

**Program: Biological Sciences**  
**Degree Offered: Master \ Thesis Track**

**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 Bachelor 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.

II. SPECIAL CONDITIONS: NONE.

III. The plan consists of (33) credit hours distributed as follows:

**1. Obligatory Courses (15 credit hours):**

Course No.	Course Title	Credit hrs.	Pre-req.
0301737	Biostatistics	3	–
0304711	Biochemistry	3	–
0304741	Advanced Microbiology	3	-
0304751	Advanced Plant Physiology	3	–
0304761	Advanced Animal Physiology	3	–

**2. Elective Courses: Studying (9) credit hours from the following:**

Course No.	Course Title	Credit hrs.	Pre-req.
0304712	Metabolism	3	-
0304716	Molecular Biology	3	-
0304731	Advanced Hematology	3	–
0304733	Advanced Immunology	3	–
0304742	Microbial Ecology	3	-
0304744	Advanced Virology	3	-
0304752	Advanced Plant Taxonomy	3	–
0304762	Advanced Marine Biology	3	-
0304763	Developmental Biology	3	-
0304767	Advanced Parasitology	3	-
0304771	Ecosystems	3	-

**3. Dissertation: (9) Credit hours (0304799).**

**Program: Biological Sciences**  
**Degree Offered: Master \ Non-Thesis Track**

**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 Bachelor 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.

II. SPECIAL CONDITIONS: NONE.

III. The plan consists of (33) credit hours distributed as follows:

**1. Obligatory Courses (21 credit hours):**

Course No.	Course Title	Credit hrs.	Pre-req.
0301737	Biostatistics	3	-
0304711	Biochemistry	3	-
0304716	Molecular Biology	3	-
0304741	Advanced Microbiology	3	-
0304751	Advanced Plant Physiology	3	-
0304761	Advanced Animal Physiology	3	-
0304781	Advanced Cytology	3	-

**2. Elective Courses: Studying (12 credit hours) from the following:**

Course No.	Course Title	Credit hrs.	Pre-req.
0304712	Metabolism	3	-
0304731	Advanced Hematology	3	-
0304733	Advanced Immunology	3	-
0304742	Microbial Ecology	3	-
0304744	Advanced Virology	3	-
0304752	Advanced Plant Taxonomy	3	-
0304754	Plant Tissue Culture	3	-
0304757	Advanced Mycology	3	-
0304762	Advanced Marine Biology	3	-
0304763	Developmental Biology	3	-
0304767	Advanced Parasitology	3	-
0304771	Ecosystems	3	-

**IV. Pass the comprehensive exam (0304798)**

**Program: Biological Sciences**  
**Degree Offered: Master**  
**Course description**

**0304711      Advanced Biochemistry**

Aqueous solutions, acids, bases, buffers, titration's and functional groups, the covalent structure of proteins including their primary and three dimensional structure, protein folding, dynamics and evolution, techniques of macromolecular isolation and purification, hemoglobin i as an example of protein function in microcosm.

**0304712      Metabolism**

Metabolic pathways (anabolism and catabolism) of the major organic substances which are carbohydrates, lipids, proteins and nucleic acids with the emphasis on the mechanisms of energy harvesting and its various transformation, and enzymes and their cofactors. Various mechanisms of regulation and organs specialization.

**0304716      Molecular Biology**

Introduction to chemistry and conformation of DNA, homologous recombinations, site specific recombination and transposition, gene families, recombinant DNA technology, DNA-Protein interaction, regulation of gene expression, regulation of cell cycle. Oncogenes and tumor suppressor genes.

**0304731      Advanced Hematology**

Scientific basis of blood physiology and pathophysiology that are related to blood components, blood cells, hemoglobin, red cell membranes, nutritional and factorial requirements for hematopoiesis, homeostasis, blood theology and flow properties, blood substitutes and recent advances in hematology.

**0304733      Advanced Immunology**

This course addresses cutting edge concepts of basic Immunology. Concept include reviews of basic component of the immune system, mechanisms of immune response both humoral and cell mediated, lymphocyte specific receptor development, ontogeny of lymphocytes. Also, the course will deal special topics in immunology such as immunotoxicology: tumor immunology; immune-deficiency, both congenital and acquired; different types of hypersensitivity as well as transplantation immunology. Recent review articles as well as key research articles in the fields listed above.

**0301737      Environmental and Biostatics:**

Organizing and summarizing data; sampling methods; statistical distributions (Binommmial, Poisson, Normal,  $X^2$ , t, F); sample methods and distributions, estimation and hypotheses about means, proportions and variances based on large and small samples; analysis of variance (One-Way, factorial design; latin square); regression analysis (simple and multiple), non-parametric methods, correlation coefficient, environmental and biostatistic applications.

**0304741      Advanced Microbiology**

Microbial evolution and taxonomy, brief characteristic of each bacterial group, Microbial nutrition and growth; metabolic diversity, microbial ecology, microbial interactions.

**0304742      Microbial Ecology**

The course will cover, microbes of soil and aquatic environments. Commensalisms between microorganisms. Microbes in extreme environments such as thermophiles, acidophiles, alkalophiles, halophiles and barophiles. The course will discuss the effect of starvation, radiation and environmental pressure on microorganisms. Moreover the course will cover the role of microorganisms in environmental pollution and its prevention.

**0304744      Advanced Virology**

Structure and assembly of viruses, genome organization, virus replication and gene expression, viral infection, viral persistence, viruses and the immune system, viruses and cancer, antiviral drug therapy, drug resistance in viruses, vaccination, prions.

**0304751      Advanced Plant Physiology**

Plant water relationship with special emphasis on osmoregulation and water stress in higher plants, plant light interaction including the role of light in photosynthesis, photoperiodism and photomorphogenesis, plant hormones with special reference to their metabolism, transport and mode of action; nitrogen metabolism and biological nitrogen fixation, secondary plant products and defense compounds, development physiology with emphasis on juvenility, senescence and abscission.

**0304752      Advanced Plant Taxonomy**

Modern applications used in plant taxonomy. Information on morphology, anatomy, pollen grains, chromosomes, genetics, ecology, geographic distribution and phytochemistry. These pieces are integrated to conclude a taxonomic system relating plant groups and their evolution (Plants of Jordan are used).

**0304754      Plant tissue culture**

It aims at studying laboratory requirements and general techniques, tissue culture media, cell culture, cellular totipotency, somatic embryogenesis, haploid production, triploid production, cytogenetic studies, *In Vitro* pollination, zygotic embryo culture, protoplast isolation and culture, somatic hybridization, production of pathogen-free plants, clonal propagation, germ plasm storage, the importance of using tissue culture techniques in the conservation of rare and endangered plant species, and developing the ornamental and economic plants.

**0304757      Advanced Mycology**

Ascomycetes and the deuteromycetes: classification, ecology, reproduction and their secondary metabolites, particularly their toxigenic metabolites (i.e. aflatoxins and others); economic importance of these fungi, including their industrial uses.

**0304761      Advanced Animal Physiology**

Basic concepts in the physiology of the nervous, heart and circulatory, respiratory, urinary and acid-base balance, digestive, endocrine systems and reproductive physiology.

**0304762      Advanced Marine Biology**

The course discusses the unity and diversity of marine systems with special emphasis on marine production of plankton, benthos and nekton. It also discusses the role of detritus as a food source as well as the utilization of marine production by man and the strategies for survival of marine organisms .

**0304763      Developmental Biology**

Gametogenesis, types and mechanisms of fertilization, molecular basis of fertilization, acrosomal reactions, capacitation, cortical granule reactions, molecular basis of morphogenesis, role of extracellular matrix in differentiation, epithelial-mesenchymal interactions and mechanisms of embryonic induction.

**0304767      Advanced Parasitology:**

The parasites and parasitism, host-parasite interactions in terms of pathogenesis, mechanisms of immunity to parasites, parasite evasion mechanisms and survival strategies, and parasite-intermediate host interactions. Parasite biology in terms of physiology, growth, reproduction and development of selected parasites. Present's studying of parasites from a molecular point of view and immunoprophylaxis of parasitic infections.

**0304771      Ecosystems**

Types of ecosystems of the world and how do these ecosystems distribute over the globe. Major processes taking place in ecosystems, such as nitrogen cycle, decomposition, mineralization and evapo-transpiration, ... etc. Problems affecting ecosystems such as nitrogen saturation, climate change and desertification.

**0304781      Advanced Cytology**

Cellular structure and function. New methodology in studying cells. Molecular structure and function of biological membranes, internal cellular organization and the synthesis of macromolecules. Extracellular matrix, cell-cell interaction and chemical signaling between cells, hormones and receptors. Cytoskeleton, intracellular transport, cellular motility and contractility. Cellular and molecular aspects of cancer, cell aging and death.