University (Quality Assurance Division)
3- • Student Guide issued by the Department of Biology.

4. Program Development Plan

1- The plan aims to improve the quality of teaching and learning and update programs to keep pace with scientific developments and the labor market. This can be achieved through:
2- • Periodically reviewing and updating curricula to ensure they are aligned with modern academic standards.
3- • Aligning learning outcomes with labor market requirements and focusing on practical aspects through the recommendations of the annual employers' conference.
4- • Enhancing practical and applied training within and outside the college in cooperation with labor market institutions.
5- • Introducing modern courses related to sustainable development, such as green chemistry, to support scientific research, critical thinking, and analytical skills.
6- • Using modern educational technologies, activating e-learning and interactive courses, and achieving a 20% completion rate for digital courses.
7- • Through graduation projects and scientific activities, selecting ideas and projects to solve societal problems.
8- • Developing the research and scientific capabilities of faculty members through specialized training workshops.

Program Skills Plan

Learning outcomes required from the program												
Values			Skills			Knowledge					Course Name	Year/Level
ق2	ق1	م4	م3	م2	م1	ع5	ع4	ع3	ع2	ع1		
#			#		#			#		#	Adv. Histology	PhD. first semester
#	#	#	#	#		#	#		#		Adv. physiology	PhD. first semester
#			#		#			#		#	Adv. Aquatic environment	PhD. first semester
#	#	#	#	#		#	#		#		Advanced microbiology	PhD. first semester
#	#	#	#	#		#	#		#		Advanced Plant Growth	PhD. first semester
#			#		#			#		#	Adv. Molecular biology	PhD. first semester
#			#		#			#		#	Advanced English	PhD. first semester
#	#	#	#	#		#	#		#		Adv. Bio separation	PhD. first semester
#			#		#			#		#	Adv. Genetic engineering	PhD. first semester
#	#	#	#	#		#	#		#		Bacterial Toxins	PhD. first semester
#			#		#			#		#	Advance Histochemistry	PhD. first semester
#	#	#	#	#		#	#		#		Plasmids	PhD. first semester
#			#		#			#		#	Research Methodology	PhD. first semester
#	#	#	#	#		#	#		#		Advanced English	PhD. first semester
#			#		#			#		#	Plant tissue culture	PhD. first semester
#	#	#	#	#		#	#		#		Endocrine glands	PhD. first semester

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

Course Description Form

1. Course Name: **Algology**

2. Course Code:

3. Semester / Year: Second Semester

4. Description Preparation Date: 16-2-2026

5. Available Attendance Forms:

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

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

Name: Prof. Dr. Ibtehal Aqeel Abdulmuneem
Email: ibtihalaqq@mu.edu.iq

8. Course Objectives

Course Objective	• **This course covers the most important types of algae, their general characteristics and methods of identification, as well as their methods of reproduction and life cycles. The course also includes an introduction to the food products they produce and their environmental and economic importance.**

9. Teaching and Learning Strategies

Strateg	• **Active Participation and Interaction: Engage students in discussions and interactive lectures to deepen understanding.** • **Hands-on Laboratory Sessions: Facilitate practical experiments to apply theoretical knowledge.** • **Case Studies and Practical Workshops: Provide real-world scenarios to enhance problem-solving skills.** • **Communication Skills Training: Develop written and oral communication skills for scientific contexts.** • **Integration of General and Transferable Skills: Incorporate critical thinking, problem-solving, and research skills into the curriculum.** • **Ethical Considerations: Discuss ethical issues related to genetic research and engineering.** • **Staying Updated with Research: Encourage students to read scientific journals and participate in research activities.** • **Collaboration and Teamwork: Promote group projects and teamwork to simulate scientific collaboration.**

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	What algae and phcology	Definition,general charecters,similarity with fungi and bryophyte, differentiation with fungi and bryophyta	Lecture and Discussion	Quiz
2	2	Classification of algae	Algal nomenclature,basis of algal classification	Laboratory Session	Report

3	2	Algal occurance	Aquatic algae, fresh water form, marine algae, plankton	Practical Workshop	Report
4	2	Cytology of algae	Prokaryotic cell , eukaryotic cell, cell wall, cytoplasm, organels	Lecture and Discussion	Mid-term Exam
5	2	Range of thallus structure	The range of morphology, unicellular motile form, multicellular	Laboratory Session	Report
6	2	Reproduction in algae	Vegetative reproduction , sexual reproduction, asexual reproduction	Lecture and Discussion	Quiz
7	2	Orgin and evolution of sex in algae	Sex , sexual and asexual unit reproduction, origin of sexual and asexual unit	Practical Workshop	Assignment
8	2	Life cycle in algae	Haploid, diploid life cycle, altarnation of generation	Laboratory Session	Report
9	2	exam	*Bordetella pertussis*	Lecture and Discussion	Quiz
10		Inorganic nutriant	Nutrient require by algae, vitamin and growth factor		Mid-term Exam
11	2	Nitrogen fixation in algae	What is nitrogen fixation ,properties and activity of nitroginase	Practical Workshop	
12	2	Movement in algae	Type of movement	Lecture and Discussion	Quiz
13	2	Ecology of algae	Habitate, communities, succession, primary production	Laboratory Session	Report

11. Course Evaluation
Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, dailyoral, monthly, or written exams, reports .... etc

12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	
Main references (sources)	**1-Robert Edward Lee.,fifth edition 2018** **2-O P Sharma., 2011**
Recommended books and references (scientific journals, reports...)	Scientific journals on algology
Electronic References, Websites	• PubMed

Course Description Form

1. Course Name: **Methodology**

2. Course Code:

3. Semester / Year: First Semester

4. Description Preparation Date: 1-9-2025

5. Available Attendance Forms:

6. Number of Credit Hours (Total) / Number of Units (Total):
   2

7. Course administrator's name (mention all, if more than one name)
   Name: Prof. Dr. Faiq H. Ali
   Email: faiq_Alradi73@mu.edu.iq

8. Course Objectives

Course Objective	• **Explain the basic principles of scientific research** • **Explaining the using the equipments in experments** • **As well as clarifying the methods to extraction** • **As well as knowing the chemical solvent** • **As well as knowing the active compounds**

9. Teaching and Learning Strategies

Strateg	• **Active Participation and Interaction: Engage students in discussions and interactive lectures to deepen understanding.** • **Hands-on Laboratory Sessions: Facilitate practical experiments to apply theoretical knowledge.** • **Case Studies and Practical Workshops: Provide real-world scenarios to enhance problem-solving skills.** • **Communication Skills Training: Develop written and oral communication skills for scientific contexts.** • **Integration of General and Transferable Skills: Incorporate critical thinking, problem-solving, and research skills into the curriculum.** • **Ethical Considerations: Discuss ethical issues related to genetic research and engineering.** • **Staying Updated with Research: Encourage students to read scientific journals and participate in research activities.** • **Collaboration and Teamwork: Promote group projects and teamwork to simulate scientific collaboration.**

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Developing the skills to write up your own research	Introduction: How to Use Th is Book	Lecture and Discussion	Quiz
2	2	• Structure Grammar and Writing Skills Tense pairs Signalling language Passive/Active	How to Write an Introduction	Quiz	Report

3	2	• Vocabulary for the Introduction	Vocabulary	Practical Workshop	Report
4	2	• Structure • Grammar and Writing Skills	Writing about Methodology	Lecture and Discussion	Mid-term Exam
5	2	• Building a model • Th e model • Testing the model	Writing Task: Build a Model	Laboratory Session	Report
6	2	• Sequence • Frequency • Quantity	Writing about Result	Lecture and Discussion	Quiz
7	2	• Building a model • Testing the mode	Writing Task: Build a Model	Practical Workshop	Assignment
8	2	• Grammar and Writing Skills • Writing Task: Build a Model	Writing the Discussion	Laboratory Session	Report
9	2	• (Vocabulary task • Testing the model	Conclusion	Lecture and Discussion	Quiz
10	2	• Structure • Verb tense	Writing the Abstract	Lecture	Assignment
11	2	• Building a model • Testing the models	Writing Task: Build a Model	Lecture	Mid-term Exam
12	2	• Vocabulary for the Abstract	Writing an Abstract	Lecture and Discussion	Quiz
13	2	• Building a model	Creating a Title	Lecture and discussion	Report

11. Course Evaluation	
Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, dailyoral, monthly, or written exams, reports .... etc	
12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	
Main references (sources)	• Scientific research writing
Recommended books and references (scientific journals, reports...)	Scientific journals of researches
Electronic References, Websites	•

Course Description Form

1. Course Name: **Medicinal plants**

2. Course Code:

3. Semester / Year:First Semester

4. Description Preparation Date: 1-9-2025

5. Available Attendance Forms:

6. Number of Credit Hours (Total) / Number of Units (Total):
   4/3

7. Course administrator's name (mention all, if more than one name)
   Name: Prof. Dr. Faiq H. Ali
   Email: faiq_Alradi73@mu.edu.iq

8. Course Objectives

Course Objectiv	• **Explain the basic principles of ancient medicinal plants** • **Explaining the using the old as treatment** • **As well as clarifying the methods to extraction** • **As well as knowing the chemical solvent** • **As well as knowing the active compounds**

9. Teaching and Learning Strategies

Strateg	• **Active Participation and Interaction: Engage students in discussions and interactive lectures to deepen** • **understanding.** • **Hands-on Laboratory Sessions: Facilitate practical experiments to apply theoretical knowledge.** • **Case Studies and Practical Workshops: Provide real-world scenarios to enhance problem-solving skills.** • **Communication Skills Training: Develop written and oral communication skills for scientific contexts.** • **Integration of General and Transferable Skills: Incorporate critical thinking, problem-solving, and research skills** • **into the curriculum.** • **Ethical Considerations: Discuss ethical issues related to genetic research and engineering.** • **Staying Updated with Research: Encourage students to read scientific journals and participate in research activities.** • **Collaboration and Teamwork: Promote group projects and teamwork to simulate scientific collaboration.**

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Propaganda about Medicinal plants	MEDICINAL PLANTS OF THE WORLD	Lecture and Discussion	Quiz
2	2	Parts of up taking of medicinal plants • Root and stem and leaf • Bulbs and rizomes	PLANT PARTS USED	Quiz	Report

3	2	• Monopreparations • Mixtures • Extracts • Medicinal spirits or medicinal essences	DOSAGE FORMS	Practical Workshop	Report
4	2	• Route of administration • Phytotherapy •	USE OF MEDICINAL PLANT PRODUCTS	Lecture and Discussion	Mid-term Exam
5	2	• Qualitycontrol • Pharmacognosy • Purity • Standardisation of phytomedicine	QUALITY AND SAFETY	Laboratory Session	Report
6	2	• Traditional use • Pharmacological studies	EFFICACY OF MEDICINAL PLANT PRODUCTS	Lecture and Discussion	Quiz
7	2	Light Reaction • Split of water molecule • Reduction of ATP and NADPH	REGULATION OF HERBAL REMEDIES AND PHYTOMEDICINES	Practical Workshop	Assignment
8	2	• Abies alba • Achillea millefolium • Aconitum napellus	THE PLANTS IN ALPHABETICAL ORDER	Laboratory Session	Report
9	2	• (DSHEA) • (HMPC)	REGULATION OF HERBAL REMEDIES AND PHYTOMEDICINES	Lecture and Discussion	Quiz
10	2	• symptomatic treatmen • isolated single substance • complex combinations	HEALTH DISORDERS AND MEDICINAL PLANTS:	Lecture	Assignment
11	2	Flavonoids	Active compounds	Lecture	Mid-term Exam
12	2	• Tatinins	Active compounds	Lecture and Discussion	Quiz
13	2	• Glycosides	Active compounds	Lecture and discussion	Report

11. Course Evaluation	
Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, dailyoral, monthly, or written exams, reports .... etc	
12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	
Main references (sources)	• MEDICINAL PLANTS OF THE WORLD

	• Modern Phytomedicine Edited by Iqbal Ahmad, Farrukh Aqil, and Mohammad Owais
Recommended books and references (scientific journals, reports...)	Scientific journals of Medicinal plants
Electronic References, Websites	• Plant web • Botany science website

Course Description Form

1. Course Name:Plasmids
2. Course Code:
3. Semester / Year: second /2026
4. Description Preparation Date:19−1−2026
5. Available Attendance Forms:
6. Number of Credit Hours (Total) / Number of Units (Total)
7. Course administrator's name (mention all, if more than one name)
Name: Asst Prof. Dr. YasirAdilJabba Alabdali Email:yasir.alabdali@mu.edu.iq
8. Course Objectives

Course Objectives	• Provide a thorough understanding of plasmid structure, classification, and their role as extrachromosomal genetic elements in bacteria. • Equip students with practical skills in plasmid DNA extraction, purification, detection, and electrophoretic analysis. • Explore the mechanisms of plasmid replication and copy number control, including ColE1-type and rolling-circle replication. • Understand transcription and regulation of plasmid genes, including promoters, ribosome binding sites, repressors, and antisense RNA control. • Investigate plasmid-mediated horizontal gene transfer such as conjugation and mobilization and its impact on bacterial adaptation and antibiotic resistance. • Introduce molecular manipulation of plasmids including restriction digestion, ligation, cloning, and plasmid mapping. • Apply PCR techniques in plasmid construction, verification, and insert confirmation. • Study recombinant protein expression systems using plasmid vectors and inducible promoters. • Analyze plasmid stability, mutation effects, and their applications in bacterial genetics and genomics. • Introduce advanced plasmid technologies and their applications in biotechnology and molecular research.

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9. Teaching and Learning Strategies

Strategy	Active Participation and Interaction: Engage students in discussions and interactive lectures to deepen understanding. Hands-on Laboratory Sessions: Facilitate practical experiments to apply theoretical knowledge. Case Studies and Practical Workshops: Provide real-world scenarios to enhance problem-solving skills. Communication Skills Training: Develop written and oral communication skills for scientific contexts. Integration of General and Transferable Skills: Incorporate critical thinking, problem-solving, and research skills into the curriculum. Ethical Considerations: Discuss ethical issues related to genetic research and engineering. Staying Updated with Research: Encourage students to read scientific journals and participate in research activities. Collaboration and Teamwork: Promote group projects and teamwork to simulate scientific collaboration.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Genes, genomes, and plasmids in bacteria	Accessory genome, replicons	Lecture and Discussion	Quiz
2	2	Structural properties of plasmids	Topology, copy number, supercoiling	Laboratory Session	Lab Report
3	2	Plasmid DNA extraction and purification methods	Alkaline lysis, detection, electrophoresis	Practical Workshop	Lab Report
4	2	Plasmid replication and copy number control	ColE1, rolling-circle, iterons	Lecture and Discussion	Mid-term Exam
5	2	Transcription and expression of plasmid genes	Promoters, RBS, gene expression	Laboratory Session	Lab Report
6	2	Regulation of plasmid	Antisense RNA, repressors	Lecture and Discussion	Quiz

		transcription			
7	2	Mobile DNA and plasmid transfer	Conjugation, mobilization	Practical Workshop	Assignment
8	2	Manipulation of plasmid DNA	Restriction, ligation, mapping	Laboratory Session	Lab Report
9	2	Gene cloning using plasmid vectors	Transformation, selection, screening	Lecture and Discussion	Quiz
10	2	PCR in plasmid construction and verification	Insert amplification & confirmation	Lecture and Case Study	Assignment
11	2	Recombinant protein expression systems	Inducible promoters, tags	Practical Workshop	Mid-term Exam
12	2	Plasmids in bacterial genetics and mutations	Stability, resistance, mutation analysis	Lecture and Discussion	Quiz
13	2	Plasmids in genomics and sequencing	Vector-based sequencing, libraries	Laboratory Session	Lab Report
14	2	Advanced plasmid technologies	Gibson Assembly, BACTH system	Lecture and Discussion	Assignment
15	2	Integrated applications & research design	Experimental planning using plasmids	Lecture and Case Study	Final Exam

11. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, dailyoral, monthly, or written exams, reports .... etc

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Molecular Genetics of Bacteria" by Larry Snyder and Wendy Champness
Main references (sources)	Molecular Genetics of Bacteria (2004) 4 &5th Edition, University of Surrey, UK. John Wiley & Sons Ltd,
Recommended books and references (scientific journals, reports…)	Brooker, Robert J. Genetics : analysis & principles / Robert J. Brooker. — 4th ed. Molecular Biology 1 and 2nd Edition by David P. Clark Fundamental Molecular Biology by Allison, Lizabeth.
Electronic References, Websites	• National Center for Biotechnology Information (NCBI) • PubMed • Microbiology Society website

Course Description Form

1. Course Name: **Bacterial toxins**

2. Course Code:

3. Semester / Year: Second Semester

4. Description Preparation Date: 14−2−2026

5. Available Attendance Forms:

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

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

Name: Prof. Dr. Noor Sami Aboud
Email: drnoor_s78@mu.edu.iq

8. Course Objectives

Course Objective

- **-The course examines major classes of toxins produced by clinically significant bacteria, including exotoxins and endotoxi well as their interactions with host cells and immune responses.**
- **-current research on toxin-mediated diseases, toxin gene regulation, secretion systems, and host-pathogen interactions.**
- **-The course also covers the application of bacterial toxins in biotechnology and medicine, such as vaccine develop antitoxin therapies, and toxin-based drug delivery systems.**

9. Teaching and Learning Strategies

Strateg

- **Active Participation and Interaction: Engage students in discussions and interactive lectures to deepen understanding.**
- **Hands-on Laboratory Sessions: Facilitate practical experiments to apply theoretical knowledge.**
- **Case Studies and Practical Workshops: Provide real-world scenarios to enhance problem-solving skills.**
- **Communication Skills Training: Develop written and oral communication skills for scientific contexts.**
- **Integration of General and Transferable Skills: Incorporate critical thinking, problem-solving, and research skills into the curriculum.**
- **Ethical Considerations: Discuss ethical issues related to genetic research and engineering.**
- **Staying Updated with Research: Encourage students to read scientific journals and participate in research activities.**
- **Collaboration and Teamwork: Promote group projects and teamwork to simulate scientific collaboration.**

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Chemical Nature of Endotoxin Immune Response of bacterial endotoxins	Bacterial Endotoxins	Lecture and Discussion	Quiz
2	2	Nomenclature of Toxins Toxins with Enzymatic Activity Attachment and Entry of Toxins	Bacterial Exotoxins	Laboratory Session	Report

3	2	-Botulinum Toxin, Structure, Mechanism of BoNTS and Host Defenses Tetanus neurotoxin , Structure, Mechanism of TeNT and Host Defenses	Neurotoxins	Practical Workshop	Report
4	2	*Clostridium difficile, Yersinia enterocolitica, Bacillus* Structure, Mechanism of toxin and Host Defenses	Enterotoxin	Lecture and Discussion	Mid-term Exam
5	2	*Staphylococcus, streptococcus* Structure, Mechanism of toxin and Host Defenses	Pore-forming toxins and Hemolysin	Laboratory Session	Report
6	2		Discussions	Lecture and Discussion	Quiz
7	2	Structure, Mechanism of toxin and Host Defenses	Types of bacteria that secrete toxins *Vibrio Cholerae*	Practical Workshop	Assignment
8	2	Structure, Mechanism of toxin and Host Defenses	*Corynebacterium diphtheriae*	Laboratory Session	Report
9	2	Structure, Mechanism of toxin and Host Defenses	*Bordetella pertussis*	Lecture and Discussion	Quiz
10			Exam		Mid-term Exam
11	2	Structure, Mechanism of toxin and Host Defenses	*E.coli*	Practical Workshop	
12	2	Structure, Mechanism of toxin and Host Defenses	*Salmonella* *Shigella*	Lecture and Discussion	Quiz
13	2	Structure, Mechanism of toxin and Host Defenses	*Listeria* *Campylobacter*	Laboratory Session	Report

11. Course Evaluation	
Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, dailyoral, monthly, or written exams, reports .... etc	
12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	
Main references (sources)	1- Medical Microbiology: Jawetz, Melnick & Adelberg's (2013). 2- Medical Microbiology & Immunology: Warren Levinson (2012). 3- Microbiology and Immunology ,Subhash Chandra Parija,2012 4- Bacterial Toxins *Edited by Klaus Aktories*. WILEY-VCH Verlag GmbH & Co. KGaA,Weinheim. 2002
Recommended books and references (scientific journals, reports...)	Scientific journals on bacterial toxin
Electronic References, Websites	• PubMed

Course Description Form

Course Name: **Advanced Molecular Biology**

1. Course Code :

2. Semester / Year : Semester

4. Description Preparation Date: 20/10/2026

5. Available Attendance Forms:

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

30/2

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

nhidaee@mu.edu.iq Prof. Dr. Nihad A.M. Al-Rashedi

8.Course Objectives

The objective of the Advanced Molecular Biology course is to provide postgraduate students with a comprehensive understanding of advanced and update topics in molecular genetics, including molecular mechanism, analysis, applications, and bioinformatics.

9. Teaching and Learning Strategies

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10. Course Structure

Evaluation method	Learning method	Unit or subject name	Hours	Week
Test	Lecture and Discussion	Foundations and Frontiers	2	**1st**
Report	Laboratory Session	CRISPR/Cas : Screening and analysis	2	**2nd**
Report	Practical Workshop	CRISPR/Cas: Gene editing	2	**3rd**
Assignment	Lecture and Discussion	Molecular Genetics of Stem Cells I	2	**4th**
Report	Laboratory Session	Molecular Genetics of Stem Cells I I	2	**5th**
Test	Laboratory Session	Epigenetics	2	**6th**

Assignment	Lecture and Discussion	Exam	2	**7th**
Report	Practical Workshop	RNA analysis I	2	**8th**
Test	Laboratory Session	RNA analysis : MicroRNA I I	2	**9th**
Midterm Test		Gene expression regulation: Factors and Mechanisms	2	**10th**
Test	Lecture and Discussion	Genetic linkage analysis LOD score	2	**11th**
Report	Lecture and Case Study	Human Genome project, Hap Map Project, Haplotypes	2	**12th**
Report	Practical Workshop	Mitochnondrial genomics	2	**13th**
Report	Lecture and Discussion	Cell free DNA	2	**14th**
Test	Lecture and Case Study	Discussion of Silent Genetic diseases	2	**15th**

11. Course Evaluation

Final exam / 70
Mid-semester exam / 25
Quizzes / 5

12. Learning and Teaching Resources

Required textbooks	
Main references (sources)	TOM STRACHAN AND ANDREW READ. HUMAN MOLECULAR GENETICS 4 the edition, Garland Science, Taylor & .Francis Group, LLC, UK Richard Twyman. Advanced Molecular Biology,1st Edition, 2018; Garland Science
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	

Head of Dep. Lecturer


وزارة التعليم العالي و البحث العلمي
Ministry of Higher Education and Scientific Research
كلية التربية الاساسية - جامعة المثنى
EST.2011-2012
Muthanna University

Course Description Form

Course Name: Advanced Microbiology

1. Course Code :

2. Semester / Year : Semester

4. Description Preparation Date: 20/10/2026

5. Available Attendance Forms:

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

30/2

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

drnoor_s78@mu.edu.iq Prof. Dr.Noor Sami Aboud

8.Course Objectives

- Provide the student with sufficient information to gain experience in dealing with life sciences and laboratory technologies

• acquirment student to experience in knowing all laboratory equipment and modern technologies

• Providing the student with sufficient information to keep up with and study the modern sciences

• To familiarize students with the use of modern methods in the treatment, prevention, and vaccination against diseases caused by microorganisms.

9. Teaching and Learning Strategies

• Active Participation and Interaction: Engaging students in discussions and interactive lectures to deepen understanding.

• Practical Lab Sessions: Facilitating practical experiments to apply theoretical knowledge.

• Case Studies and Practical Workshops: Presenting real-world scenarios to enhance problem-solving skills.

• Communication Skills Training: Developing written and oral communication skills for scientific contexts.

• Integrating General and Transferable Skills: Integrating critical thinking and problem-solving skills, research into methodology.

• Ethical considerations: Discuss ethical issues related to research and genetic engineering.

• Staying informed about research: Encourage students to read scientific journals and participate in research activities.

• Collaboration and teamwork: Promote group projects and teamwork to simulate scientific collaboration.

10. Course Structure

Evaluation method	Learning method	Unit or subject name	Hours	Week
Test	Lecture and Discussion	Immune response to extracellular bacteria	2	**1st**
Report	Laboratory Session	Immune Responses to Intracellular Bacteria	2	**2nd**
Report	Practical Workshop	Immunity to Viruses	2	**3rd**
Assignment	Lecture and Discussion	Immunity to Fungi	2	**4th**
Report	Laboratory Session	Gram positive rods *Listeria monocytogenes, Corynebacterium diphtheriae*	2	**5th**
Test	Laboratory Session	Gram negative *Bordetella, Nesseria*	2	**6th**
Assignment	Lecture and Discussion	Bactria which difficult to gram stain *Chlamydia, Rickettsia, Mycobacterium*	2	**7th**
Report	Practical Workshop	Spore-forming bacteria *Clostridia, Bacillus anthracis*	2	**8th**
Test	Laboratory Session	*Mycoplasmas, Treponema*	2	**9th**
Midterm Test		Examination	2	**10th**
Test	Lecture and Discussion	Neurotropic Viral Infections	2	**11th**
Report	Lecture and Case Study	Human Cancer Viruses	2	**12th**
Report	Practical Workshop	Viral Hemorrhagic Fevers	2	**13th**
Report	Lecture and Discussion	Viral respiratory infection	2	**14th**

Test	Lecture and Case Study	Viral hepatitis infection	2	**15th**

11. Course Evaluation
Final exam / 70 Mid-semester exam / 25 Quizzes / 5

12. Learning and Teaching Resources	
Required textbooks	
Main references (sources)	1-Levison, W., 2014. Revew of Medical Microbiology and Immunology. McGraw-Hill Education 2- Lippincott's Illustrated Reviews:Immunology. Williams & Wilkins.2013 3- Microbiology and Immunology. Hawley Louise B., Richard J. Ziegler, Benjamin Clarke. Sixth Edition. (2014). Philadelphia: Wolters Kluwer/Lippincott Williams & Wilkins 4- Virology Principles & Applications : Joen B. Carter & Venetia A. Saunders (2007). 5- Principles of Virology.Jane Flint. Fifth Edition. (2020).
Recommended books and references (scientific journals, reports...)	**Scientific journals specializing in microbiology**
Electronic References, Websites	PubMed Microbiology Society website

Head of Dep.

Lecturer

Prof. Dr.Noor Sami Aboud

Course Description Form

1. Course Name: **Adv.Animal physiology**

2. Course Code:

3. Semester / Year: first Semester

4. Description Preparation Date: 17−2−2026

5. Available Attendance Forms:

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

2

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

Name: Prof. Dr. Wafaa Abdulmutalib Naji
Email: wafaabdu@mu.edu.iq

8. Course Objectives

Course Objectiv	• **This course aims to develop an understanding of physiology by exploring their characteristics, defining them, and classifying them.** • **It also aims to prepare and qualify students to prepare glass slides.** • **Furthermore, it aims to develop and encourage scientific research.** • **The course also aims to provide all students with a comprehensive education in the fundamental aspects during the first year and to equip them with a higher level of knowledge and understanding of their chosen subject in the second year.**

9. Teaching and Learning Strategies

Strate	• **The student actively participates during the lecture.** • • **2. The student listens attentively to the explanation.** • • **3. The student actively participates in extracurricular activities.** • • **4. The student learns professional conduct.** • • **5. General and transferable skills (other skills relevant to employment and personal development).** • • **6. The student is equipped to succeed in job interviews and the job market.** • • **7. The student is empowered to pursue professional development after graduation..**

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Introduction	Introduction	Lecture and Discussion	Quiz

2	2	Integumentary system	Integumentary system	Quiz	Report
3	2	Nervous system	Nervous system	Lecture and Discussion	Report
4	2	Muscular system	Muscular system	Quiz	Mid-term Exam
5	2	Digestive system	Digestive system	Laboratory Session	Quiz
6	2	Cardiovascular system	Cardiovascular system	Lecture and Discussion	Report
7	2	Respiratory system	Respiratory system	Lecture and Discussion	Report
8	2	Excretory system	Excretory system	Quiz	Mid-term Exam
9	2	Male reproductive system	Male reproductive system	Quiz	Quiz
10	2	Female reproductive system	Female reproductive system	Discussion	Quiz
11	2	Exam	Exam	Lecture and Discussion	Quiz
12	2	Endocrine system	Endocrine system	Quiz	Mid-term Exam

11. Course Evaluation
Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation dailyoral, monthly, or written exams, reports .... etc

12. Learning and Teaching Resources	
Required textbooks (curricular boo if any)	
Main references (sources)	Stanle of Animal physiology
Recommended books and references (scientific journals, reports...)	Scientific journals on Animal physiology
Electronic References, Websites	

Course Description Form

1. Course Name: **Endocrine**

2. Course Code:

3. Semester / Year: first Semester

4. Description Preparation Date: 17−2−2026

5. Available Attendance Forms:

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

2

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

Name: Prof. Dr. Wafaa Abdulmutalib Naji
Email: wafaabdu@mu.edu.iq

8. Course Objectives

Course Objectiv	• **This course aims to develop an understanding of physiology by exploring their characteristics, defining them, and classifying them.** • **It also aims to prepare and qualify students to prepare glass slides.** • **Furthermore, it aims to develop and encourage scientific research.** • **The course also aims to provide all students with a comprehensive education in the fundamental aspects during the first year and to equip them with a higher level of knowledge and understanding of their chosen subject in the second year.**

9. Teaching and Learning Strategies

Strate	• **The student actively participates during the lecture.** • **2. The student listens attentively to the explanation.** • **3. The student actively participates in extracurricular activities.** • **4. The student learns professional conduct.** • **5. General and transferable skills (other skills relevant to employment and personal development).** • **6. The student is equipped to succeed in job interviews and the job market.** • **7. The student is empowered to pursue professional development after graduation..**

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Introduction	Introduction	Lecture and	Quiz

				Discussion	
2	2	Integumentary system	Integumentary system	Quiz	Report
3	2	Nervous system	Nervous system	Lecture and Discussion	Report
4	2	Muscular system	Muscular system	Quiz	Mid-term Exam
5	2	Digestive system	Digestive system	Laboratory Session	Quiz
6	2	Cardiovascular system	Cardiovascular system	Lecture and Discussion	Report
7	2	Respiratory system	Respiratory system	Lecture and Discussion	Report
8	2	Excretory system	Excretory system	Quiz	Mid-term Exam
9	2	Male reproductive system	Male reproductive system	Quiz	Quiz
10	2	Female reproductive system	Female reproductive system	Discussion	Quiz
11	2	Exam	Exam	Lecture and Discussion	Quiz
12	2	Endocrine system	Endocrine system	Quiz	Mid-term Exam

11. Course Evaluation
Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation dailyoral, monthly, or written exams, reports .... etc

12. Learning and Teaching Resources	
Required textbooks (curricular boc if any)	
Main references (sources)	Essentials in Endocrinology
Recommended books and references (scientific journals, reports...)	Hormones
Electronic References, Websites	

Course Description Form

1. Course Name: Histopathology
2. Course Code :

3. Semester / Year 2/ 2026
4. Description Preparation Date: 15.2.2026
5. Available Attendance Forms:
6. Number of Credit Hours (Total) / Number of Units (Total)

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

Prof. Dr. Bassim Abdullah Jassim

8. Course Objectives

Learning principles of Histopathology

9. Teaching and Learning Strategies

Using lectures and discussion

10. Course Structure

Evaluation method	Learning method	Unit or subject name	Required Learning Outcomes	Hours	Week
Short exam and MCQ	e-learning and discussion	**Histopathological technique** **Terms of histopathology** **Cell injury** **Inflammation and necrosis** **Histopath of cargiovasscular system** **Histopathological conditions of digestive system** **Histopathological conditions of respiratory system** **Histopathological conditions of urinary system** **Histopathology of lung** **Histopathological conditions of**		2h per week	15 week

		bronchial tree			
		Histopathological conditions of lymphoid tissue			
		Histopathological conditions of integumentary system			
		Histopathological conditions of Female reproductive			
		Histopathological conditions of Male reproductive			

11. Course Evaluation
Final exam / 70 Mid-semester exam / 30

12. Learning and Teaching Resources	
Required textbooks	Pathology textbook , Danish Pathology textbook Robbin Basic histology eight edition
Main references (sources)	
Recommended books and references (scientific journals, reports...)	**Scientific Journals**
Electronic References, Websites	

Head of Dep. Lecturer

Prof. Dr. Bassim A. Jassim Prof. Dr. Bassim A. Jassim

Course Description Form

1. Course Name: Bio-separation
2. Course Code :

3. Semester / Year: First Semester, Academic Year 2025–2026

4. Description Preparation Date: 1/9/2025

5. Available Attendance Forms: In-person

6.Number of Credit Hours (Total) / Number of Units (Total): Total Hours = 2 | Total Units = 2

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

Prof. Dr. Hana Kadum Shanan
Email: hanakadum@mu.edu.iq

8.Course Objectives

1 .	The main objective, in brief, of the course is to help life science students understand the basic rules and working principles of most basic instruments being used by biologists working in very different ranges of biological sciences. The course objective became even more important after the coronavirus pandemic. Hence, the specific objectives of the course are to: 1. Understand the principle of the pH/hydronium ion measurement and its importance in biological sciences,
2 .	2. Understand the working principle of the colorimeter and its application in the analysis of different cells' propagation in culture or proteins in solution,
3 .	3. Understand the principle of centrifugation and its application in the separation, analysis, and concentration of the biological solution, 4. Understand different separation techniques with a focus on size-based separation and its applications in pharmaceutical and biotechnological industries,
4 .	5. Understand different levels of precautions to be taken against pathogenic bacteria with varying pathogenicity and ways of sterilization.

9. Teaching and Learning Strategies

- Demonstrate knowledge and understanding of different techniques and processes used to separate and purify products in biotechnological applications.
- Apply the appropriate separation techniques based on the specific characteristics of the target product.

- Analyze and evaluate the yield and purity of the separated products.
- The ability to perform bioprocess design and economics.

10. Course Structure

Evaluation method	Learning method	Unit or subject name	Required Learning Outcomes	Hours	Week
Quiz	Lecture and Discussion	Introduction: bioproducts, bio separation vs chemical separation, design of bio separation processes.		2	1
Report	Quiz	Analytical bio separation Methods		2	2
Report	Lecture and Discussion	Properties of biological material		2	3
Mid-term Exam	Quiz	Cell disruption, Physical methods, Chemical and physicochemical methods.		2	4
Quiz	Laboratory Session	Precipitation and its mechanism, concentrating and purifying antibiotics and proteins		2	5
Report	Lecture and Discussion	Extraction, Liquid-liquid extraction, applications in pharmaceutical industry and Single-stage equilibrium extraction; types of equipment and design for extraction, continuous multistage countercurrent extraction		2	6
Report	Lecture and Discussion	Design of towers for extraction; Adsorption, adsorbents, batch adsorption, design of fixed-bed adsorption columns, scale-up laboratory adsorption column		2	7
Mid-term Exam	Quiz	Adsorption, Adsorption is a selective process and this is influenced, Separation mechanisms.		2	8
Quiz	Quiz	Project presentations		2	9
Quiz	Discussion	Liquid Chromatography, purification of biologics and drugs: ion exchange, affinity, hydrophobic interaction, reversed phase chromatography and gel filtration		2	10
Quiz	Lecture and Discussion	Filtration, types of filtration equipment, filter aids, basic theory of filtration and equations		2	11
Mid-term Exam	Quiz	Membrane based bio separation		2	12
Quiz	Lecture and Discussion	Industrially important membrane separation processes: dialysis, reverse-osmosis, ultra-filtration, micro-filtration; common membranes		2	13
Report	Quiz	Freeze-drying of biological materials, unsteady state thermal processing and sterilization of biological materials, pasteurization.		2	14
		Exam			

11. Course Evaluation
• Quizzes – 5% • Mid-examination – 20% • Attendance – 5% • Final Examination – 70% • Total – 100%

12. Learning and Teaching Resources	
BIOSEPARATIONS SCIENCE AND ENGINEERING Roger G. Harrison University of Oklahoma, Paul Todd, Space Hardware Optimization Technology, Inc. Greenville, Indiana, Sc R. Rudge, Demetri P. Petrides /2003	
BIOSEPARATIONS Principles and Techniques/ B. SIVASANKAR Professor -Department of Chemistry-Anna University-Chennai/2010	

Course Description Form

1. Course Name: Aquatic ecology
2. Course Code :

3. Semester / Year first- 2025-2026
4. Description Preparation Date: 15-2-2026
5. Available Attendance Forms: Hall
6. Number of Credit Hours (Total) / Number of Units (Total)
30/2
4. Course administrator's name (mention all, if more than one name)

Ali Abdulhamza Al-Fanharawi/ alialfanharawi@mu.edu.iq

8. Course Objectives

1- Student will gain understanding of main concept in Aquatic ecology, including definition, types, process, classification etc.
2- Describe the structure of an aquatic ecosystem
3- Describe the roles of producers, consumers, and decomposers in various aquatic ecosystems and identify their trophic levels..
4- Knowledge about current issues in water quality and water resources.

Feels important and responds effectively to maintain it.

9. Teaching and Learning Strategies

1- We begin with the chemical and physical properties of water that fundamentally regulate the diverse nature of aquatic habitats.
2- Recognize about aquatic chemistry and factors controlling nutrient cycling.
3- Progress from small-scale stream ecology to large-scale open ocean habitat.
4- Hydrology and Physiography of Wetland Habitats.
5- Study the Coral Reefs ecology and ocean ecology

10. Course Structure

Evaluation method	Learning method	Unit or subject name	Required Learning Outcomes	Hours	Week
Exams-Seminars	Lecture-Discussion-Assignments	**Continental Aquatic Systems**	Understanding-Application	2	1
Exams-Seminars	Lecture-Discussion-Assignments	**Properties of Water**	Understanding-Application	2	2
Exams-Seminars	Lecture-Discussion-Assignments	**Movement of Light, Heat, and Chemicals in Water**	Understanding-Application	2	3

Exams-Seminars	Lecture-Discussion-Assignments	**Groundwater Habitats**	Understanding-Application	2	4
Exams-Seminars	Lecture-Discussion-Assignments	**Wetland Habitats**	Understanding-Application	2	5
Exams-Seminars	Lecture-Discussion-Assignments	**Flowing Water, River ecology**	Understanding-Application	2	6
Exams-Seminars	Lecture-Discussion-Assignments	**Discussions**	Understanding-Application	2	7
Exams-Seminars	Lecture-Discussion-Assignments	**Lakes and Reservoirs**	Understanding-Application	2	8
Exams-Seminars	Lecture-Discussion-Assignments	**Life in Water**	Understanding-Application	2	9
Exams-Seminars	Lecture-Discussion-Assignments	**Water Relations**	Understanding-Application	2	10
Exams-Seminars	Lecture-Discussion-Assignments	**Species Interactions**	Understanding-Application	2	11
Exams-Seminars	Lecture-Discussion-Assignments	**Open Ocean**	Understanding-Application	2	12
Exams-Seminars	Lecture-Discussion-Assignments	**Coral Reefs**	Understanding-Application	2	13
Exams-Seminars	Lecture-Discussion-Assignments	**Extreme Habitats**	Understanding-Application	2	14
Exams-Seminars	Lecture-Discussion-Assignments	**Discussions**	Understanding-Application	2	15

11. Course Evaluation

Final exam / 70
Mid-semester exam / 25
Quizzes / 5

12. Learning and Teaching Resources

Required textbooks	_____
Main references (sources)	Freshwater Ecology, Dodds and Whiles, 2010
Recommended books and references (scientific	-----

journals, reports...)	
Electronic References, Websites	--

Head of Dep.

Lecturer

Prof. Dr. Ali Abdulhamza Al-Fanharawi