

## **Life Sciences Department**

### **Course Descriptions:**

#### **BIO 101      General Biology I**

##### **Credit hours: 3**

Course covers major fields and fundamental principles of the modern biology and provides a foundation to more in-depth and specialized studies during the following years. The course concentrates on the core concepts of modern biology and provides knowledge about the role of various biological macromolecules in the cell physiology; how different types of cells are integrated into multicellular systems; molecular and chromosomal mechanism of heredity.

Prerequisite: None

Co-requisite: BIO 101 L

#### **BIO 101 L      General Biology I lab**

##### **Credit hours: 1**

This course is a hand on course to apply and discover the Basic skills in practical biology.

Prerequisite: None

Co-requisite: BIO 101

#### **BIO 103      Introduction to Human Biology**

##### **Credit hours: 3**

The course concentrates on the basic aspects of human biology and provides knowledge about the role of various biological macromolecules in the human body, how different types of cells are integrated into multicellular systems, and how organs and organisms develop and function. The course satisfies the General Education Requirements in Science.

Prerequisite: None

Co-requisite: None

#### **BIO 112      General Biology II**

##### **Credit hours: 3**

This is the second module of the general biology introductory course designed for the Life Science Major curriculum. It concentrates on the fundamental aspects of animal physiology with an emphasis on the human body. The course is focused on the evolution, development, structure, function, health and disease of major physiological systems and regulatory mechanisms coordinating their function in the human organism.

Prerequisite: BIO 101  
Co-requisite: BIO 112 L

**BIO 112 L      General Biology II lab**

**Credit hours: 1**

An introductory course that helps the students to correlate concepts they learn in class with hands on experience for better understanding. This course covers the basic techniques needed for any biologist such as Micropipetting, DNA extraction, and Electrophoresis.

Prerequisite: BIO 101 L  
Co-requisite: BIO 112

**BIO 223      Microbiology**

**Credit hours: 3**

The course provides a basic understanding of modern medical microbiology with emphasis on the contribution microorganisms make to human health and welfare and intensive study of the processes by which microorganisms cause human disease, how the pathogens can be recognized (identified) and what steps can be taken for the prevention and treatment of infections. The emphasis on the development of observational, practical and analytical skills through supervised laboratory work and demonstrations.

Prerequisite: BIO 112  
Co-requisite: BIO 223 L

**BIO 223 L      Microbiology lab**

**Credit hours: 1**

This course will introduce the students to the basic concepts and practical skills in modern Microbiology by studying the general characteristics and identification of microorganisms. The study of the processes by which these microorganisms cause human disease, how these pathogens are identified in the diagnostic laboratory and what steps can be taken for the prevention of these infections. The classification and mechanism of action of major groups of antibiotics will also be covered. There will be emphasis on the development of observational, practical and analytical skills through supervised laboratory work and demonstrations.

Prerequisite: BIO 112 L  
Co-requisite: BIO 223

**BIO 224      Human Physiology and Anatomy**

**Credit hours: 3**

The course covers human anatomy and physiology from a systems-based perspective, stressing the ways in which different physiological systems interact. Emphasis is on understanding the integration of human anatomy

through biological function, development, evolutionary history and genetics. Several clinical examples are given to illustrate how human variation, including congenital defects, emerges from the interaction of development, form, and function.

Prerequisite: BIO 112

Co-requisite: BIO 224 L

### **BIO 224 L    Human Physiology and Anatomy lab**

#### **Credit hours: 1**

This course provides a comprehensive study of the anatomy and physiology of the human body. Upon completion, students should be able to demonstrate an in-depth understanding of principles of anatomy and physiology and their interrelationships.

Prerequisite: BIO 112 L

Co-requisite: BIO 224

### **BIO 325        Conservation Biology**

#### **Credit hours: 3**

This course is general in nature that provides a general introduction to conservation biology. Conservation Biology is the scientific study of the phenomena that affect the maintenance, loss, and restoration of biological diversity. Topics covered include: 1) the impacts of global warming, species invasions, and habitat destruction on biodiversity, 2) strategies developed to combat these threats, and 3) a consideration of key economic and ethical tradeoffs. Special attention will be paid to current debate and controversy within this rapidly emerging field of study.

Prerequisite: BIO 223

Co-requisite: None

### **BIO 345    Molecular Biology I**

#### **Credit hours: 3**

As the first module of the Molecular Biology course, BIO 345 concentrates on molecular mechanisms of genetic processes. This module explains how the flow of biological information from DNA to RNA to protein gives rise to the recognizable, inherited attributes of living organisms. It uses seminal experiments to introduce the students to basic classical and molecular genetics, and then expands on these themes to include genetic engineering and genomic approaches to these phenomena.

Prerequisite: BIO 223

Co-requisite: BIO 345 L

## **BIO 345 L Molecular Biology I Lab**

### **Credit hours: 1**

Upon completion of the course, students will be familiar with basic molecular biology techniques such as DNA extraction, polymerase chain reaction, Electrophoresis, and ligation and transformation. Also, understand and apply these concepts in real life applications in the field of medicine, agriculture, food, diagnostic, and forensics.

Prerequisite: BIO 223 L

Co-requisite: BIO 345

## **BIO 357 Molecular Biology II**

### **Credit hours: 3**

As the second module of the Molecular Biology course, BIO 357 concentrates on molecular mechanisms of cellular physiology and interactions. This module provides a detailed knowledge of the structural organization and differentiation of eukaryotic cells as well as key processes in development that are based on cell-cell communication and cell movement. It introduces fundamental properties of the cytoplasm and the roles of the cytoskeleton in fundamental biological processes including chromosome separation, cell motility and intracellular transport processes as well as the evolution, function and biogenesis of cell organelles.

Prerequisite: BIO 345

Co-requisite: BIO 357 L

## **BIO 357 L Molecular Biology II Lab**

### **Credit hours: 1**

This course is built on major techniques in molecular biology that students have learned from Bio 345L such as nucleic acid extraction, DNA Quantification and Quality analysis, Polymerase Chain Reaction, gel electrophoresis, and Restriction digestion. These techniques are applied in the areas of Forensic, medicine, agriculture, food science, diagnostic, and biotechnology.

Prerequisite: BIO 345 L

Co-requisite: BIO 357

## **BIO 346 Biochemistry I**

### **Credit hours: 3**

The two-module Biochemistry course concentrates on the chemical properties of biological macromolecules with particular attention to the relationship between structure and biological function. The first module specifically covers amino acids, the fundamentals of protein structure, the basics of enzyme catalysis and kinetics, lipids, and membrane structures, transport proteins, the physicochemical basis of signal transduction, vitamins and their functional role in the body.

Prerequisite: BIO 223 & CHM 211

Co-requisite: BIO 346 L

## **BIO 346 L Biochemistry I Lab**

### **Credit hours: 1**

This course introduces the students to the basic Biochemical techniques. These include expressing, quantifying, and purifying proteins as well as study enzyme kinetics and amino acid titration.

Prerequisite: BIO 223 L & CHM 211 L

Co-requisite: BIO 346

## **BIO 358 Biochemistry II**

### **Credit hours: 3**

The second module of the Biochemistry course concentrates on the complexity of metabolic pathways and their regulation. It reviews the inter-linked metabolic processes involved in nutrient handling and homeostasis.

Prerequisite: BIO 346

Co-requisite: BIO 358 L

## **BIO 358 L Biochemistry II Lab**

### **Credit hours: 1**

This focus of this course is to provide the students with hands on experience in clinical biochemistry techniques applied to extract, separate, and detect proteins using chromogenic and fluorescence detection. In addition, students will be experience performing Tissue culture and immunohistochemistry techniques.

Prerequisite: BIO 346 L

Co-requisite: BIO 358

## **BIO 405 Human Genetics**

### **Credit hours: 3**

BIO 405 will cover: 1) the genetic and molecular basis of heredity and inherited traits, 2) how genetics and genomics help to understand the human condition, including genetic diseases, cancer, and human evolution, 3) how basic and translational genetics research is leading to improvements to human health, and 4) current ethical discussions related to human genetics.

Prerequisite: BIO 223

Co-requisite: None

## **BIO 440 Biotechnology**

### **Credit hours: 3**

Biotechnology is a merger of sciences and engineering knowledge tailored towards using living organisms and their products for benefit of humans and environment. The course introduces students to the molecular and

genetic tools used for modification of various organisms to produce desired organic molecules and proteins. It covers four principal branches of biotechnological applications: industry, medicine, agriculture, and environment. The emphasis is made on responsible development and use biotechnological applications to address various issues, particularly in medicine and ecology.

Prerequisite: BIO 223

Co-requisite: None

## **ENV 305                      Environmental Health**

### **Credit hours: 3**

The course examines the physical, biological and chemical factors affecting human health. The course also explores approaches to control the major environmental health problems in industrialized and developing countries. A range of topics are covered including how the body reacts to environmental pollutants; physical, chemical, and biological agents of environmental contamination; vectors for dissemination (air, water, soil); solid and hazardous waste; susceptible populations; the scientific basis for policy decisions; and emerging global environmental health problems.

Prerequisite: BIO 223

Co-requisite: None

## **LSR 302                      Research Methodology**

### **Credit hours: 3**

The course aims to provide students the basic concepts of research, types of research and the research method. The ultimate aim of this course is to equip students with skills on how to formulate a research hypothesis, review literature, design research projects, acquire & analyze data and report the research findings. The students will also be introduced to research writing and ethical issues associated with research.

Prerequisite: ENG 112

Co-requisite: None

## **LSR 390                      Life Sciences Summer Internship**

### **Credit hours: 0**

The Summer Internship will provide the students with an opportunity to gain knowledge and skills from a planned work experience in the student's chosen career field. Internship placements are directly related to the student's program of study and provide learning experiences not available in the classroom setting. Internships provide entry-level, career-related experience and workplace competencies that employers value when hiring. The duration of the summer internship is 8-10 weeks. Students will be evaluated by the Faculty Internship Advisor and Training Supervisor.

Prerequisite: LSR 302

Co-requisite: None

## **LSR 421-422 Life Science Research Project I & II**

### **Credit hours: 6**

The courses represent a two-semester-term individually guided investigation project involving laboratory work and/or computational investigation in some aspect of Biomedical Science. The background, results and conclusions of the study to be reported in the form of an oral presentation in reading week of the second semester of the year and a thesis, submitted at the end of the course.

Prerequisite: LSR 302

Co-requisite: None

## **LSR 423 Integrative Life Science Research Seminar**

### **Credit hours: 3**

LSR423 course is designed to train students to summarize results obtained during student research project courses, built up scientific hypotheses and discuss their merits in group seminars with assessment of the subsequent self-directed learning in oral presentations, coursework or undergraduate thesis writing and defense. This course develops transferable skills, associated with analysis and presentation of laboratory-based experimental research in Life Sciences in the form of poster and podium presentation.

Prerequisite: LSR 421

Co-requisite: None

## **LST 421-422 Life Science Special Topics I & II**

### **Credit hours: 3-6**

The “special topics” courses are offered for credit in emerging areas of life sciences and related fields. The subject matter or content may vary from term to term as indicated by that course’s title and description. Special topics courses are intended to review recent development, discoveries, or to address specific issues or concepts within the field of study that are not covered in existing courses.

Prerequisite: BIO 346

Co-requisite: None

## **SCI 321 Immunology**

### **Credit hours: 3**

SCI 321 aims to provide students with an understanding of immunology and the immunological basis of some common and well-known diseases. The course will balance basic knowledge of the underlying complexity of the immune system, such as T and B cell receptor genes, the MHC and antigen presentation, with the application of immunological aspects to infectious diseases, cancer, inflammation and autoimmunity.

Prerequisite: BIO 223 & BIO 224

Co-requisite: None

## **SCI 322      Cancer Biology**

### **Credit hours: 3**

This course will introduce the core aspects of cancer biology. Emphasis will be placed on molecular mechanisms of cancer pathophysiology - such as signal transduction, DNA damage and repair and regulation of cell division, death and senescence as well as on system biology, microevolution of tumors, interaction between tumor and organism. Existing and novel strategies of cancer prevention, diagnosis and treatment will be discussed.

Prerequisite: BIO 223 & BIO 224

Co-requisite: None

## **SCI 323      Signal Transduction**

### **Credit hours: 3**

The concept of "signal transduction pathway" is one of the major advancements in our understanding of how living cell – a unit of life – is functioning: how it adapts to changing environment and communicates with neighbors in multicellular organisms. Perspective of "signal transduction" is essential to understand complex biological processes and diseases ranging from memory formation to diabetes and cancer. The course makes sense of the dizzying array of pathways used by the cell to communicate.

Prerequisite: BIO 223 & BIO 224

Co-requisite: None

## **SCI 325      Bioinformatics and Computational Genomics**

### **Credit hours: 3**

The course is a combination of lectures and instructor-guided practical sessions. SCI325 will cover: 1) the theoretical basis of various comparative analyses of DNA and protein sequences, 2) how bioinformatics, genetics and genomics help to understand the population and evolutionary processes, 3) how computational genomic analyses generate testable hypotheses, and 4) a role of bioinformatics in conservation biology, current human genetics and medicine.

Prerequisite: BIO 112 & STA 211

Co-requisite: None

## **SCI 326      Virology**

### **Credit hours: 3**

This is an elective course, which focuses on the principles of virus structure, replication and genetics. It will help the students appreciate the relevance of virology in the modern world, including the fields of vaccines, anti-viral drugs and cancer. Other acellular biological particles like prions are also discussed. The course reflects many recent developments in virology and offers deeper insights into the subject. Newly-discovered and emerging viruses are discussed.

Prerequisite: BIO 223

Co-requisite: None