

Study Plan for the Bachelor's Degree In Biological Sciences

The Department of Biological Sciences at Yarmouk University offers a Bachelor's Degree on the completion of the following requirements:

1. The fulfillment of the conditions stated in the regulations of awarding the Bachelor's Degree at Yarmouk University No. (2) for the year 1991 and its amendments issued in accordance with the bylaws of awarding academic degrees and diplomas at Yarmouk University No. 76 for the year 1976.
2. University course requirements stated under the above regulations.
3. Faculty of Science course requirements stated earlier.
4. Department course requirements (86 Credit Hrs.):

I. **Single Major** (86 Credit Hrs.):

(1) Obligatory courses: (65 Credit Hrs).

Bio. 102, Bio. 105, Bio. 106, Bio. 107, Chem. 102, Chem. 105, Chem. 106, Chem. 215, Chem. 216, Bio. 215, Bio. 216, Bio. 221, Bio. 227, Bio. 251, Bio. 304, Bio. 317, Bio. 333, Bio. 341, Bio. 345, Bio. 352, Bio. 415, Bio. 425, Bio. 432, Bio. 448, Bio. 453.

(2) Elective courses: (21 Credit Hrs.).

a - (15 Credit Hrs.) chosen from the following courses:

Bio. 222, Bio. 223, Bio. 261, Bio. 305, Bio. 306, Bio. 307, Bio. 313, Bio. 314, Bio. 319, Bio. 322, Bio. 323, Bio., 328, Bio. 337, Bio. 346, Bio. 381, Bio. 401, Bio. 414, Bio. 417, Bio. 418, Bio. 424, Bio. 428, Bio. 429, Bio. 431, Bio. 433, Bio. 442, Bio. 444, Bio. 445, Bio. 450, Bio. 455, Bio. 457, Bio. 461, Bio. 471, Bio. 491, Bio. 492, Bio. 499.

b - (6 Credit Hrs.) chosen from the following courses:

Phys. 102, Phys. 202, Phys. 103, Chem. 231, Stat. 111, Stat. 201, Stat. 211, Math. 241, Geo. 102, Geo. 210, Geo. 215, Geo. 252, Env. 102A, Env. 211A, Env. 251A, Env. 252, Cs. 117, Cs. 130, Cis. 103, Mis. 120.

**Table (1)
Single Major Credit Hours**

| Requirements | Obligatory | Elective | Total |
|--------------|------------|----------|-------|
| University | 21 | 6 | 27 |
| Faculty | 21 | - | 21 |
| Department | 65 | 21 | 86 |
| Total | 107 | 27 | 134 |

II. **Major / Minor** (86 Credit Hrs.):

(1) Major (in Biology) (65 Credit Hrs.):

a – Obligatory courses (60 Credit Hrs.): same as obligatory courses for single major.

Bio. 102, Bio. 105, Bio. 106, Bio. 107, Chem. 102, Chem. 105, Chem. 106, Chem. 215, Chem. 216, Bio. 215, Bio. 216, Bio. 221, Bio. 227, Bio. 251, Bio. 304, Bio. 317, Bio. 333, Bio. 345, Bio. 352, Bio. 415, Bio. 425, Bio. 432, Bio. 448.

b – Elective courses (5 Credit Hrs.): **chosen from the following courses:**

Bio. 491, Bio. 453, Phys. 102, Phys. 202, Phys. 103, Chem. 231, Stat. 111, Stat. 201, Stat. 211, Math. 241, Geo. 102, Geo. 210, Geo. 215, Geo. 252, Env. 102A, Env. 211A, Env. 251A, Env. 252, Cs. 117, Cs. 130, Cis. 103, Mis. 120.

(2) Minor (21 Credit Hrs.) in any of the Departments of the Faculty of Science and the departments of the Faculty of Information Technology and Computer Sciences according to the minor course listing of each Department.

Table (2)
Major / Minor Credit Hours

| Requirements | Obligatory | Elective | Total |
|---------------------|-------------------|-----------------|--------------|
| University | 21 | 6 | 27 |
| Faculty | 21 | - | 21 |
| Department (Major) | 60 | 5 | 65 |
| Minor | - | - | 21 |
| Total | | | 134 |

III. Minor in Biological Sciences (21 Credit Hrs.):

(1) Obligatory courses (15 Credit Hrs.): Bio. 102, Bio. 107, Bio. 251, Bio. 345, Bio. 448.

(2) Elective courses (6 Credit Hrs.) chosen from the following courses:

Bio. 215, Bio. 216, Bio. 227, Bio. 304, Bio. 323, Bio. 333, Bio. 415, Bio. 425.

Table (3)
The Significance of the Second Digit

| Title | Num. | Title | Num. |
|----------------------|-------------|--------------------------------------|-------------|
| General Biology | 0 | Molecular and Cellular Biology | 5 |
| Zoology | 1 | Microtechniques and Histology | 6 |
| Botany | 2 | Marine Sciences | 7 |
| Microbiology | 3 | Research, Seminar and Special Topics | 9 |
| Genetics and Ecology | 4 | | |

Table (4)
Courses Offered by the Department of Biological Sciences
for the Bachelor's Degree in Biology

| No. | Course No. | Course Title | Weekly Hours | | Cr. Hrs. | Prerequisites |
|-----|------------|---|--------------|-----|----------|------------------------------------|
| | | | Theory | Lab | | |
| 1 | Bio. 100 | Public Health and Awareness | 3 | - | 3 | None Science Students |
| 2 | Bio. 101 | General Biology (1) | 3 | - | 3 | - |
| 3 | Bio. 102 | General Biology (2) | 3 | - | 3 | Bio. 101 |
| 4 | Bio. 103 | Human Biology | 3 | - | 3 | None Science Students |
| 5 | Bio. 104 | Principles of Nutrition | 3 | - | 3 | None Science Students |
| 6 | Bio. 105 | General Biology Practical (1) | - | 3 | 1 | Bio. 101 or concurrent |
| 7 | Bio. 106 | General Biology Practical (2) | - | 3 | 1 | Bio. 105 |
| 8 | Bio. 107 | General Biology (3) | 3 | - | 3 | Bio. 101 |
| 9 | Bio. 108A | Human Biology | 3 | - | 3 | For Biomedical Systems Engineering |
| 10 | Bio. 201 | Human Anatomy and Physiology | 3 | - | 3 | None Biology Students |
| 11 | Bio. 204 | Family Health | 3 | - | 3 | None Biology Students, |
| 12 | Bio. 215 | Invertebrate Zoology | 2 | 3 | 3 | Bio. 102 |
| 13 | Bio. 216 | Comparative Vertebrate Anatomy | 2 | 3 | 3 | Bio. 102 |
| 14 | Bio. 221 | Plant Anatomy | 2 | 3 | 3 | Bio. 107 |
| 15 | Bio. 222 | Plant Taxonomy | 2 | 3 | 3 | Bio. 107 |
| 16 | Bio. 223 | Economic Botany | 2 | 3 | 3 | Bio. 107 |
| 17 | Bio. 227 | Plant Morphology | 2 | 3 | 3 | Bio. 107 |
| 18 | Bio. 251 | Cell Biology | 3 | - | 3 | Bio. 102 |
| 19 | Bio. 261 | Microtechniques | 1 | 6 | 3 | Bio. 102 & Bio. 107 |
| 20 | Bio. 266 | Basic Histology and Histological Techniques | 2 | 3 | 3 | None Biology Students |
| 21 | Bio. 304 | Biochemistry | 2 | 3 | 3 | Chem. 215 & Bio. 251 |
| 22 | Bio. 305 | Radiation Biology | 3 | - | 3 | Bio. 251 |
| 23 | Bio. 306 | Biodiversity | 2 | 3 | 3 | Bio. 102, Bio. 107 |
| 24 | Bio. 307 | Hematology | 2 | 3 | 3 | Bio. 304 |
| 25 | Bio. 313 | Fish Biology | 2 | 3 | 3 | Bio. 216 |
| 26 | Bio. 314 | Parasitology | 2 | 3 | 3 | Bio. 215 |
| 27 | Bio. 317 | Developmental Biology | 2 | 3 | 3 | Bio. 216 & Bio. 251 |
| 28 | Bio. 319 | Arthropoda | 2 | 3 | 3 | Bio. 215 |
| 29 | Bio. 322 | Plant Embryology | 2 | 3 | 3 | Bio. 221 |
| 30 | Bio. 323 | Flora and Vegetation of Jordan | 2 | 3 | 3 | Bio. 227 |

Table(4) (Continued)

| No. | Course No. | Course Title | Weekly Hours | | Cr. Hrs. | Prerequisites |
|-----|------------|-----------------------------------|--------------|-----|----------|---------------------|
| | | | Theory | Lab | | |
| 31 | Bio. 328 | Phycology | 2 | 3 | 3 | Bio. 227 |
| 32 | Bio. 333 | Microbiology | 2 | 3 | 3 | Bio. 251 |
| 33 | Bio. 337 | Medical Microbiology | 2 | 3 | 3 | Bio. 333 |
| 34 | Bio. 341 | Evolution | 3 | - | 3 | Bio. 216 , Bio. 227 |
| 35 | Bio. 345 | Genetics | 2 | 3 | 3 | Bio. 251 |
| 36 | Bio. 346 | Human Genetics | 3 | - | 3 | Bio. 345 |
| 37 | Bio. 352 | Molecular Biology | 2 | 3 | 3 | Bio. 251 |
| 38 | Bio. 381 | Animal Behavior | 2 | 3 | 3 | Bio. 102 & Bio. 107 |
| 39 | Bio. 401 | Biology and Society | 2 | - | 2 | Bio. 345 |
| 40 | Bio. 414 | Mammalian Reproduction | 3 | - | 3 | Bio. 317 |
| 41 | Bio. 415 | Animal Physiology | 2 | 3 | 3 | Bio. 216 |
| 42 | Bio. 417 | Endocrinology | 2 | 3 | 3 | Bio. 415 |
| 43 | Bio. 418 | Laboratory Diagnosis of Parasites | 2 | 3 | 3 | Bio. 314 |
| 44 | Bio. 424 | Lichenology | 2 | 3 | 3 | Bio. 227 |
| 45 | Bio. 425 | Plant Physiology | 2 | 3 | 3 | Bio. 221 |
| 46 | Bio. 428 | Mycology | 2 | 3 | 3 | Bio. 333 |
| 47 | Bio. 429 | Plant Pathology | 2 | 3 | 3 | Bio. 227 & Bio. 333 |
| 48 | Bio. 431 | Virology | 2 | 3 | 3 | Bio. 333 |
| 49 | Bio. 432 | Immunology | 2 | 3 | 3 | Bio. 304 |
| 50 | Bio. 433 | Industrial Microbiology | 2 | 3 | 3 | Bio. 333 |
| 51 | Bio. 442 | Plant Cytogenetics | 2 | 3 | 3 | Bio. 345 |
| 52 | Bio. 444 | Cytogenetics | 2 | 3 | 3 | Bio. 345 |
| 53 | Bio. 445 | Microbial Genetics | 2 | 3 | 3 | Bio. 333 |
| 54 | Bio. 448 | Ecology | 2 | 3 | 3 | Bio. 216 & Bio. 227 |
| 55 | Bio. 450 | Cell Physiology | 3 | - | 3 | Bio. 304 |
| 56 | Bio. 453 | Biotechnology | 2 | - | 2 | Bio. 345 |
| 57 | Bio. 455 | Bioinformatics | 1 | 6 | 3 | Bio. 352 |
| 58 | Bio. 457 | Molecular Evolution | 3 | - | 3 | Bio. 352 |
| 59 | Bio. 461 | Histology | 2 | 3 | 3 | Bio. 216 |
| 60 | Bio. 471 | Marine Sciences | 2 | 3 | 3 | Bio. 215, Bio. 216 |
| 61 | Bio. 491 | Seminar | 1 | - | 1 | 4th year level |
| 62 | Bio. 492 | Special Topics | 3 | - | 3 | 4th year level |
| 63 | Bio. 499 | Graduation Project | 3 | - | 3 | Department approval |

Guidance Plan for Biology Students

First Year

| First Semester | | Second Semester | |
|-------------------------------|--------------|-------------------------------|--------------|
| Course | Credit Hours | Course | Credit Hours |
| Bio. 101 | 3 | Bio. 102 | 3 |
| Bio. 105 | 1 | Bio. 106 | 1 |
| Chem. 101 | 3 | Chem. 102 | 3 |
| Chem. 105 | 1 | Chem. 106 | 1 |
| Obligatory course /University | 3 | Obligatory course /University | 3 |
| Obligatory course/ Faculty | 3 | Obligatory course/ Faculty | 3 |
| Elective course / University | 3 | Elective course / University | 3 |
| Total | 17 | Total | 17 |

Second Year

| First Semester | | Second Semester | |
|-------------------------------|--------------|-------------------------------|--------------|
| Course | Credit Hours | Course | Credit Hours |
| Bio. 107 | 3 | Bio. 216 | 3 |
| Bio.215 | 3 | Bio. 227 | 3 |
| Bio. 221 | 3 | Bio. 251 | 3 |
| Chem. 215 | 3 | Obligatory course /University | 3 |
| Chem. 216 | 2 | Obligatory course/ Faculty | 3 |
| Obligatory course /University | 3 | Obligatory course/ Faculty | 3 |
| Total | 17 | Total | 18 |

Third Year

| First Semester | | Second Semester | |
|--------------------------------|--------------|-------------------------------|--------------|
| Course | Credit Hours | Course | Credit Hours |
| Bio. 304 | 3 | Bio. 333 | 3 |
| Bio. 317 | 3 | Bio. 345 | 3 |
| Bio. 341 | 3 | Bio. 352 | 3 |
| Obligatory course / University | 3 | Obligatory course /University | 3 |
| Obligatory course / Faculty | 3 | Elective course / Department | 3 |
| Elective course / Department | 3 | | |
| Total | 18 | Total | 15 |

Fourth Year

| First Semester | | Second Semester | |
|--------------------------------|--------------|------------------------------|--------------|
| Course | Credit Hours | Course | Credit Hours |
| Bio. 415 | 3 | Bio. 453 | 2 |
| Bio. 425 | 3 | Bio. 448 | 3 |
| Bio .432 | 3 | Elective course / Department | 3 |
| Obligatory course / University | 3 | Elective course / Department | 3 |
| Elective course / Department | 3 | Elective course / Department | 3 |
| Elective course / Department | 3 | | |
| Total | 18 | Total | 14 |

**Course Description of the
Department of Biological Sciences Courses for the Bachelor's Degree**

Bio. 100 - Public Health and Awareness (3 credit hrs.)

Introductory course related to hygiene, public health, environmental health, nutrition basic knowledge about human body & its systems, diseases with emphasis on childhood and infection & endemic diseases. Occupational and social health. Effects of smoking and alcoholism.

Bio. 101 - General Biology (1) (3 credit hrs.)

The structure and function of macromolecules, chemical and molecular structure of cell organelles. Metabolism, respiration and photosynthesis, cell cycle and cell division. Basics of inheritance, gene structure and function. Introduced caution animal development.

Bio. 102 - General Biology (2) (3 credit hrs.)

To have broad knowledge of animals with an overview of the diversity of life on earth. Study of various organ systems; digestive, respiratory, circulatory, endocrine, immune, excretory, nervous, skeletal, reproductive and development, taking human as a model.

Bio. 103 - Human Biology (3 credit hrs.)

Principles of human anatomy and physiology: skeletal system, articular system, muscular system, nervous system, endocrine glands, circulatory system, renal system and reproductive system.

Bio. 104 - Principles of Nutrition (3 credit hrs.)

Study of food and its digestion, metabolism as related to human health.

Bio. 105 - General Biology Practical (1) (1 credit hr.)

Light microscope: structure and uses. Experiments to illustrate essential functions of the cell: chemical and physical characteristics, enzymes, photosynthesis, respiration, cell division. Animal and plant tissues.

Bio. 106 - General Biology Practical (2) (1 credit hr.)

Animal reproduction and development. Taxonomy of living organisms: bacteria, algae, fungi, plants and animal kingdom. Anatomy of the frog, study of organs and systems.

Bio. 107 - General Biology (3) (3 credit hrs.)

The study of form and function in vascular plants, transport, nutrition, reproduction and plant responses to internal and external signals. Principles of ecology, populations, communities, ecosystems, conservation biology and restoration ecology.

Bio. 108A – Human Biology (3 credit hrs.)

Survey of human body structure and function. Starting at biological macro-molecules, levels of organization, cells, tissues and ending at the level of human body systems (skeletal, muscular, nervous, cardiovascular, respiratory and digestive systems). Topics include human inheritance (from chromosomes to biotechnology), human reproduction (male and female anatomy and physiology), fetal development and birth. On modular basis, students will be introduced to techniques and machinery applied in medicine for diagnostic procedures.

Bio. 201 – Human Anatomy and Physiology (3 credit hrs.)
Principles of structure and function of the different organ systems of the human body, with emphasizes on the physical aspects of different organ systems. It also tackles with the clinical aspects of some common diseases related to anatomy and physiology.

Bio. 204 - Family Health (3 credit hrs.)
Special topics related to women and family health, related diseases, causes, prevention and treatment. Anatomy and physiology of reproductive systems. Conception, child birth and nursing. Injury prevention and First Aid. The course is designed for students from non science faculties.

Bio. 215 - Invertebrate Zoology (3 credit hrs.: 2 lect. + 3 lab)
Major invertebrate phyla, their classification, habitat, morphology and study of various organs with emphasis on the evolutionary changes within and between phyla and ecological adaptation.

Bio. 216 - Comparative Vertebrate Anatomy (3 credit hrs.: 2 lect. + 3 lab)
The course includes basic information on chordates, their origin & phylogenetic relationship with different vertebrate groups. Comparative study of various organ systems and their modifications which occurred as a result of adaptation from the evolutionary point of view.

Bio. 221 - Plant Anatomy (3 credit hrs.: 2 lect. + 3 lab)
An introduction to the structure, and function of various seed plants, cells and tissues. Development of structural features with emphasis on microscopic work with thin section material.

Bio. 222 - Plant Taxonomy (3 credit hrs.: 2 lect. + 3 lab)
Study of the major families of the flowering plants (angiosperms) and the characteristics used to separate them, stress on laboratory and field work.

Bio. 223 - Economic Botany (3 credit hrs.: 2 lect. + 3 lab)
Introduction to the relation of plants to human beings. This includes the influence of plants on the economic, cultural, political history, and the recent improvements on chosen plants for human purposes. Lectures cover necessities and textures including sugars and beverages, fermentation, rubber, medicinal plants and the emergence of tropical nations.

Bio. 227 - Plant Morphology (3 credit hrs.: 2 lect. +3 lab)
Comparative study of the major groups of plants: algae, bryophytes, ferns, gymnosperms and angiosperms and the evolutionary tendencies of these groups. Stress on laboratory and field work.

Bio. 251 - Cell Biology (3 credit hrs.)
The structure and function of macromolecules as well as the ultra structure and function of the plasma membrane and cellular organelles: mitochondria, chloroplast, endoplasmic reticulum, ribosome, Golgi complex, and lysosomes. Structure and function of the nucleus and chromosomes. Regulation of gene expression.

Bio. 261 - Microtechniques (3 credit hrs.: 1 lect. + 6 lab)
Laboratory training in methodology of stained tissue and small organisms. Slide preparations and histochemical analysis. Theoretical bases of above involved techniques. Animal specimen preservation. Alizarin technique.

Bio. 266 - Basic Histology and Histological Techniques (3 credit hrs.: 2 lect.+ 3 lab)
Processing and preservation of animal tissues. Study of the mammalian tissues through of microscopic slide.

Bio. 304 - Biochemistry (3 credit hrs.: 2 lect. + 3 lab)
Chemistry of macromolecules, structure, function and metabolism of proteins, carbohydrates, nucleic acids and lipids. Practically isolation, identification and quantification of such compounds from some tissues.

Bio. 305 - Radiation Biology (3 credit hrs.)
The course is designed to provide a bridge between features of radiation (physics) and the important aspects of radiation biology with the emphasis on the effects on human life.

Bio. 306 – Biodiversity (3 credit hrs.: 2 lect. + 3 lab)
Fundamental aspects of earth biological diversity, natural processes that maintain its structure and function, human impact and threats, means to conserve and preserve this diversity.

Bio . 307- Hematology (3 credit hrs.: 2 lect. + 3 lab)
Composition, formation and structure of blood components. Blood banking. Coagulation physiology and pathology of blood and related human diseases.

Bio. 313 - Fish Biology (3 credit hrs.)
Introduction to fishes. taxonomical, morphological and anatomical studies. Structure and form of fishes in relation to their behavior. Marine and fresh water ecosystem with adaptation and distribution of fishes in these ecosystems. Zoogeographical studies with emphasis on Ichthyofauna of Jordan.

Bio. 314 – Parasitology (3 credit hrs. : 2 lect. +3 lab)
Biology, life cycles and pathogenesis of parasitic protozoa, platyhelminthes, round worms and cestods. Methods of differentiation between groups with particular emphasis on human parasites.

Bio. 317- Developmental Biology (3 credit hrs.: 2 lect.+ 3 lab)
A comparative study of embryogenesis from fertilization to hatching or birth. The roles of genes. Morphogens in embryogenesis , differentiation , regeneration and cancer.

Bio. 319 – Arthropoda (3 credit hrs.: 2 lect. + 3 lab)
Principal of entomology and diversification, within the group, emphasis on social and disease carrying insects.

Bio. 322 - Plant Embryology (3 credit hrs.: 2 lect. + 3 lab)
Study the basic concepts of bacterial genetics and immune response, relationships among bacteria on external surfaces and mechanisms by which bacteria damage the host, host defense mechanisms, epidemiology, diagnosis and antimicrobial agents.

Bio. 323- Flora and Vegetation of Jordan. (3 credit hrs.: 2 lect. +3 lab)

Floristic studies and their characteristics. Changes in the vegetation, from past to present caused by direct or indirect influence of mankind and taxonomic study of the main families growing in Jordan.

Bio. 328 - Phycology

(3 credit hrs.: 2 lect. + 3 lab)

Taxonomy of algae, study of their external and internal structure. Evolution with emphasis on distribution of algae in different habitats. Ecological and biological aspects of algae and their use as bioindicators for aquatic pollution.

Bio. 333 - Microbiology

(3 credit hrs.: 2 lect. + 3 lab)

Fundamental aspects of microbial classification, structure, nutrition, ecology metabolism and genetics; principles of immunity; prevention and treatment of diseases caused by bacteria, viruses and fungi.

Bio. 337 - Medical Microbiology

(3 credit hrs.: 2 lect. + 3 lab)

Study of pathogenic bacteria, mechanisms of pathogenicity and virulence. Antibiotics and resistance.

Bio. 341- Evolution

(3 credit hrs.)

Introduction to the basic principles and processes of evolution including: origin of life, diversity of plants and animals. Natural selection, sources of variability and speciation. Human evolution as well as divergent and convergent evolution.

Bio. 345 - Genetics

(3 credit hrs.: 2 lect. + 3 lab)

The course overviews the principles of classical and molecular genetics. Different patterns of inheritance. Structure, replication and gene expression. Mutagenesis and repair systems.

Bio. 346 - Human Genetics

(3 credit hrs.)

Study of human chromosomes and some Mendelian and non-Mendelian traits. Twins as a model in genetic studies. Genetic diseases and prenatal diagnosis Pharmaco and Ecogenetics, Genetics of cancer. Gene and protein therapy. Future prospects.

Bio. 352- Molecular Biology

(3 credit hrs.:2 lect. + 3 lab.)

In depth study of nucleic acids structure. Restriction endonucleases, nucleic acid technology, vectors, recombinant DNA and Genetic Engineering and some of its applications in medicine, agriculture and industry, RNA biosynthesis and regulation of gene expression, gene arrangement and processing.

Bio. 381 - Animal Behavior

(3 credit hrs.: 2 lect. + 3 lab)

An introduction to the processes that determine when behavior will occur and what form it takes, including anatomical and physiological foundations of behavior, social behavior and anatomical relationship between behavior and ecology.

Bio. 401- Biology and Society

(2 credit hrs.)

Application of biological techniques in different aspects of mankind and society. Stress will be on the health and economic aspects.

Bio. 414 - Mammalian Reproduction (3 credit hrs.)
Study of reproductive systems, accessory glands ovarian and uterine development, reproductive hormones, reproductive and estrous cycles and their regulation, fertilization, implantation, gestation and reproductive failure. Brain imprinting.

Bio. 415 - Animal Physiology (3 credit hrs.: 2 lect. + 3 lab)
Analysis of basic physiological principles as they pertain to animals of various phylogenetic levels with special emphasis on the mammalian systems The course also includes information about disorders caused by the failure of some organs.

Bio. 417- Endocrinology (3 credit hrs.)
Morphology and physiology of endocrine glands, with emphasis on vertebrates. Structure and mode of action Experiments on hormonal effects of the different hormones.

Bio. 418 - Laboratory Diagnosis of Parasites (3 credit hrs.: 2 lect. + 3 lab)
Methods in diagnostic parasitology for the detection of parasites in blood, urine, stool and skin. Immunodiagnostics of parasites. Preservation and staining of parasite stages for identification.

Bio. 424 - Lichenology (3 credit hrs.: 2 lect. + 3 lab)
Study of lichens, their anatomy, taxonomy, and ecology. Chemical constituents of lichens and its use as monitors for pollution.

Bio. 425 - Plant Physiology (3 credit hrs.: 2 lect. + 3 lab)
The course includes plant water relations, inorganic nutrients, photosynthesis and bioenergetics. Cellular respiration and plant hormones role, biochemistry and mode of action in plant's development as well as physiology of plants under stress.

Bio. 428 - Mycology (3 credit hrs.: 2 lect. + 3 lab)
Structure, genetics and biochemistry of fungi with economic importance to human. Fungal infections in man, animals and plants.

Bio. 429 - Plant Pathology (3 credit hrs.: 2 lect. + 3 lab)
Introduction to the basic principles involved in plant disease, cause and control. Laboratory emphasis on identification of plant diseases and their causing organisms.

Bio. 431 - Virology (3 credit hrs.: 2 lect. + 3 lab)
Molecular biology of viruses, methods of isolation, purification and culturing of viruses. Classification of viruses by modern molecular biology techniques. Life cycle of viruses. Molecular response of viral hosts. Viral diseases of man, animals and plants with emphasis on the diagnostic aspects.

Bio. 432 - Immunology (3 credit hrs.: 2 lect. + 3 lab)
Biological and biochemical aspects of immunity, innate and adaptive components of humoral and cellular parts of immunity. Immune system in health and diseases. Immunological reactions as diagnostic tools for bacterial, viral, parasitic as well as autoimmune diseases.

Bio. 433 - Industrial Microbiology (3 credit hrs.: 2 lect. + 3 lab)

The role of microorganisms in food and food technology with emphasis on laboratory techniques.

Bio. 442 - Plant Cytogenetics

(3 credit hrs.: 2 lect. + 3 lab)

Variation in chromosome number and structure, banding techniques, chromosomal movements during cell cycle and extra chromosomal inheritance (Plastids and mitochondria).

Bio. 444 - Cytogenetics (3 credit hrs.: 2 lect. + 3 lab)
General principles of cytogenetics of bio-animal populations with emphasis on human cytogenetics. Theoretical background for understanding basic techniques and their applications to human chromosome pathology. Karyotyping and karyotypic analysis.

Bio. 445 - Microbial Genetics (3 credit hrs. 2 lect. + 3 lab.)
Conjugation, transformation and recombination in microorganisms. Inheritance and mutation in nonchromosomal element of bacteria, genetic control of metabolism and antibiotic synthesis. Mechanisms of mutations and applications of genetic engineering.

Bio. 448 – Ecology (3 credit hrs.: 2 lect. + 3 lab)
Introduction to ecology, biotic and abiotic factors that affect population growth and distribution ecosystem concepts of food, energy and materials. Aquatic and terrestrial examples of ecosystems. Evolutionary ecology includes natural selection, sources of variability and speciation. Community ecology processes and interactions.

Bio. 450 - Cell Physiology (3 credit hrs.)
Discussion of the physiology of cells. Topics will cover chemical, structural and general physiological properties of the cell, energy conversion, transmembrane transport, bioelectrical phenomena, movement and contraction and intercellular signaling.

Bio. 453 - Biotechnology (2 credit hrs.)
Basic principles of genetic engineering, their application in agriculture, medicine, and industry. Large scale culturing of microorganism for industrial fermentation. Plant biotechnology. Ethical issues of biotechnology.

Bio. 455 - Bioinformatics (3 credit hrs.: 1 lect. + 6 lab)
Introduction to bioinformatics. Principles and computational methods for upgrading and organizing biological data generated by genome sequencing, proteomics and gene expression studies. Modeling philosophy and principles as well as simulation methodologies.

Bio. 457 - Molecular Evolution (3 credit hrs.)
Molecular basis of evolution, evolution of macromolecules including genes, dynamics of genes, evolutionary changes of nucleotide sequences. Evolution by gene duplication, exon shuffling and transposition.

Bio. 461 - Histology (3 credit hrs.: 2 lect. + 3 lab)
Study of the structure and function of mammalian basic tissues and organ systems with emphasis on mammals and particularly human histology and histopathology.

Bio. 471 - Marine Sciences (3 credit hrs.: 2 lect. + 3 lab)
Study of different animal and plant life in relation to different zones of sea and concept of adaptation to that particular type of habitat.

Bio. 491 - Seminar (1 credit hr.)

Bio. 492 - Special Topics (3 credit hrs.)

Bio. 499 - Research Project (3 credit hrs.)
Practical research in one of the major fields in biology, writing and presenting the results.