

Program: Biological Sciences  
Degree Offered: Ph.D.



## STUDY PLAN

### I. GENERAL RULES AND CONDITIONS:

- 1- This plan conforms to the valid regulations of programs of graduate studies.
- 2- Areas of specialty of admission in this program:  
-Holders of the Master of Science in:  
(a) Biological Sciences. (b) Biological and Medical Analysis.  
(c) Agricultural Sciences. (d) Medicine or Veterinary Medicine.  
(e) Pharmacy. (f) Biochemistry, Microbiology, or equivalent.  
(g) Environmental Management (On Condition that Bachelor degree accepted).

### II. SPECIAL CONDITIONS: NONE.

### III. The plan consists of (54) credit hours distributed as follows:

#### 1. Obligatory Courses (18 credit hours):

Course No.	Course Title	Credit hrs.	Pre-req.
0304922	Chemistry of Proteins and Enzymes	3	-
0304924	Biotechnology of Living Organisms	3	-
0304942	Microbial Physiology	3	-
0304952	Biodiversity	3	-
0304964	Advanced Vertebrate Biology	3	-
0304965	Molecular Physiology	3	-

#### 2. Elective Courses: Studying (18 credit hours) from the following:

Course No.	Course Title	Credit hrs.	Pre-req.
0304901	Ecology of Marine Communities	3	-
0304921	Bioenergetics	3	-
0304931	Molecular Hematology	3	-
0304932	Biotechnology in Immune Chemistry	3	-
0304945	Advanced Applied Microbiology	3	-
0304953	Plant Hormones and Tissues Culture	3	-
0304954	Medicinal Plants	3	-
0304961	Muscle Biology	3	-
0304962	Ecological Physiology	3	-
0304963	Amphibia & Reptiles	3	-
0304971	Plant Ecology	3	-
0304981	Cytogenetics	3	-
0304982	Gene Therapy	3	-

#### 3. Passing the qualification exam (0304998)

#### 4. Submission of approved thesis (18 credit hours) (0304999)



0304901 **Ecology of Marine communities**

The unity and diversity of marine communities. Distribution of phyto-and zooplankton and their chemical composition, and production. Dissolved and particulate organic matter and processes of formation. Feeding of plankton; detritus and its role as a food source. Distribution, diversity and abundance of the benthos and benthic secondary production. Chemical composition of benthic sediments, Patterns of migration and production of nekton, its population growth and production. Utilization, of marine production strategies of survival.

0304921 **Bioenergetics**

This course aims to inform students about energy metabolism in biological systems, starting from light, the ultimate source of energy in this planet and ending with its export to the surrounding as entropy and light. It also discusses the various stages of energy transformation, transduction and conservation especially in ATP molecules and the mechanisms of its formation and its utilization in driving various cellular activities. In this course we discuss also the process of photosynthesis and cellular respiration of main organic nutrients that re used as a source of energy which are: carbohydrates, lipids and amino acids.

0304922 **Protein and Enzymes Chemistry**

Proteins and enzymes from the following points: isolation, characterization, amino acids and their reactions, protein conformation, enzyme classification, factors affecting activity, kinetic, active sites, inhibition. Michaelis enzymes, metabolic pathway enzymes, activation energy and its determination, analytical methods of measuring reaction velocities, enzyme regulation and isozymes.

0304924 **Biotechnology of Microorganisms**

This course deals with the fundamentals of molecular biotechnology to include molecular research procedures and manipulation of gene expression. Use of microbial systems for commercial products synthesis i.e. pharmaceutical proteins, antibiotics, biopolymers, vaccines and therapeutic agents, bioremedations, and biocontrol agent development. Transgenesis in animals and plants and their use, genetically modified food.

0304931 **Molecular Hematology**

Focus on the clinical relevance of molecular biology in hematology and the impact made by molecular research on understanding the pathogenesis of a variety of blood disorders. It also focuses on the balance between descriptions of basic mechanisms and discussions of their implications on blood.



0304932 **Biotechnology in Immune Chemistry**

The course aims to introduce Biological Graduate Students to immunological techniques much needed in various fields of biological research Such as Flowcytometry, monoclonal antibody production, ELISA, Immunohistochemistry and Immunoblotting.

0304942 **Microbial Physiology**

Biochemistry of microbial metabolism, composition and function of pacterial cell parts, physiology of nutrition and growth, different factors which affect biological activities of microganisms.

0304945 **Advanced Applied Microbiology**

The course will study certain microorganisms used in industry and focuses on ways to genetically modifying it. Also the course will cover the broad subject of Biotechnology and its utilization in the production of secondary products such as organic acids, antibiotics, vitamins,, hormones, enzymes and mycotoxins. Moreover, the course will discuss the role of some microorganisms in the processes of biorehabilitation and bioremediation to achieve a healthy environment.

0304952 **Biodiversity**

Concepts; genetic diversity, species diversity, ecosystem diversity, biodiversity meaning and measurement, biodiversity changes in time and space, loss of biodiversity, causes of loss of biological diversity maintaining biological diversity: *In situ* conservation, *ex situ* conservation, why conserve biological diversity, biological diversity as a source: Food, pharmaceutical, none resources of biological diversity: ethics, aesthetics.

0304953 **Plant hormones and Tissue culture:**

The course will cover the chemistry of plant hormones, its transport and its receptors. Also, will cover the role of hormones in the regulation and homeostasis of certain processes that occurs within plants. In addition, the course will discuss issues of growing calluses *in vitro* to produce plant tissues and organs.

0304954 **Medicinal and Herbal Plants**

The course covers the medicinal plant and herbs and its contribution for improving human lives on all global, regional and local levels. The course will cover plants used in folkloric medicine and its applications in the current drug industry. The plants discussed are the ones in Jordan and in the Arab world, taking in consideration their elaborate use in the Arabic and Islamic cultures.



0304961 **Muscle Biology**

The types of muscles and its genetic origins, the molecular structure of the muscle cells. the structure and function of the contractile reticulum and the cell environment necessary for the contractile reticulum. The physiology of muscle contraction. Biological elements and drugs that affect muscle contraction.

0304962 **Environmental Physiology**

The course covers the relationship between the physiology of animals and animal behavior. Also, the course will cover the physiological adaptations of organisms to harsh and extreme environments. The first part will cover the mechanism of biophysical exchange between animals and their environments. The second part will focus on the developmental strategies for adaptations to the following criteria: osmotic, nutritional, metabolic, thermoregulation, respiration, and reproductive cycles.

0304963 **Amphibians and Reptiles**

This course discusses developmental stages and life history, morphology, anatomy, classification, functional adaptations and evolutionary relationships. Always structural and functional approaches will be considered. Moreover, their taxonomy, habitat and geographical distribution will be tackled. Analyzing of the environmental factors determining the distribution of reptilian species in Jordan.

0304964 **Advanced Vertebrate Biology**

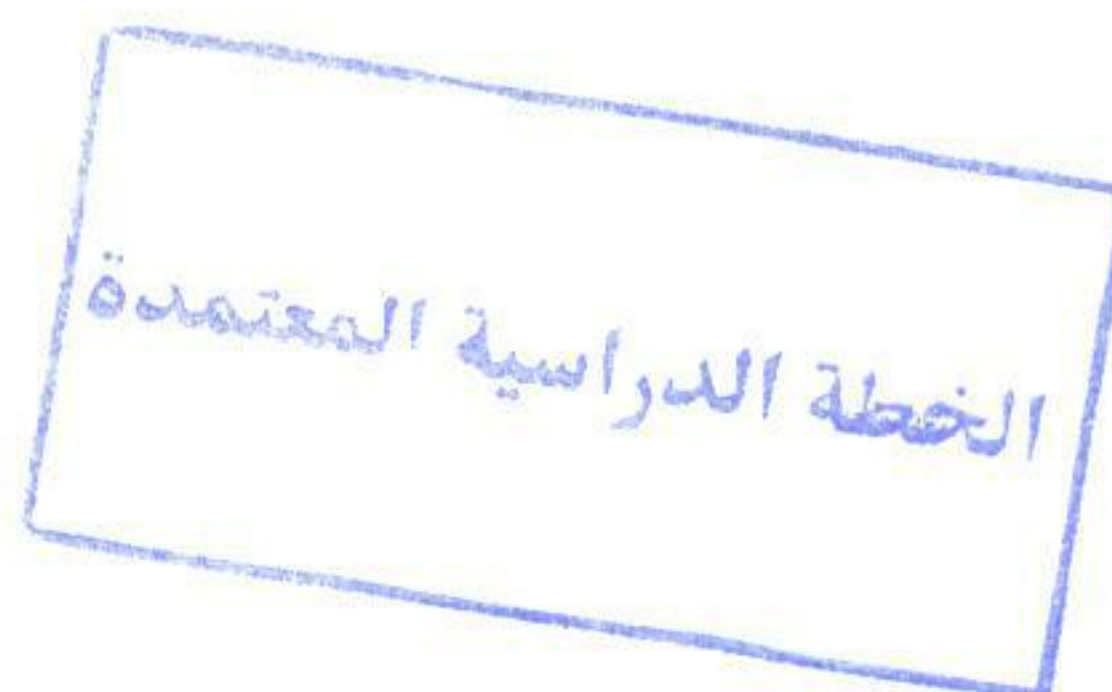
This course exposes the students to various body systems in the vertebrate classes with emphasis on mammals. Also, it integrates embryonic development, morphology, structural and functional evolutionary approaches. It considers the adaptational changes in vertebrates to different habitats.

0304965 **Molecular Physiology**

Molecular aspects of physiology such as membrane biophysics, signal regulation and transduction, membrane excitabilities and ion channels, patch-clamp and voltage clamp techniques and their applications in the analysis of membrane current ion channels as targets for drugs and toxins, synaptic transmission and sensory transduction as well as the molecular bases for the neural musculature cell functions.

0304971 **Plant Ecology**

Plant population and community ecology. Concepts and theory applying to plant single populations, species interactions (e.g competition, herbivory)



mutualistic relationships,...etc.). and the structure and dynamics of multi – species plant communities.

**0304981 Cytogenetics**

The course studies the structure, number and function of chromosomes with in a cell and in an individual and the their involvement in congenital disorders. The course will focus on tissue culture techniques and the preparation of chromosomes for karyotyping and the localization of specific genes using in situ hybridization. Also, the course will cover human genetics and genetic disorders such as mental retardation, congenital deformities. Prevention of genetic disorders, genetic counseling and prenatal diagnostic tests.

**0304982 Gene Therapy**

Construction and analysis of recombinant DNA, Gene delivery and the expression systems. types of gene therapy and their applications. DNA vaccination and the immune response to gene therapy. Also, the course will deal with the important aspects of bioethics.

