The University of Jordan

الجامعة الاردنية

Form: Study Plan- Bachelors	Form Number	EXC-01-03-02A
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	Number of Pages	20

1.	School	**Science**
2.	Department	**Biological Sciences**
3.	Program title (Arabic)	**بكالوريوس في العلوم الحياتية**
4.	Program title (English)	**Biological Sciences Bachelor in**

5. Components of Curriculum:

The curriculum for the bachelor's degree in Physics consists of (136) credit hours distributed as follows

Number	Type of requirement	credit hours
First	University Requirements	27
Second	Faculty Requirements	21
Third	Specialty Requirements	88
Total		136

6. Numbering System:

A- Department number

Department	Number
Mathematics	1
Physics	2
Chemistry	3
Biological Sciences	4
Geology	5
Clinical Sciences	8

Basic Sciences	9

B- Course number

Domain title	Domain number	Domain title	Domain number
Botany	5	General Biology	0
Zoology	6	Practical Biology	1
Ecology	7	Biochemistry & Clinical Chemistry	2
Genetics & Molecular Biology	8	Microtechniques & Histology	3
Graduation Project	9	Microbiology & Immunology	4

C- Course number consists of 7 digits

Serial number		Level	Department		School	
3	1	2	0	4	0	3

First: University Requirements:

Preparation Program Requirements

All students admitted to the university must apply for a degree examination in Arabic and English and the computer is prepared or approved by the university to determine their level. Based on the results of the examinations, either the student will study one or more of the requirements of the preparatory program

(0 - 15 Credit Hours)

No.	Course Title	Course No.	Credit Hours	Prerequisites	Notes
1	COMMUNITY SERVICE	0300150	0		Pass/Fail
2	COMPUTER SKILLS PLACEMENT TEST	1902098	0		Pass/Fail
3	BASICS OF COMPUTING	1932099	3	1902098	Pass/Fail
4	Arabic LANGUAGE (LEVEL 1)	3201001	3	3211098	Pass/Fail
5	Arabic LANGUAGE (LEVEL 2)	3201002	3	3201001	Pass/Fail
6	ENGLISH LANGUAGE (LEVEL 1)	3202001	3	3212098	
7	ENGLISH LANGUAGE (LEVEL 2)	3202002	3	3202001	
8	ARABIC PLACEMENT TEST	3211098	0		

9	ENGLISH PLACEMENT TEST	3212098	0		

Compulsory Requirements (18 Credit Hours)					
No.	**Course Title**	**Course No.**	**Credit Hours**	**Prerequisites**	**Notes**
1	Military Science	2220100	3		
2	ENGLISH LANGUAGE (LEVEL 1)	3202003	3	3202002	
3	National Culture	3400100	3		
4	ETHICS AND SOCIAL RESPONSIBILITY	3420100	3		
5	ENTREPRENEURSHIP , INNOVATION AND LEADERSHIP	3420101	3		
6	مهارات التواصل و المهارات الناعمة باللغة الانجليزية	3420103	3	3202003 or 3202103	
7	*موضوع خاص في اللغة الإنجليزية	3202104	3	معفي من 3202001 + 3202002	

*الطالب الحاصل على نتيجة C1 في الامتحان التصنيفي في اللغة الإنجليزية يدرس هذه المادة بدلا من مادة اللغة الإنجليزية (المستوى الثالث)

Electives (9 Credit Hours)					
Elective courses: (9) credit hours to be chosen from the first, second and third groups mentioned below. The student has to choose one course from each of the groups.					
(First Group)					
No.	**Course Title**	**Course No.**	**Credit Hours**	**Prerequisites**	**Notes**
1	ENVIRONMENTAL CULTURE AND DEVELOPMENT	0359102	3		
2	ISLAMIC CULTURE	0400102	3		
3	HEALTH CULTURE	0309100	3		
4	LEGAL CULTURE	1000102	3		
5	PHYSICAL FITNESS CULTURE	1100100	3		
6	INTRODUCTION TO PHILOSOPHY AND CRITICAL THINKING	3400103	3		
7	TOURISM CULTURE	3400111	3		
(Second Group) (3 credits hour)					
No.	**Course Title**	**Course No.**	**Credit Hours**	**Prerequisites**	**Notes**
1	ISLAM AND CONTEMPORARY ISSUES	0400101	3		
2	SOCIAL MEDIA	0309101	3		
3	APPRECIATION OF ARTS	2000100	3		
4	FOREIGN LANGUAGE	2200103	3		
5	ARAB-ISLAMIC CIVILIZATION	2300101	3		
6	JORDAN: HISTORY AND CIVILIZATION	2300102	3		

7	SPECIAL SUBJECT	3400106	3		
8	GREAT BOOKS	3400107	3		
9	JERUSALEM	3400108	3		

Electives (3) credits hour (Third Group)					
No.	**Course Title**	**Course No.**	**Credit Hours**	**Prerequisites**	**Notes**
1	SPECIAL TOPIC IN DIGITAL SKILLS	0309104	3	0309103	

Second: School courses: distributed as follows:

A. Obligatory school courses: (21) credit hours
B. Elective school courses: (None) credit hours

A. Obligatory school courses: (21) credit hours:

Course Number	Course Title	Type of learning (face-to-face | blended | online)	Contact Hours		Credit Hours	Pre-requisite
			Theoretical	Practical		
0319101	Calculus-1	face-to-face	-	3	3	-
0319131	Principles of Statistics	online	-	3	3	-
0329101	General Physics-1	face-to-face	-	3	3	-
0339101	General Chemistry-1	face-to-face	-	3	3	-
0349101	General Biology-1	face-to-face	-	3	3	-
0305101	General Geology	face-to-face	-	3	3	-
0309103	Modern Digital Skills	face-to-face	-	3	3	1932099

B. Elective school courses: (None) credit hours:

Course Number	Course Title	Type of learning (face-to-face | blended | online)	Contact Hours		Credit Hours	Pre-requisite
			Theoretical	Practical		

Third: Specialty courses: (88) credit hours distributed as follows:

A. Obligatory specialty courses: (69) credit hours
B. Elective specialty courses: (19) credit hours:

A. Obligatory specialty courses: (69) credit hours:

Course Number	Course Title	Type of learning (face-to-face | blended | online)	Contact Hours		Credit Hours	Pre-requisite
			Theoretical	Practical		
03391012	General Chemistry (2)	Face to face	3	-	3	0339101
0339109	Practical General Chemistry for Non-Chemistry Students	Face to face	-	3	1	0339101
0339233	Organic Chemistry for Non-Chemistry Students	Face to face	3	-	3	03391012
0304102	General Biology (2)	Face to face	3	-	3	0349111 or concurrently +0349101
0349111	Practical General Biology	Face to face	-	3	1	0349101 or concurrently
0304232	Cell Biology	Face to face	3	-	3	0304102
0334251	General Botany	Face to face	3	3	4	0304102
0334261	General Zoology	Face to face	3	3	4	0304102
0304281	Genetics	Face to face	2	3	3	0349101
0344221	Biochemistry	Face to face	3	3	4	0339233
0334341	General Microbiology	Face to face	3	3	4	0304102+ 0304232
0344351	Plant Anatomy and Development	Face to face	2	3	3	0334251
0334352	Plant Physiology	Face to face	2	3	3	0334251
0364361	Vertebrate Anatomy	Face to face	2	3	3	0334261
0344363	Physiology	Face to face	3	3	4	0304232
0334382	Molecular Biology	Face to face	2	3	3	0304281+ 0344221
0304465	Evolution	Face to face	3	-	3	0334251+ 0334261
0304483	Biotechnology	Face to face	3	-	3	0334382+ 0334341
0334471	Ecology	Face to face	2	3	3	0334251+ 0334261
0344443	Immunology	Face to face	2	3	3	0344221+ 0334341
0304493	Graduation Project	Face to face	2	-	2	Successfully finished 100 credit hours
0304494	Employability Readiness	Face to face	5	3	6	Exclusively taught during Summer semester after studying 90 credit hours. The number of students in one section

						must not exceed 5 students.

B. Elective specialty courses: (19) credit hours:

C.

Course Number	Course Title	Type of learning (face-to-face | blended | online)	Contact Hours		Credit Hours	Pre-requisite
			Theoretical	Practical		
0334282	Human Genetics	**Blended**	3	-	3	0304281
0364462	Developmental Biology	**Face to face**	2	3	3	0304232+0364361
0308357	Medical Mycology	**Blended**	2	3	3	0334341
0344421	Metabolism	**Face to face**	3	-	3	0344221
0334432	Histology	**Face to face**	2	3	3	0304232
0334441	Applied Microbiology	**Face to face**	2	3	3	0334341
0308355	Medical Virology	**Face to face**	2	-	2	0334341
0334452	Taxonomy of Flowering Plants	**Face to face**	2	3	3	0334251
0304468	Principles of Endocrinology	**Face to face**	2	-	2	0344363
0304473	An Introduction to Marine Sciences	Online	3	0	3	0334261
0308214	Histological Microtechniques	Face to face	1	3	2	0349111
0308367	Hematology	Face to face	2	3	3	0344363
0304486	Introduction to Bioinformatics	Face to face	1	3	2	0309103+0304483 or concurrently
0334332	Cell Dynamics	Face to face	2	-	2	0304232
0304448	Introduction to Microbial Pathogenesis	Face to face	2	-	2	0334341
0304391	Applications in Biostatistics and Biological Experimental Design	Face to face	2	-	2	0319131+0344221
0334444	Introduction to Human Microbiome	Face to face	2	-	2	0304232+0334341
0304469	Animal Behavior	Face to face	3	-	3	0364361+0344363
0334468	Vertebrate Natural History and Conservation	Blended	3	-	3	0364361+0344363
0304458	Introduction to Plant Cell Wall Biology	Face to face	2	-	2	0344221

Transition Plan for Biology Program (Similar Courses)

2024 Old Plan			2025 New Plan		
0304101	GENERAL BIOLOGY I	3	0349101	GENERAL BIOLOGY I	3
0304111	PRACTICAL GENERAL BIOLOGY	1	0349111	PRACTICAL GENERAL BIOLOGY	1

Fourth: Courses offered by other faculties/schools and departments

Course Number	Course Title	Type of learning (face-to-face | blended | online)	Contact Hours		Credit Hours	Pre-requisite
			Theoretical	Practical		
0319101	Calculus (1)	Face to face	3	-	3	-
0319131	Principles of Statistics	Online	3	-	3	-
0329101	General Physics (1)	Face to face	3	-	3	-
0339101	General Chemistry (1)	Face to face	3	-	3	-
0339109	Experimental General Chemistry for non-Chemistry Students	Face to face	-	3	1	0339101
0305101	General Geology	Face to face	3	-	3	-
0309103	Modern Digital Skills	Face to face	3	-	3	1932099
03391012	General Chemistry (2)	Face to face	3	-	3	0339101
0308357	Medical Mycology	Face to face	2	3	3	0334341
0308355	Medical Virology	Face to face	2	-	2	0334341
0308214	Histological Microtechniques	Face to face	1	3	2	0349111
0308367	Hematology	Face to face	2	3	3	0344363
0339233	Organic Chemistry for Non-Chemistry Students	Face to face	3	-	3	03391012

Transition plan

Old Curriculum			New Curriculum (2024)		
Course #	Course Title	Credit Hours	Course #	Course Title	Credit Hours
0304472	Marine Biology and Ecology	3	0304473	An Introduction to Marine Sciences	3
0344321	Biochemistry	4	0344221	Biochemistry	4
0304383	Biotechnology	3	0304483	Biotechnology	3
0364362	Developmental Biology	3	0364462	Developmental Biology	3
0304393	Graduation Project	2	0304493	Graduation Project	2

Fifth: Advisory Study Plan

First Year

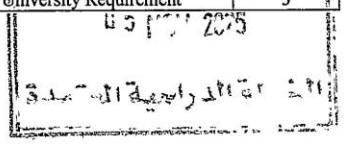
First Semester			Second Semester		
Course Number	Course Title	Credit Hours	Course Number	Course Title	Credit Hours
0319101	Calculus (1)	3	0329101	General Physics (1)	3
0339101	General Chemistry (1)	3	0304102	General Biology (2)	3
0349101	General Biology (1)	3	03391012	General Chemistry (2)	3
0349111	Practical General Biology	1	0339109	Practical General Chemistry for Non-Chemistry Students	1
	University Requirement	3		Faculty Requirement	3
	University Requirement	3		University Requirement	3
Total		**16**	**Total**		**16**

Second Year

First Semester			Second Semester		
Course Number	Course Title	Credit Hours	Course Number	Course Title	Credit Hours
0339233	Organic Chemistry for Non-Chemistry Students	3	0304232	Cell Biology	3
0334251	General Botany	4	0334261	General Zoology	4
0304281	Genetics	3	0344221	Biochemistry	4
	Faculty Requirement	3		University Requirement	3
	Faculty Requirement	3		University Requirement	3
Total		**16**	**Total**		**17**

Third Year

First Semester			Second Semester		
Course Number	Course Title	Credit Hours	Course Number	Course Title	Credit Hours
0364361	Vertebrate Anatomy	3	0334341	General Microbiology	4
0334352	Plant Physiology	3	0344351	Plant Anatomy and Development	3
0334363	Physiology	4	0334382	Molecular Biology	3
	Elective Specialty Requirement	2		Elective Specialty Requirement	2
	University Requirement	3		Elective Specialty Requirement	2
	University Requirement	3		University Requirement	3



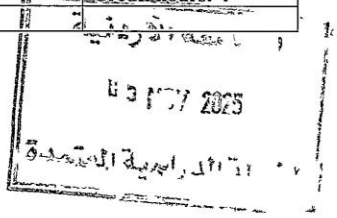
Total		**18**	**Total**		**17**
Summer Semester					
0304494	Employability Readiness	6			
Total		6			

Fourth Year

First Semester			Second Semester		
Course Number	**Course Title**	**Credit Hours**	**Course Number**	**Course Title**	**Credit Hours**
0344443	Immunology	3	0304483	Biotechnology	3
0304465	Evolution	3	0334471	Ecology	3
	Elective Specialty Requirement	3	0304493	Graduation Project	2
	Elective Specialty Requirement	3		University Requirement	3
	Elective Specialty Requirement	3		Elective Specialty Requirement	2
				Elective Specialty Requirement	2
Total		**15**	**Total**		**15**

Course Description

0349101	**General Biology (1)**	**Credit hours:3**
Prerequisite:		
This course includes major general biological concepts including, the chemistry of water, structure and function of biological macromolecules, a tour of the cell, membrane structure and function. The course also deals with metabolism, cellular respiration and photosynthesis. The course further investigates the genetic basis of life including meiosis, mitosis, Mendelian genetics, molecular basis of inheritance and gene expression. During the course, the students will be introduced to the biology of viruses.		
0304102	**General Biology (2)**	**Credit hours: 3**
Prerequisite: 0349111 or concurrently & 0349101		
This course surveys the diversity of living organisms, describes how they coordinate their responses to internal and external stimuli and explores their interactions in the biosphere. It describes the mammalian circulation, immune system, gas exchange, controlling the internal environment, nervous system and motor mechanism, transport in plants, plant reproduction and development. The course further investigates the cellular basis and physiological principles underlying biological response, coordination and control by examining hormonal systems in plants and animals and nervous systems in animals. The comparison between plant hormones and animal endocrine systems demonstrates how different organisms can use different structures and signals to achieve the same basic homeostatic regulatory functions.		
0349111	**Practical General Biology**	**Credit hours: 1**
Prerequisite: 0349101 or concurrently		
Laboratory experiments in microscopy and cells, chemical aspects of cells, plant and animal issues, animal and plant physiology, mammalian anatomy, and systematic of major living groups.		
0304232	**Cell Biology**	**Credit hours: 3**
Prerequisite: 0304102		
The focus of Cell Biology is the study of the structure and function of the cell. In this course we will focus on Eukaryotic cell biology and will cover topics such as membrane structure and composition, transport, and trafficking, the cytoskeleton, the extracellular matrix and cell movement; and the integration of cells into tissues. We will also cover important cellular processes such as cell cycle regulation, signal transduction, immune response, apoptosis (programmed cell death), autophagy, and cancer cell biology. Finally, the student will be introduced to the main techniques in cell biology.		
0334251	**General Botany**	**Credit hours: 4**
Prerequisite: 0304102		



The course is designed to deliver the main basics of plant science, the structure of plant cells compared with prokaryotes cells and animal cells, studying plant tissues, organs like roots, stems, leaves, flowers, seeds, fruits, embryos, classification of plant groups and diversification of plant kingdom, meiosis in plant cells, and alternation of generation, genetics and evolution theories in plants, plant breeding and propagation using conventional and modern non-classical methods of propagation. Studying kingdom Protista, kingdom Fungi, seedless plants like Bryophytes. Flowering plants and civilization, also providing knowledge of the economic and commercial benefits of plant groups to human and other organisms with emphasis on examples of selective global and local plants.

0334261	**General Zoology**	**Credit hours: 4**
Prerequisite:		**0304102**
The course is an overview of the field of Zoology. This course investigates levels of organization of animals and criteria used for categorization of organisms belonging to the kingdoms Protista and Animalia. Beside taxonomy, the course focuses on morphology, anatomy, physiology, reproduction, ecology and evolution of organisms belonging to these kingdoms. Laboratory sessions of the course focus on specimens representing various protozoan and animal groups to provide students with the practical experience and knowledge with regard to the diversity of organisms from taxonomic, morphological, structural, functional and ecological perspectives.		

0304281	**General Genetics**	**Credit hours: 3**
Prerequisite: 0349101		
This course aims to teach the students the structure of the genetic material, mendelian genetics, and extensions of mendelian genetics. Additionally, this course covers sex determination, sex chromosomes, and chromosome mutations. Finally, this course introduces the students briefly to the extranuclear Inheritance. This course includes two lectures and one laboratory session, which includes experiments dealing with mitosis, meiosis, how to work with Drosophila, and karyotyping.		

0334282	**Human Genetics**	**Credit hours: 3**
Prerequisite: 0304281		
This course will introduce the student to the human genome components, chromosome structure and cytogenetics. With a focus on Mendelian and non-Mendelian inheritance in man. The course will introduce the student to multifactorial inheritance, population genetics, implications of genome sequencing and genetic counselling. Finally, the student will be introduced to main hereditary defects, the available diagnostic tools and the recent developments and challenges in current gene therapies.		

0344221	**Biochemistry**	**Credit hours: 4**
Prerequisite: 0339233		
This course introduces students to the basic principles of biochemistry, reviewing key concepts including water chemistry, pH, structured solutions, and the behavior of acids and bases. The course focuses on the structure and function of basic biomolecules such as proteins, carbohydrates, and lipids. Topics covered include the chemical properties of amino acids, proteins, carbohydrates, and lipids, the mechanisms of action of enzymes, and an overview of the major metabolic pathways within the cell. The practical part of the course provides hands-on training in the basic techniques of biochemistry, where students perform biochemical calculations, prepare structured solutions, perform titrations, isolate, purify, and determine the concentration of proteins, perform enzyme tests, and analyze carbohydrates and lipids. During the course, students also acquire the skills to use common laboratory equipment such as pH meters, microbalances, spectrophotometers, centrifuges, homogenizers, and others.		

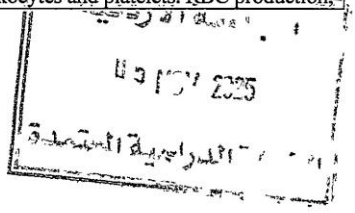
0334341	**General Microbiology**	**Credit hours: 4**
Prerequisite: 0304102 & 0304232		
The course is considered as an overview of the field of microbiology. This course investigates the history and scope of microbiology, prokaryotic morphology, cell structure and function, microbial growth, requirements for microbial growth, factors affecting microbial growth, methods for the control of microbial		

growth, microbial metabolism and nutrition, microbial genetics, bacterial reproduction, microbial taxonomy, major groups of bacteria, microorganisms and environment, element cycling and symbiotic associations. The laboratory sessions focus on many significant practical parts, such as pure culture techniques, methods of staining and microscopic, colonial and biochemical identification of microorganisms.		
0344351	**Plant Anatomy and Development**	**Credit hours: 3**
Prerequisite: 0334251		
The course is basic biology course for students at the B.Sc. level. The objectives of this course are to link structure with function of the plant body. Therefore, it focusis on the organization of tissues from the embryo, then studying each type of plant fundamental tissue types, functions, and characterization, their locations. Then studying dermal tissue especially epidermis organization cell types, functions, developmental type and various trichome types. Then a special attention on the vascular tissue of xylem, phloem, and cambium, especially cell types and their functions, developmental aspects and uses in identification of wood. The Periderm characteristics, various types, cell types, functions and different Periderm aspects including lenticels, leaf abscission, wound healing and so on. Then study of roots, stems and leaves, different types, tissues, primary, secondary, and anomalous growth types. The nodal anatomy and apical meristem organization of both shoot and root tips.		
0334352	**Plant Physiology**	**Credit hours: 3**
Prerequisite: 0334251		
The course covers core concepts in plant physiology with specific focus on water relations; mineral nutrition; photosynthesis; phloem translocation; plant growth, hormones and a brief coverage of dormancy, germination and stress physiology. The course format will consist of lectures and an accompanying laboratory section. The laboratories' main objective is to introduce plant physiology tools by running basic experiments, processing, analyzing, presenting results and preparing a scientific report.		
0308357	**Medical Mycology**	**Credit hours: 3**
Prerequisite: 0334341		
This course is a study of the medically important fungi, including mode of transmission, pathogenicity, defense mechanisms of host, and relative techniques for clinical laboratory diagnosis and identification.		
0364361	**Vertebrate Anatomy**	**Credit hours: 3**
Prerequisite: 0334261		
This course aims to introduce the students to the study of the different groups of vertebrates. It will expose the students to the morphological, embryological, structural, functional and evolutionary approaches. The course will integrate vertebrate anatomy with functional morphology and phylogenetic relationships. The following systems will be discussed: the integument, skeletal, digestive, muscular, circulatory, respiratory, excretory and the nervous and sense organs.		
0364362	**Developmental Biology**	**Credit hours: 3**
Prerequisite: 0304232 & 0364361		
This course deals with the following topics: Male reproductive system, spermatogenesis, oogenesis, fertilization, assisted reproduction technology, cleavage, gastrulation, neurulation, and early human development. In addition, the course covers development of the following: The skin and its derivatives; the central nervous system, the sense organs; the heart and major blood vessels, the excretory and the reproductive systems, the limbs, the digestive system; the respiratory system. Also a study of the fetal membranes, parturition, and twinning is covered.		
0344363	**Physiology**	**Credit hours: 4**
Prerequisite: 0304232		

This course provides an in-depth exploration of the physiological processes that govern the functioning of the human body. Students will study the intricate systems that work together to maintain homeostasis, including the cardiovascular, respiratory, nervous, muscular, digestive, endocrine, and renal systems. By the end of the course, students will have a comprehensive understanding of the human body's functioning and its ability to adapt to various internal and external challenges.		
0334382	**Molecular Biology**	**Credit hours: 3**
Prerequisite: 0304281 & 0344221		
This course aims to introduce the students to the basic concepts of molecular biology. The first part covers the molecular nature of genes and chromosomes. The second part covers DNA replication and DNA repair in prokaryotic and eukaryotic cells, transcription in prokaryotic and eukaryotic cells, translation in prokaryotic and eukaryotic cells, and regulation of gene expression. This course includes two lectures and one laboratory session, which includes experiments of DNA extraction, quantitative and qualitative measurement of DNA, PCR, restriction enzymes digestion, DNA blotting, and gene cloning.		
0304483	**Biotechnology**	**Credit hours: 3**
Prerequisite: 0334382 and 0334341		
This biotechnology course focuses on the intersection of Biology and Technology. This would be achieved through tackling the history of biotechnology, the study and manipulation of living organisms or biological systems to develop products and technologies that improve human lives, address societal needs, or benefit the environment. Providing students with an understanding of modern biotechnology, including molecular biology, food biotechnology, immunology, protein science, biopolymers, bioinformatics, bioenergy and process engineering. Ethical issues of biotechnology and patenting will be highlighted. During the course, the students will be introduced to the ethics and biorisk of genetically modified organisms and recombinant DNA technology. This course will enable students to learn about the science behind biotechnology while also looking at how to succeed in a career in the industry.		
0344421	**Metabolism**	**Credit hours: 3**
Prerequisite: 0344221		
This course will help you to understand what metabolism is and how different biological molecules (carbohydrates, proteins, nucleic acids, and lipids) metabolism takes place in human body. The anabolic, catabolic and amphibolic pathways of the main organic molecules in the living cell will be discussed in details, with emphasis on energy metabolism and the role of vitamins as cofactors for enzymatic reactions. The course will focus on the basic biochemistry and physiology relevant to human nutrition, to understand how the body works and how it responds to the food we eat. Students will gain detailed knowledge of the digestion, absorption and metabolism of carbohydrates, protein, fat, alcohol, vitamins and minerals, as well as energy balance and healthy diet.		
0334432	**Histology**	**Credit hours: 3**
Prerequisite: 0304232		
This course covers the following topics: types of tissues, characteristics, structural and functional aspects of the following tissues: epithelial, connective, cartilage, bone, blood, muscular and nervous. In addition, the course deals with study of histology of the following systems: ntegumentary; lymphoid, digestive, respiratory, excretory, reproductive, and endocrine.		
0334441	**Applied Microbiology**	**Credit hours: 3**
Prerequisite:		**0334341**

The course aims at imparting the students with basic principles of applied microbiology and industrial biotechnology and their benefits to humankind. It investigates the involvement, utilization and application of microbes in different processes, such wastewater treatment, fermentative processes and food production from plant and animal sources. It also focuses on the general concepts of industrial microbiology, particularly industrial fermentation, industrial products and the microorganisms that make them. Besides, the course covers the importance of waterborne and foodborne diseases and the infectious agents causing them, as they significantly relate to the public health. The laboratory sessions focus on providing students with the fundamental understanding of how microorganisms are utilized and controlled for the benefit of human and on developing the laboratory skills needed to investigate different aspects of applied microbiology.		
0344443	**Immunology**	**Credit hours: 3**
Prerequisite: 0344221 & 0334341		
This course aims to introduce the student to concepts of immunology. Including basic components of innate and acquired immunity, genetic basis of antibody diversity, mechanisms of immune response both humoral and cell mediated, role of major histocompatibility complex (MHC) in immune response, biology of T- and B- lymphocytes, cytokines and complement system. Moreover, the course will cast a light on special cases of immune-dysfunctions such as hypersensitivity, autoimmunity and immunodeficiencies. The practical part of the course will introduce the student to basic immunological techniques. The protocols include those for the detection of antigen-antibody interactions, lymphocyte proliferation as well as flow cytometry.		
0308355	**Medical Virology**	**Credit hours: 2**
Prerequisite: 0334341		
Virus structure, viroids, satellites, prions, virus evolution, multiplication of viruses, virus taxonomy, viral pathogenesis, viral persistant, latency, patterns of some viral diseases of human, cell transformation by viruses, host-immune response to viral infections, interferons, antiviral agents, immunization and vaccination. Virus structure, viroids, satellites, prions, virus evolution, multiplication of viruses, virus taxonomy, viral pathogenesis, viral persistant, latency, patterns of some viral diseases of human, cell transformation by viruses, host-immune response to viral infections, interferons, antiviral agents, immunization and vaccination.		
0344452	**Taxonomy of Flowering Plants**	**Credit hours: 3**
Prerequisite: 0334251		
Taxonomy of flowering plants, plant according to simple principles, aims to taxonomy, historical summary, phytogeography, and terminology of plant description, field and herbarium methods, nomenclature, concepts of taxa, construction and use of keys, taxonomic literature for such study of the characteristics of about 48 families of plants in Jordan.		
0304468	**Principles of Endocrinology**	**Credit hours: 2**
Prerequisite: 0344363		
This course provides a foundational understanding of the principles governing the endocrine system, emphasizing the role of hormones in regulating various physiological processes. Students will explore the basic mechanisms of hormone action, including hormone synthesis, secretion, and the interaction with specific receptors on target cells. The course also covers the regulatory pathways that control hormone levels and their effects on metabolism, growth, development, and homeostasis. The course also introduces students to the concept of feedback loops, signal transduction pathways, and the integration of endocrine signals with other physiological systems. Both normal endocrine function and the pathophysiology of common endocrine disorders are discussed, providing students with a broad understanding of how hormones influence health and disease.		
0308214	**Histological Microtechniques**	**Credit hours: 2**
Prerequisite: 0349111		
The student will be introduced to the microtome and the principles and practices of preparing clinical specimens for histological examination. The course will focus on the procedures used in fixation,		

decalcification, processing, embedding and microtomy of specimens. Major disciplines in medical laboratory sciences.		
0304465	**Evolution**	**Credit hours: 3**
Prerequisite: 0334251 and 0334261		
A review or the history of evolution and evidence for it, biogeography; natural barriers and oceanic islands; fossils and fossilization, origin of life, biogenetic law; the origin of variation and the genetic basis of evolution, natural section, adaptation and evolution; species and speciation; rates of evolutionary changes, ecology, behavior, and evolution; human evolution; the primates and apes; family Hominidae; major functional and structural changes in relation to new habitat; origin of man; genus *Homo*, and the rise of modern man.		
0334471	**Ecology**	**Credit hours: 3**
Prerequisite: 0334251 and 0334261		
Basic concepts in ecology; organization, structure and function of ecosystem and ecosystem properties; cycling of matter and flow of energy in ecosystems and their equilibrium; factors involved in the regulation, growth, and general dynamics of populations; data needed to describe populations, population growth, population models, and regulatory mechanisms; spatial and temporal variation and properties of populations; community structure and interactions; succession patterns in aquatic and terrestrial communities; field trips to the different vegetation types in Jordan and analysis of quantitative data from the field.		
0304473	**An Introduction to Marine Sciences.**	**Credit hours:3**
Prerequisite:		**0334261**
The course is divided into three sections. The first section introduces the students to the earth's water cycle, the formation of ocean basins, and large-scale wind patterns and ocean circulation. In the second section, students will learn about the connections among dissolved compounds in the ocean, global patterns of primary productivity, and the health of marine food webs and ecosystems. Students will also learn about the ocean's role in global warming and changes in the Arctic Ocean in response to a warming planet. In the third section, students will learn about the marine communities, e.g., coral reefs, shallow grass flats, deep-sea communities, and the factors limiting the distribution of organisms within those communities. Discussion will also be directed toward the impacts and interactions between humans and oceans.		
303101	**General Chemistry-1**	**Credit hours: 3**
Prerequisite:		
Measurements and significant figures, chemical reactions; stoichiometry; the gaseous state; thermochemistry; electronic structure and periodicity; chemical bonding; molecular shapes; states of matter and intermolecular forces.		
03391012	**General Chemistry-2**	**Credit hours:3**
Prerequisite: 303101		
Physical properties of solutions; chemical kinetics; chemical equilibrium; acids and bases; acid-base equilibria in aqueous solutions; solubility and complex ion equilibria; chemical thermodynamics; electrochemistry.		
0339109	**Experimental General Chemistry for non-Chemistry Students**	**Credit hours:1**
Prerequisite: 0339101		
The course includes experiments dealing with the following topics: safety and laboratory rules; chemical observations; stoichiometry; volumetric analysis; oxidation and reduction; colligative properties; thermochemistry and equilibrium.		
0308367	**Hematology**	**Credit hours: 3**
Prerequisite: 0344363		
Theory and application of hematology tests performed routinely in the clinical laboratory. Hematopoiesis. Counting and identification of blood cells including erythrocytes, leukocytes and platelets. RBC production,		



destruction and Functions. Iron and Hemoglobin Metabolism. WBC production, kinetics and functions. Platelets production and function. Blood Hemostasis, its function, interaction, and monitoring.		
0339233	**Organic Chemistry for Non-Chemistry Students**	**Credit hours: 3**
Prerequisite: 03391012		
Hydrocarbons: alkanes, cycloalkanes, alkenes, alkynes; aromatic compounds; stereochemistry; halides; alcohols; phenols; ethers; amines; carbonyl compounds and carboxylic acids.		
0319101	**Calculus-I**	**Credit hours: 3**
Prerequisite:		
Functions: domain, operations on functions, graphs of functions; trigonometric functions; limits: meaning of a limit, computational techniques, limits at infinity, infinite limits ;continuity; limits and continuity of trigonometric functions; the derivative: techniques of differentiation, derivatives of trigonometric functions; the chain rule; implicit differentiation; differentials; Roll's Theorem; the mean value theorem; the extended mean value theorem; L'Hopital's rule; increasing and decreasing functions; concavity; maximum and minimum values of a function; graphs of functions including rational functions (asymptotes) and functions with vertical tangents (cusps); antiderivatives; the indefinite integral; the definite integral; the fundamental theorem of calculus ; the area under a curve; the area between two curves; transcendental functions: inverse functions, logarithmic and exponential functions; derivatives and integrals; limits (the indeterminate forms); hyperbolic functions and their inverses; inverse trigonometric functions; some techniques of integration.		
0319131	**Principles of Statistics**	**Credit hours: 3**
Prerequisite:		
Describing statistical data by tables, graphs and numerical measures, Chebychev's inequality and the empirical rule, counting methods, combinations, permutations, elements of probability and random variables, the binomial, the Poisson, and the normal distributions, sampling distributions, elements of testing hypotheses, statistical inference about one and two populations parameters.		
0329101	**General Physics-1**	**Credit hours 3**
Prerequisite:		
Motion in One Dimension, Vectors, Motion in Two Dimensions, The Laws of Motion, Circular Motion and Other Applications of Newton's Laws, Work and Kinetic Energy, Potential Energy and Conservation of Energy, Linear Momentum and Collisions, Rotation of a Rigid Object About a Fixed Axis, Rolling Motion and Angular Momentum.		
0305101	**General Geology**	**Credit hours: 3**
Prerequisite:		
This Course provides a base of general earth science knowledge, which would help the student, better understand the natural world of which we are an inseparable part. This course includes four major units as follows: Earth materials: Earth and the universe; Minerals; Rocks (Igneous, Sedimentary, and metamorphic); Processes that shape the earth surface: Weathering and Soils; Mass wasting; Surface and ground water; Volcanic Activity; Wind and Deserts; The Evolving Earth: Rock Deformation; Earthquakes; Plate Tectonics; Geologic Time scale; Fluid spheres: Oceans; Atmosphere.		
0304493	**Graduation Project**	**Credit hours: 2**
Prerequisite: successfully finished 100 credit hours		
This course gives students the opportunity to apply the knowledge he/she gained from the program courses in one project. The instructor will teach the students how to use search engines to find scientific articles and the skills of scientific presentation. Then, the student will conduct a graduation project, in which he/she has three options: the student can do a research project in the lab, or a computer based-research project (bioinformatics or other software/databank-based analysis), or a literature review and comparative data analysis in a certain topic or technique(s) in any of the biological disciplines such as biochemistry, microbiology, molecular biology....etc. In all cases, the student needs to		

write a report and present his/her work at the end of the semester in front of classmates and the instructor. During the course, the students will be introduced to the basic concepts and the different topics of Biorisk Management.		
0304486	**Introduction to Bioinformatics**	**Credit hours: 2**
Prerequisite: 1931102, 0304483 or concurrently		
This course introduces basic concepts and tools in the field of bioinformatics with a focus on developing the student basic skills for working with large biological data sets. Students will be introduced to; key concepts and bioinformatic algorithms, the history of bioinformatics, bioinformatics applications, biological databases and information retrieval, basics of using command line and Python, pairwise and multiple sequence alignment, phylogenetic trees construction, score matrices calculations, statistical evaluation of alignment scores, measures of classification performance, and prediction of protein secondary structure from amino acid sequence, prediction of tertiary structure of proteins by modelling. The course also reviews some basics of biochemistry and molecular biology in particular the concepts of genomes and protein's structure and function.		
0334332	**Cell Dynamics**	**Credit hours: 2**
Prerequisite: 0304232		
This course aims to understand how cells can move and how cell movement is directed and organized to allow single cells, small groups and entire cell fields to migrate. Students will learn how cells interact with other cells and how the extracellular matrix allowing for tissue formation and maintenance. The course also reviews spatial organization within the cell, how cellular asymmetry and polarity can be created and maintained, and why this can be important for cell function. The course also aims to understand the homeostasis mechanisms that allow cells to adapt to changes in development and cellular physiology.		
0304448	**Introduction to Microbial Pathogenesis**	**Credit hours: 2**
Prerequisite:		**0334341**
This course will address concepts related to the pathogenesis of infectious diseases within the framework of host cell characteristics. It will introduce various human pathogens, outlining their virulence, and delve into how pathogens engage with their host cells, as well as how host cells defend themselves against invading microorganisms. The curriculum will cover topics such as bacterial toxins and secretion types and mechanisms, microbial invasion and intracellular parasitism, manipulation of host cell functions, induction of cell death by pathogens, innate defense mechanisms of the host, autophagy, inflammation, sepsis, and advancements in microbial genomics, including vaccines, and anti-infective developments.		
0304391	**Applied Biostatistics and Biological Experimental Design**	**Credit hours: 2**
Prerequisite: 0319131 + 0344221		
This course covers the methods, software, theory, and philosophy used in biological experimental design and contemporary biostatistics, drawing examples from various biological disciplines, including ecology, physiology, genomics, cell biology, molecular biology, and more. The course presents the fundamental processes for designing, collecting, and analyzing biological data, exploring different ways for students to convert data into information and examining how this process aligns with decision-making aspects in the life sciences. Topics covered include basic data science and visualization, hypothesis testing and model building, analysis of variance (ANOVA), linear regression, multivariate statistics, power analysis, and basic random effects models, with a focus on using statistical software such as GraphPad Prism and SPSS to apply these methods to real biological data. The course complements traditional analytical skills course by delving into the diverse scientific thinking methods applied in biology, ranging from tightly controlled laboratory experiments to non-repetitive field surveys. It offers an opportunity to enhance handling of basic data and integrate it within the framework of scientific thinking to address biological issues, encouraging students to refine their critical thinking, evaluation, and experimental design skills through real-life research examples in the life sciences.		
0334444	**Introduction to Human Microbiome**	**Credit hours: 2**
Prerequisite: 0304232 & 0334341		

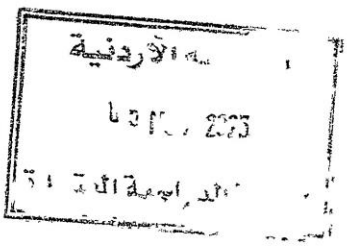
"The Human Microbiome" is an introductory course that delves into the collection of microorganisms residing in and on the human body, highlighting their captivating role in maintaining our health. Throughout the course, we will examine various microbial communities within the human body, including those in the gut, urogenital tract, oral cavity, and skin microbiota. Our exploration will encompass understanding how these communities contribute to or undergo alterations in both healthy and diseased states. Topics covered in the course include, but are not limited to, the impact of microbial communities on processes such as digestion and gut health, mood regulation, obesity, immune system function, fertility, pregnancy, and neurological disorders. Given the dynamic nature of this field, we will place special emphasis on exploring these subjects through an in-depth review of primary research articles.		
0304469	**Animal Behavior**	**Credit hours: 3**
Prerequisite: 0364361 & 0344363		
This course is about what animals do, how they do it, and why. The course aims to introduce the basic questions about animal behavior and the main techniques for answering these questions. The lectures will focus on examining the adaptive significance of behavior in an ecological context. The topics include optimal foraging, predator-prey interaction, competition, social behavior, mating systems, sexual selection, territoriality, and cooperation. The lectures will also include a mixture of delivering information and developing skills in independent learning such as case studies, exercises, and discussions. The course will also introduce the students to various methodologies and experimental approaches in animal behavior.		
0334468	**Vertebrate Natural History and Conservation**	**Credit hours: 3**
Prerequisite: 0364361 & 0344363		
The course aims to introduce the students to the vertebrate diversity and the factors that determine their current distribution and abundance. The course will explore the distribution of vertebrates will be addressed within a geographical and ecological context, how vertebrates deal with environmental stresses on physiology, morphology, feeding, breeding, and overall existence. The course will also focus on protecting the remaining vertebrate diversity, major threats to vertebrate diversity, and practical aspects of conservation, with more emphasis on the vertebrates of Jordan. Current questions of conservation-oriented research and management aimed at protecting species will be addressed.		
0304458	**Introduction to Plant Cell Wall Biology**	**Credit hours: 2**
Prerequisite: 0344221		
This course aims to teach the students the basic concepts of plant cell wall biology. The course will introduce the students to the basic structure of plant cell wall and cell wall architecture. Additionally, the course will introduce the students to the plant cell wall biosynthesis and assembly, and the role of cell wall in plant growth and cell differentiation. Finally, the course will cover briefly the plant cell walls as sources of food, feed, fiber, and fuel, and their genetic improvement.		
0304494	**Employability Readiness**	**Credit hours: 6**
Prerequisite: Exclusively taught during Summer semester after studying 90 credit hours		
This course focuses on training students on the use of modern educational techniques, formulating learning outcomes, taking into account individual differences when writing exam questions and linking them to the required learning outcomes, and presenting information in a clear manner. The course also trains students on the basics of conducting scientific experiments, collecting and analyzing data using mathematical and statistical methods, and using scientific equipment. The course also focuses on developing the student's professional skills, including resume writing, job interviewing, effective communication, and calm and logical dialog. In addition to stimulating constructive criticism and the ability to solve issues, this course trains students on the ability to adapt in different environments and changes of individuals and work. This course also enhances students' ability to make decisions and learn how to use digital devices, search and exchange information.		
0304103	**General Biology for Life Sciences Students**	**Credit hours: 3**
Prerequisite:		
This introductory biology course covers the fundamental principles of biology, focusing on the chemical basis of life, cell structure and function, energy transformations, and cellular processes. The course is designed to provide a comprehensive overview of biological concepts and processes, preparing students for advanced study in agricultural sciences.		

0334105	Cell Biology for Dental Students	Credit hours: 3
Prerequisite:		**0349101**
The course is designed to introduce students to the basics of cellular biology. Students will explore major concepts in cell biology including eukaryotic cell structure and function, the cellular use of biomolecules, membranes, signal transduction, motility, the extracellular matrix, cell interactions, regulation, and death. Examples of well-known disease mechanisms are discussed. Therapeutic approaches and relationships to underlying disease mechanisms are included to illustrate how interventions at the cell biological level restore normal function. Students will engage in techniques appropriate to the study of cells and cellular processes and gain experience in experimental design, and data analysis and interpretation.		
0309103	**Modern Digital Skills**	**Credit hours: 3**
Prerequisite:		**1932099**
This course aims to enhance the students' digital knowledge and skills, placing a spotlight on Artificial Intelligence (AI) and cutting-edge digital technologies, to equip them for current and future jobs. The course allows participants to learn the foundations of the digital world and enable them to better utilize technology to advance their careers. The course material includes, but is not limited to: types of data, information, and content; digital identity; digital content creation in all forms; cybersecurity and safety; collaborating and working online; global trends and technologies such as Big Data, Cloud Computing, Artificial Intelligence, Internet of Things, Gamification; Balanced use of technology and social media; and digital career competencies needed in the current job market. Aligned with Education for Sustainable Development (ESD) and Sustainable Development Goals (SDGs), it instills responsibility for inclusive and sustainable practices in the digital era. As the digital landscape evolves, the course content is continuously updated to keep students well-prepared and informed about emerging digital technologies shaping the future. The course employs experiential and active learning methods, including interactive lectures, collaborative activities, and the use of digital tools. Assessment methods include exams, assignments, practical tasks and the integration of professional certifications, providing students with hands-on experience and industryrecognized credentials that enhance their career prospects.		

Courses offered by Biological Sciences Department:

Course Number	Course Title	Type of learning (face-to-face | blended | online)	Contact Hours		Credit Hours	Prerequisites
			Theoretical	Practical		
0304103	General Biology for Life Sciences Students	**face-to-face**	3	-	3	-
0349101	General Biology (1)	**face-to-face**	3	-	3	-
0334105	Cell Biology for Dental Students	**face-to-face**	3	-	3	0349101
0304102	General Biology (2)	**face-to-face**	3	-	3	0349111+0349101
0349111	Practical General Biology	**face-to-face**	-	3	1	0349101 or concurrently
0304232	Cell Biology	**face-to-face**	3	-	3	0304102
0334251	General Botany	**face-to-face**	3	3	4	0304102
0334261	General Zoology	**face-to-face**	3	3	4	0304102
0304281	Genetics	**face-to-face**	2	3	3	0349101
0344221	Biochemistry	**face-to-face**	3	3	4	0339233
0334341	General Microbiology	**face-to-face**	3	3	4	0304102+0304232
0344351	Plant Anatomy and Development	**face-to-face**	2	3	3	0334251

0334352	Plant Physiology	**face-to-face**	2	3	3	0334251
0364361	Vertebrate Anatomy	**face-to-face**	2	3	3	0334261
0344363	Physiology	**face-to-face**	3	3	4	0304232
0334382	Molecular Biology	**face-to-face**	2	3	3	0304281+ 0344221
0304483	Biotechnology	**face-to-face**	3	-	3	0334382+ 0334341
0304465	Evolution	**face-to-face**	3	-	3	0334251+ 0334261
0334471	Ecology	**face-to-face**	2	3	3	0334251+ 0334261
0344443	Immunology	**face-to-face**	2	3	3	0344221+0334341
0304493	Graduation Project	**face-to-face**	2	-	2	Successfully finished 100 credit hours
0304494	Employability Readiness	**face-to-face**	5	3	6	Exclusively taught during Summer semester after studying 90 credit hours
0334282	Human Genetics	**blended**	3	-	3	0304281
0364462	Developmental Biology	**face-to-face**	2	3	3	0304232+0364361
0344421	Metabolism	**face-to-face**	3	-	3	0344221
0334432	Histology	**face-to-face**	2	3	3	0304232
0334441	Applied Microbiology	**face-to-face**	2	3	3	0334341
0334452	Taxonomy of Flowering Plants	**face-to-face**	2	3	3	0334251
0304468	Principles of Endocrinology	**face-to-face**	2	-	2	0344363
0304473	An Introduction to Marine Sciences	**online**	3	0	3	0334261
0334332	Cell Dynamics	**face-to-face**	2	-	2	0304232
0304448	Introduction to Microbial Pathogenesis	**face-to-face**	2	-	2	0334341
0334444	Introduction to Human Microbiome	**face-to-face**	2	-	2	0304232+0334341
0304469	Animal Behavior	**face-to-face**	3	-	3	0364361+0344363
0334468	Vertebrate Natural History and Conservation	**blended**	3	-	3	0364361+0344363
0304458	Introduction to Plant Cell Wall Biology	**face-to-face**	2	-	2	0344221
0304486	Introduction to Bioinformatics	**face-to-face**	1	3	2	1931102+ 0304483 or concurrently
0304391	Applications in Biostatistics and Biological Experimental Design	**face-to-face**	2	-	2	0319131+0344221



Inclusion rates in the program:

A. Courses that will be taught on the principle of full online:

Total hours that will be taught on the principle of full online in this program: (12 hour).

The percentage achieved for the subjects that will be taught on the principle of full online in this program: (9%)

B. Subjects to be taught on the blended learning principle:

The total number of hours that will be taught on the principle of blended learning in this program: (27 hours)

Percentage achieved for subjects that will be taught on the principle of blended learning in this program: (20%)

C. Face-to-face learning courses:

Number of hours of face-to-face education: (97 hours).

Percentage	Number of Hours	Elective Specialty Requirement	Obligatory Specialty Requirement	Obligatory School Requirement	Elective University Requirement	Obligatory University Requirement	
71%	97	7	69	15	0	6	Face – to - face
9%	12	3	0	3	0	6	On line
20%	27	9	0	3	9	6	Blended
100%	136	19	69	21	9	18	Number of Hours