

OWG 9 Science Approved Recommendations

1. Recommends no changes the Forensic catalog descriptions.
2. Recommends courses that are common to both DSC and ASU in Area F Foundations:

ISCI 2001 - Foundations of Life/Earth Science (3)

An integrated overview of the core Life and Earth Science content covered in the K- 5 Georgia Performance Standards. Topics include the Solar System, Earth Processes, Cells and Cellular Processes, Characteristics and Classification of Living Organisms, Biodiversity, Ecology and the Natural History of Georgia. Students will gain conceptual understanding through Inquiry-Oriented, Activity-Based pedagogical strategies in order to have experience learning science content in the ways they will be expected to teach in the future. There is a laboratory component. Prerequisite: Teacher Education major status or permission from the instructor.

Offered: Fall, Spring and Summer (as needed).

ISCI 2002 - Foundations of Physical Science (3)

An integrated overview of the core Physical Science content covered in the K- 5 Georgia Performance Standards. Topics include the Energy, light, heat, sound, electricity, magnetism, matter, periodic table, periodic trends, chemical reactions and conservation of energy and matter. Students will gain conceptual understanding through Inquiry-Oriented, Activity-Based pedagogical strategies in order to have experience learning science content in the ways they will be expected to teach in the future. There is a laboratory component. Prerequisite: Teacher Education major status or permission from the instructor.

Offered: Fall, Spring and Summer (as needed).

3. Recommends that Chemistry courses common to both institutions have the following course numbers, names, and descriptions:

CHEM 1151K, Survey of Chemistry I, "This course is the first in a two-semester sequence covering elementary principles of general and organic chemistry and biochemistry designed for allied health profession majors. Topics to be covered include elements and compounds, chemical equations, nomenclature, and molecular geometry. Laboratory exercises will supplement the lecture material.

Prerequisite(s): Completion or exemption of all learning support and English requirements; MATH 0099, MATH 0987, MATH 0989, or satisfactory math scores to place into co-requisite remediation or higher."

CHEM 1211K, Principles of Chemistry I, “First course in a two-semester sequence covering the fundamental principles and applications of chemistry designed for science plans of study. Topics to be covered include composition of matter, nomenclature, stoichiometry, solution chemistry, gas laws, thermochemistry, quantum theory and electronic structure, periodic relations, and bonding. Laboratory exercises supplement the lecture material.

Prerequisites: Completion or exemption of all learning support requirements.

Corequisites: MATH 1111 or satisfactory math scores to place into MATH 1112 or higher.”

CHEM 1212K, Principles of Chemistry II, “Second course in a two-semester sequence covering the fundamental principles and applications of chemistry designed for science plans of study. Topics include molecular structure, intermolecular forces, properties of solutions, reaction kinetics and equilibria, thermodynamics, and electro-and nuclear chemistry. Laboratory exercises supplement the lecture material.

Prerequisite: CHEM 1211K.”

CHEM 2301K, Organic Chemistry I, “This course will cover the stereochemistry, properties, as well as methods of preparation and mechanisms of the principle classes of carbon compounds. Laboratory instruction will include basic techniques for preparation, purification and identification of organic compounds. Laboratory exercises supplement the lecture material.

Prerequisite: CHEM 1212K.”

CHEM 2302K, Organic Chemistry II, “This is a continuation of CHEM 2301K, a systematic study of the reactivity of organic compounds as well as their identification by spectroscopy. Laboratory exercises supplement the lecture material.

Prerequisite: CHEM 2301K.”

NOTE: All courses will remain 4 credit hours:

4. Recommends that all laboratory science courses have the lecture and laboratory portions consolidated into a single course.

5. Recommends that the following tracks should be added to the BS in Biology degree in addition to the current biomed track and biotec concentration:

A. Research Track with following courses:

- (i) **BIOL 2000 - Foundations of Research I:** Critical Reading of the Biomedical Literature (1 credit hour): This course is the introductory course of the research track designed

for biology majors to gain competence as biomedical scientists. The goal of this course is to introduce students to the various types of research literature (primary, secondary, articles for the public, etc.) for developing competence in the use of literature sources. A necessary part of the course is learning how to search for relevant biomedical literature. Students will use common electronic search engines such as PubMed, SciFinder Scholar, Web of Science, MedLine, Psychology Abstracts, and Science Citation Index etc. to gain experience and generate an annotated bibliography of references pertinent to his/her research project.

Prerequisite: None

- (ii) **BIOL 2240 - Foundations of Research II: Formulating Hypothesis Driven Research and Ethics of Research** (2 credit hour): This is the second course for research track to build student confidence in formulating hypotheses and designing experiments. To ensure that students think ethically when doing so, this course also includes an introduction to the ethical issues that arise in research. Through case studies and review of literature, the course will present hypothesis-driven research from diverse areas related to biomedical science.

Prerequisite: BIOL 2000 or permission of the instructor

- (iii) **BIOL 4223 - Foundations of Research III: Communication of Biomedical Information** (1 credit hour): As the third and final course of the Research track, this course will provide students the formal context to become critical writers and speakers of biomedical information. Student competence is enhanced through exercises that demonstrate the need for effective written and oral communication. Students will learn to critique scientific literature; thereby, helping them to improve their own writing. Students will prepare both written and oral presentations of their research and results. Oral communications include a 3-minute elevator talk, a 10-minute presentation, and a 20-minute seminar. Written communications include posters in the formats of the professional societies in their disciplines.

Prerequisite: BIOL 2240

B. Bioenergy Track with following courses:

- (i) **BIOL 2501 - Introduction to biomass** (2 Credit hours): As the introductory course for students in the bioenergy track, this course is designed to introduce students to the source of bioenergy, which is biomass. Topics include defining biomass, sources of biomass, processing biomass, uses of biomass, and the role of environment and pollution in biomass production.

Prerequisite: BIOL 2107 K

- (ii) **BIOL 3103 - Fundamentals of Bioenergy** (3 credit hours): This course expands upon the concepts introduced in BIOL 2501. The course introduces students to the application of biomass in the bioenergy field. Topics include defining bioenergy,

sources of bioenergy, and the social, political and economic effects of using bioenergy.

Prerequisite: BIOL 2501B

C. Public health track with following courses:

- (i) **BIOL 2330 - Principles of Epidemiology in Public Health (3 credit hours):** This course is first of two courses offered for student pursuing the track in public health. Principles of Epidemiology provides an overview of epidemiology methods used in research studies that address disease patterns in community and clinic-based populations. Topics covered include distribution and determinants of health-related states or events in specific populations and application to control of health problems.

Prerequisite: BIOL 2107K

- (ii) **BIOL 3801 - Environmental Health Concepts in Public Health (2 credit hours):** As the second course for student's pursuing the track in public health, this course provides a survey of major topics of environmental health. Topics include sources, routes, media, and health outcomes associated with biological, chemical, and physical agents in environment; effects of agents on disease, water quality, air quality, food safety, and land resources; current legal framework, policies, and practices associated with environmental health and intended to improve public health. **Prerequisite:** BIOL 2330

D. Food Safety track with following courses:

- (i) **BIOL 2601 - Introduction to Foodborne Diseases (3 credit hours):** This course is one of the two courses offered for students completing the track in food safety. This is an intermediate level course, which will introduce students to the major pathogens associated with foodborne diseases, their epidemiology, and approaches to outbreak investigation and control of foodborne illness.

Prerequisite: BIOL 2107K

- (ii) **BIOL 3201 - Fundamentals of Public Health Nutrition (2 credit hours):** This course is one of the two courses offered for students completing the track in food safety. This course will provide an introduction to Public Health Nutrition and the role of the Public Health Nutrition professional. Emphasis will be on definition, identification and prevention of nutrition related disease, as well as improving health of a population by improving nutrition. Malnutrition will be discussed on a societal, economic, and environmental level. It will include the basics of nutritional biochemistry as it relates to malnutrition of a community and targeted intervention. Finally, it will review existing programs and policies, including strengths, weaknesses and areas for modification or new interventions.

Prerequisite: BIOL 2107K

6. Recommends the following Forensic Science Course Description and Check Sheet:

FOSC - Forensic Science

FOSC 2100K - Intro to FOSC (3-2-3)

This course is designed as an introductory course for those who wish to pursue a career in forensic science. Course is an overview of investigative techniques and methods used in the crime laboratory to analyze physical evidence. Course will also provide lab exercises in the metric system of measurement, general crime scene investigative techniques, and methods of scientific analysis used in crime laboratories. No Prerequisite
Offered: Fall and Spring.

FOSC 2110 - Survey of Forensic Science (3-2-3)

This course will enlighten students with the basic principles and uses of forensic science in the criminal justice system. This course will review the basic applications of forensic science fields in crime reconstruction. The outcome of the course will include students gaining basic understanding of the importance and limitations of the forensic sciences in solving crime. No prerequisite
Offered: Spring.

FOSC 2120K - Forensic Photography (3-2-3)

Designed as an introductory course in forensic photography, the history of photography will be presented. Technical aspects of exposure, images characteristics, and crime scene and evidence documentation will be introduced and projects will be used to apply these techniques. A final crime scene project with a presentation using photographs generated in the project will be used to show how photographic documentation can be used as an investigative and analysis technique in the reconstruction of a crime scene. Pre requisite FOSC 2100
Offered: Fall

FOSC 2130 K- Crime Scene Invst & Recon I (3-2-3)

This course is intended to familiarize students with the basic principles of Crime Scene investigations and reconstruction through Crime Scene Unit, Crime Scene Protocol, Crime Scene Evidence Collection and Crime scene interpretations. Prerequisite FOSC 2100
Offered: Spring

FOSC 2140K - Crime Scene Invest & Recon II (3-2-3)

This course will present opportunities to learn more principles in crime scene investigation including crime scene processing, crime scene Evidence Classification collection methods and crime scene reports. The course will go in debt and much more beyond what is presented in Crime Scene Investigation and Reconstruction I. Prerequisite FOSC 2130
Offered: Spring

FOSC 3020 K- Forensic Microscopy of Trace (3-3-4)

Light microscopy of trace evidence including, contrast, resolving power and illumination; interference, phase and fluorescence microscopy; microscopy with polarized light, birefringence and crystal structure; dispersion staining; photomicrography; fibers, minerals, and residues. Prerequisite: PHYS 2221K and PHYS 2222K Or PHYS 1111K and PHYS 1112K

Offered: Fall

FOSC 3030 - Criminal Evidence/Court Proc (3)

Consideration of laws of criminal evidence, rules of search and seizures, chain-of-custody, admissibility, opinion and hearsay, etc., and the mechanics of trials.

Prerequisite: CRJU 1100 and FOSC 2100.

Offered: Fall

FOSC 3100K - International Forensic Sci DNA Typi (3-2-3)

This course consists of lectures that review in some detail the history, scientific principles, forensic applications and practice of DNA typing and databases in different countries. This course will teach students about different DNA typing technologies and databases and their international usage and variations. DNA typing provides information on genetic variations in all forms of life and molecular level which can be used in forensics, clinical diagnostics and evolutionary biology among many fields. This course will also examine the roles and activities of international, regional and national organizations in the promotion and exchange of DNA database technologies and information.

Prerequisite FOSC 2100, and BIOL 2111K

Offered: Fall

FOSC 3200K - Bio-Terrorism & Biotechnology (3-2-4)

This course was designed to help internalize the ASU Forensic Science program curriculum. The course is concerned with the scientific issues and nature of current and future threats posed by Bioterrorism and the connection between Biotechnology and bio-defense. The scientific theme and scope are international and involve showing how different countries, multinational companies and transnational organizations are active in the fields of Biotechnology and impacted by issues relating to Biotechnology and Bioterrorism. Prerequisite: FOSC 2100, BIOL 2111K Offered: Spring.

FOSC 4040K - Forensic Serology/DNA Tech I (3-2-3)

Practices of search, collection, preservation, and identification of blood and body fluids as wet or dry stains; immunologic typing of blood; DA- typing and electrophoresis, and laboratory report.

Distribution: Forensic Technology/Technician. Prerequisite: BIOL 2111K, CHEM 1212K, and CHEM 3250 K

Offered: Spring.

FOSC 4050K - Forensic Chemistry (3-3-4)

Theory and practice of quantitative chemical analysis, chemical spectroscopy and instrumental methods of analysis: U.V., visible and infrared (IR) spectrophotometry, Fourier transform IR, fluorescence and fluorometry, atomic absorption and emission, Raman NMR, mass- spec., for structures and molecular stereochemistry; chromatographic methods of separation- TLC, HPLC, and GC. Laboratory report. Prerequisite: CHEM 2302K or CHEM 2302 and CHEM 2351K or CHEM 2351. Offered: Fall

FOSC 4060K - SEM-EDAX of Trace Evidence (3-2-3)

Practice of scanning electronic microscopy with energy-dispersive X-rays for physical and elemental characterization of trace evidence, including gunshot residue particles, image processing and automation. Laboratory report. Prerequisite: FOSC 3020. PHYS 1111K and PHYS 1112K Offered: Spring.

FOSC 4080K- Forensic Serology/DNA Tech II (3-2-3)

Laboratory practice of confirmatory tests for traces of bloodstains and semen stains; electrophoresis of blood enzymes and blood grouping, advanced DNA-typing, etc., and Lab report. Prerequisite: BIOL 2111K, and CHEM 1212K Offered Spring

FOSC 4090K - Controlled Substance/Toxicology (3-2-3)

Theory and practice of controlled substance identification GC-MS, HPLC, TLC, and infrared spectroscopy (IR/ FTIR), and detection of alcohol toxication by breath testing. Laboratory report. Prerequisite: CHEM 2302, and CHEM 3250 or CHEM 2351 Offered: Fall

FOSC 4120K - Electron Optics, EM/Quant Anal (3-2-3)

An introduction to electron microscopy, optical designs of SEM, TEM, HVEM and STEM, and to microanalysis with wave length dispersive, energy-dispersive, and X-ray fluorescence spectrometers. SEM-EDX practice and laboratory report. Prerequisite: 0-3 credits. Prerequisite: FOSC 4060. Offered: Spring

FOSC 4130 - Expert Witness at Mock Trial (2)

Consideration of place of expert's in dispute resolution, cases that require expert testimony, pre-trial preparations, rules of evidence, articles and exhibits, courtroom demeanor, participation at criminal mock trials and offer expert testimony. Prerequisite: FOSC 3030 and CRJU 1100. Offered: Fall

FOSC 4140K- Fingerprint Technology (2 – 2-2)

Practice of fingerprinting: identification and development of latent fingerprints, enhancements by laser, automated identification system, image processing and the expert fingerprint witness. Prerequisite: FOSC 2100 and FOSC 2000 or FOSC 2100.

Offered: Fall

FOSC 4150K- Evident Proc/Med Tech/Nur/Para (2)

Practice in evidence protection and collection: biological and medical evidence and controls to be collected, injuries to be photographed, legal and scientific requirements of packaging and storage, writing medical report and assisting, the coroner, rules of evidence and expert witness. Laboratory report. Prerequisite: FOSC 3020 and FOSC 2130.

Offered: Spring.

FOSC 4170K - Ballistics of Firearms/Tool mark (3-2-3)

Theory and practice of the physics of interior, exterior, and terminal ballistics as applied to identification of fire arms, bullets, and casing, primer and powder, gunshot residue formation and deposition, pellet distribution, muzzle-to-target distance and bullet wounds. Lab report. Prerequisite: FOSC 2100, FOSC 3020

Offered: Spring.

FOSC 4201K - Evidence Analysis/Research I (3-2-3)

On-campus research and evidence examination or Internship I to generate crime laboratory proficiency and competence in defending to witness in the presence of judges in a moot court. Prerequisite: Graduating Seniors only

Offered: Fall & Spring.

FOSC 4999 - Senior Capstone Seminar (3)

This course involves establishing students' understanding of ethics, quality control and assurance and their being able to explain, analyze and apply their knowledge of these topics. The course also reviews laboratory techniques and field practice in the forensic science field as well as certain of the forensic science professional literature. Preparation of application materials for Forensic careers and the review and exercise of their forensic knowledge gained during the degree program may also be done based on time and inclination of students. Prerequisite Graduating seniors only.

Offered: Fall & Spring.

7. Recommends that the following Biology Course Description and Check Sheet be used for new ASU:**Department of Natural and Forensic Sciences**

The Department of Natural and Forensic Sciences offers degrees in biology, forensic sciences and chemistry with course offerings in physics and engineering. The department also offers a degree in science education with a broad based emphasis in biology.

BIOLOGY - BACHELOR OF SCIENCE DEGREE

The major in biology provides course sequences leading to the Bachelor of Science degree in biology. The program prepares a student for professional careers and employment in biological sciences and teaching in the area of biology. The flexibility and design of the program aids in preparation for entrance into graduate, medical, pharmacy and dental schools, as well as other professional schools. Students majoring in biology must complete a minimum of 36 hours in biology, including 2107K, 2108K, 2311K, 3101K, 3333K, 3501K, 4001, 4222 and 4701K. Additionally, the Biology major must complete a minimum 13 hours of biology electives of which a minimum of eight hours must be at the 3000/4000 level. The electives will be chosen by the student with the advisor from a list of approved electives. Biology majors and minors must make a "C" or better in all biology, chemistry, physics, and mathematics courses. Students must meet the requirements of the Core Curriculum. Students must also pass an Area Concentration Achievement Test (ACAT) in the biology field during the senior year. Students interested in attending medical and dental schools choose from a select number of biology and chemistry courses and are advised by the Pre-Health advisor. Students desiring to opt for a concentration in biotechnology are advised to contact the biotech program coordinator or academic advisor. In addition to the biotech concentration and pre-med program, the biology degree program also offers additional tracks in Research, Bioenergy, Public Health, and Food safety. It is highly recommended for students to confer with their academic advisor or department chair prior to choosing courses.

COURSE DESCRIPTION

BIOL 1100K - Human Anatomy & Physiology for the Health Care Professional (4 credit: 3.2.4)¹

This course is a survey of general principles of human anatomy and physiology with an emphasis on medical applications. It is restricted to students in Health Science programs or requires the consent of the Division Dean. Laboratory exercises supplement the instruction material. **Course Pre-requisite:** READ 0099, ENGL 0989 or satisfactory English scores to place into co-requisite remediation or higher

BIOL 1110K - Introduction to Environmental Biology (4 credit: 3.2.4)¹

This course uses an interdisciplinary approach to contemporary environmental problems for students not studying in science. Laboratory exercises supplement the lecture material. **Course Pre-requisite:** None

BIOL 1111K - Introduction to Biological Sciences I (4 credit: 3.2.4)¹

A course designed for non-science majors that emphasizes fundamental concepts of the cell (i.e. cell structure and function, mitosis and metabolism), and plant anatomy and physiology through the use of lectures, audio visual aids, selected laboratory experiments, and demonstrations. **Course Pre-requisite:** Completion or exemption of all learning support requirements.

BIOL 1112K - Introduction to Biological Sciences II (4 credit: 3.2.4)¹

A course designed for non-science majors that emphasizes human anatomy and physiology, classical and molecular genetics, evolution, ecology, and surveys the plant and animal kingdoms through lectures, audio-visual aids, selected laboratory experiments, and demonstrations. **Course Pre-requisite:** BIOL 1111K

BIOL 1801 – Science Career Exploration (1 credit: 1.x.1)¹

This course is designed to introduce students (majors and non-majors) to the diverse career opportunities in the biological, biomedical, chemical and related sciences. **Course Pre-requisite:** None

BIOL 2000 - Foundation of Research I: Critical Reading of Biomedical Literature (1 credit: 1.x.1)¹

This course is the introductory course of the research track designed for biology majors to gain competence as biomedical scientists. The goal of this course is to introduce students to the various types of research literature (primary, secondary, articles for the public, etc.) for developing competence in the use of literature sources. A necessary part of the course is learning how to search for relevant biomedical literature. Students will use common electronic search engines such as PubMed, SciFinder Scholar, Web of Science, MedLine, Psychology Abstracts, and Science Citation Index etc. to gain experience and generate an annotated bibliography of references pertinent to his/her research project. **Course Pre-requisite:** None

BIOL 2001 - Introduction to Research (2 credit: 1.2.2)¹

This course is designed specifically to teach students pursuing degrees in health professions the basic principles of performing a scientific research project. Each student will identify a problem, perform a literature search, design and perform an experiment, analyze data and present the results. **Course Pre-requisite:** BIOL 1111K, CHEM 1212K, PHYS 1112K or consent of Division Dean.

BIOL 2107K - Principles of Biology I (4 credit: 3.3.4)¹

Biology I is the first part of a two course sequence required for students majoring in Biology. Designed specifically for the Biology major, discussions will include the chemistry of macromolecules in biological systems, cell structure and function, membrane structure and function, energy and metabolism, photosynthesis, cell communication, mitosis and meiosis, DNA structure, transcription and translation. Laboratory exercises supplement the lecture material. **Course Pre-requisite:** Completion of English composition I with C or better or exemption of all learning support requirements - (Only for BIO Majors)

BIOL 2108K - Principles of Biology II (4 credit: 3.3.4)¹

Biology II is the second part of the two course sequence required for students majoring in Biology. The two course sequence is designed to give students a broad foundation in the biological sciences that will enable them to pursue advanced courses in the biology curriculum. The continuity and diversity of life, evolution and activities of plant and animal life and its environment will be discussed. Emphasis will be placed on the following topics:

classical and molecular genetics, organic evolution, plant and animal reproduction, human anatomy and physiology, ecology and environment. Selected laboratory exercises are used to emphasize the continuity, evolution and activities of plant and animal life which includes classical and molecular genetics, organic evolution, plant and animal reproduction, human anatomy and physiology, ecology and the environment. **Course Pre-requisite:** BIOL 2107K

BIOL 2211K - Introduction to Microbiology (4 credit: 3.3.4)¹

This is a general course in microbiology designed for Nursing majors or non-biology majors which discusses the fundamental principles of the different types of microorganisms associated with organismal pathology, genetics, immunity, and disease control are included. Laboratory exercises supplement the lecture material. Select laboratory exercises will provide the basic skills and tools necessary in staining, culturing and the identification of different types of microorganisms associated with disease.

Course Pre-requisite: BIOL 1100K and Chem 1151K or BIOL 1111K or BIOL 2107 or BIOL 2411K (For non-science major).

BIOL 2240 - Foundation of Research II: Formulating Hypothesis Driven Research and Ethics of Research (2 credit: 2.x.2)¹

This is the second course for the research track to build student confidence in formulating hypotheses and designing experiments. To ensure that students think ethically when doing so, this course also includes an introduction to the ethical issues that arise in research. Through case studies and review of literature, the course will present hypothesis-driven research from diverse areas related to biomedical science. **Course Pre-requisite:** BIOL 2000 or permission of the Instructor.

BIOL 2250 – Responsible Conduct of Research (2 credit: 2.x.2)¹

This course is designed to provide an introduction to the basic concepts required for the responsible and ethical conduct of students engaged in undergraduate research. Topics will include lab safety, conflict of interest, data management, data sharing, authorship, animal welfare and policies involving use of human and animal subjects. **Course Pre-requisite:** BIOL 2107K.

BIOL 2311K – General Botany (4 credit: 3.3.4)¹

An introduction to the study of the plant kingdom with emphasis on plant structure and function, reproduction and heredity. **Course Pre-requisite:** BIOL 2108K.

BIOL 2320K - Laboratory Research Techniques (3 credit: x.3.3)¹

This course provides students hands-on training in cutting-edge techniques, technologies, and equipment that are essential for conducting general and biomedical research. It contains four modules: Basic Lab Skills, DNA, Protein Techniques and Instrumental Methods in Chemistry. Students learn experimental techniques including reagent preparation, pipetting, DNA isolation, protein purification, Agarose Gel Electrophoresis, SDS Gel Electrophoresis, conventional PCR, cell culture, Western blot, ELISA, chromatography (GC-MS) and spectroscopy (FT-IR, NMR, UV-Vis). **Course Pre-requisite:** BIOL 2107K or CHEM 2112K.

BIOL 2330 - Principles of Epidemiology (3 credit: 3.x.3) ¹

This course is the first of two courses offered for students pursuing the track in public health. Principles of Epidemiology provides an overview of epidemiology methods used in research studies that address disease patterns in community and clinic-based populations. Topics covered include distribution and determinants of health-related states or events in specific populations and application to control of health problems. **Course Pre-requisite:** BIOL 2107K.

BIOL 2411K - Human Anatomy & Physiology I (4 credit: 3.3.4) ¹

BIOL 2411K is designed as an introductory course in human anatomy and physiology. Discussions include fundamental concepts related to the gross and microscopic structure and functional relationships of the integument, bones, muscles, nerves and endocrine organs. Laboratory exercises supplement the lecture material. **Course Pre-requisite:** Completion or exemption of all learning support requirements.

BIOL 2412K - Human Anatomy & Physiology II (4 credit: 3.3.4) ¹

This course is a continuation of human anatomy and physiology I (BIOL 2411). Discussion will focus on the structure and functions of body systems (endocrine, cardiovascular, lymphatic, immune, digestive, respiratory, urinary and reproductive). Laboratory exercises supplement the lecture material. **Course Pre-requisite:** BIOL 2411K or BIOL 2108K.

BIOL 2501 - Introduction to Biomass (2 credit: 2.x.2) ¹

As the introductory course for students in the bioenergy track, this course is designed to introduce students to the source of bioenergy, which is biomass. Topics include defining biomass, sources of biomass, processing biomass, uses of biomass, and the role of environment and pollution in biomass production. **Course Pre-requisite:** BIOL 2107K

BIOL 2601 - Introduction to Foodborne Diseases (3 credit: 3.x.3) ¹

This course is one of the two courses offered for students completing the track in food safety. This is an intermediate level course, which will introduce students to the major pathogens associated with foodborne diseases, their epidemiology, and approaches to outbreak investigation and control of foodborne illness. **Course Pre-requisite:** BIOL 2107K

BIOL 2702K – Fundamentals of Biotechnology (4 credit: 3.3.4) ¹

A course designed to illustrate the current rise in biotechnology and explore its possible applications in plant, animal, biomedical, societal and global environments. Basic concepts of gene and recombinant DNA technology and laboratory on biotechnology research techniques is included. **Course Pre-requisite:** BIOL 2107K.

BIOL 3101K – Environmental Biology (4 credit: 3.3.4) ¹

Environmental Biology is an interdisciplinary science that integrates the disciplines and sub-disciplines of biology, chemistry, social sciences, technology, business, law, ethics, philosophy, morality, aesthetics and government. Environmental Biology analyzes the effects and subsequent impact of man's activities on Earth's ecosystems as related to

issues of personal and community health. Laboratory exercises supplement the lecture material. **Course Pre-requisite:** BIOL 2108K.

BIOL 3103 - The Fundamentals of Bioenergy (3 credit: 3.x.3)¹

This course expands upon the concepts introduced in BIOL 2501. The course introduces students to the application of biomass in the bioenergy field. Topics include defining bioenergy, sources of bioenergy, and the social, political and economic effects of using bioenergy. **Course Pre-requisite:** BIOL 2501.

BIOL 3201 - Fundamentals of Public Health Nutrition (2 credit: 2.x.2)¹

This course is one of the two courses offered for students completing the track in food safety. This course will provide an introduction to Public Health Nutrition and the role of the Public Health Nutrition professional. Emphasis will be on definition, identification and prevention of nutrition related disease, as well as improving health of a population by improving nutrition. Malnutrition will be discussed on a societal, economic, and environmental level. It will include the basics of nutritional biochemistry as it relates to malnutrition of a community and targeted intervention. Finally, it will review existing programs and policies, including strengths, weaknesses and areas for modification or new interventions. **Course Pre-requisite:** BIOL 2701K.

BIOL 3250K/ CHEM 3250K - Biochemistry (4 credit: 3.3.4)¹

The student examines the structure, function, and metabolism of carbohydrates, amino acids and proteins, lipids, and nucleic acids in this course. Topics include bioenergetics, enzyme kinetics, photosynthesis, and the interdependence of the various metabolic pathways of intermediate metabolism. **Course pre-requisite:** CHEM 2302

BIOL 3311K - Introduction to Natural Resources (3 credit: 2.2.3)¹

Lecture and laboratory activities in this course are designed to introduce students to the problems of population, resource availability and environmental quality. Aspects of air, water resource problems, conventional sources of energy, and food and land resource issues will be considered in the course. **Course Pre-requisite:** BIOL 2107K and CHEM 2112K or permission of instructor.

BIOL 3316K - Sources/Use of Plant/Wildlife (3 credit: 2.2.3)¹

Lecture and laboratory activities introduce the student to the ways plant and wildlife resources have been used throughout history and studies their importance in food production and non-edible production utilization. **Course Pre-requisite:** BIOL 2108K.

BIOL 3320K - Principles/Techniques in Water Resource Services (4 credit: 3.3.4)¹

Lecture and laboratory activities introduce the student to the procedures needed to examine water over a wide quality of ranges, including water suitable for domestic or industrial supplies, surface water, and treated and untreated municipal or industrial wastewater. **Course Pre-requisite:** BIOL 2108K.

BIOL 3333K – Microbiology and Application (4 credit: 3.3.4)¹

A general course in microbiology specifically for Biology majors. Lecture and laboratory activities emphasize the fundamental concepts of the different groups of microorganisms as related to applications in human, animal and plant health, environment, industry, technology and biotechnology. The course will cover Archaea, bacteria, protists, fungi, viruses, parasites, algae and other microbial groups. **Course Pre-requisite:** BIOL 2107K or BIOL 2108K

BIOL 3401K - Introduction to Histology (4 credit: 3.3.4)¹

Lecture and laboratory activities introduce the study of tissues with emphasis placed on light microscopic preparations. **Course Pre-requisite:** BIOL 2107K or BIOL 2108K

BIOL 3501K – Principles of Genetics (4 credit: 3.3.4)¹

Lecture and laboratory activities introduce the study of the classical and modern concepts of heredity in plant and animal systems. **Course Pre-requisite:** BIOL 2108K

BIOL 3506 - Bioinformatics (3 credit: 3.x.3)¹

This course is designed to help students master the DNA analysis tools and resources to study the functions of genomics, understand the gene identity, and facilitate the analysis and presentation of molecular and biochemical data. **Course Pre-requisite:** BIOL 2702K or BIOL 2107K.

BIOL 3611K – Medical Mycology (4 credit: 3.3.4)¹

Lecture and laboratory activities are designed to acquaint students with select fungal groups that cause human disease. **Course Pre-requisite:** BIOL 2108K.

BIOL 3701 - Current Issues & Topics in Biotechnology (2 credit: 2.x.2)¹

This course is to familiarize the students with some of the frontier areas of biotechnological applications where a huge scope for further contributions for betterment of the society exists. This course will allow students to gain theoretical and practical, hands-on knowledge of both commonly used and some specialized laboratory instruments, as well as preparation of common solutions, reagents and methodology. **Course Pre-requisite:** BIOL 2702K.

BIOL 3801 - Environmental Health Concepts in Public Health (2 credit: 2.x.2)¹

As the second course for student's pursuing the track in public health, this course provides a survey of major topics of environmental health. Topics include sources, routes, media, and health outcomes associated with biological, chemical, and physical agents in environment; effects of agents on disease, water quality, air quality, food safety, and land resources; current legal framework, policies, and practices associated with environmental health and intended to improve public health. **Course Pre-requisite:** BIOL 2330.

BIOL 3901 - Pathophysiology (3 credit: 3.x.3)¹

This course discusses the fundamentals of human diseases, with emphasis on anatomical, physiological and clinical processes. **Course Pre-requisite:** BIOL 2108K.

BIOL 4001 – Research Independent Study I (1 credit: 1.x.1)¹

This is a required course for the Biology major. The student will be introduced to concepts, methods and techniques necessary for the development of an undergraduate research topic. The student will make oral presentations on scientific topics of interest and plan a research project with assistance from a faculty advisor. (Required of all majors). **Course Pre-requisite:** Junior classification or permission of the instructor.

BIOL 4101K – General Physiology (4 credit: 3.3.4)¹

In this course, lecture and laboratory activities will emphasize the experimental approach to physiology including the nerve impulse, enzymes and their properties, along with other selected topics. **Course Pre-requisite:** BIOL 2108K.

BIOL 4201K - Introduction to Parasitology (4 credit: 3.3.4)¹

The fundamentals of parasitology are investigated using lecture and laboratory activities with emphasis on the life histories and economic importance of protozoans, helminths, and arthropod parasites. **Course Pre-requisite:** BIOL 2108K

BIOL 4222K – Biology Senior Research (3 credit: x.3.3)¹

This is a required course for Biology majors. The student will conduct a supervised research project in the biological/biomedical or related sciences. The students will perform the experiments, collect and analyze the data, and write up the research finding in a scientific report. The student will also give an oral presentation of the research findings. **Course Pre-requisite:** BIOL 4001.

BIOL 4223 - Foundation of Research III: Communication of Biomedical Information (1 credit: 1.x.1)¹

As the third and final course of the Research track, this course will provide students the formal context to become critical writers and speakers of biomedical information. Student competence is enhanced through exercises that demonstrate the need for effective written and oral communication. Students will learn to critique scientific literature; thereby, helping them to improve their own writing. Students will prepare both written and oral presentations of their research and results. Oral communications include a 3-minute elevator talk, a 10-minute presentation, and a 20-minute seminar. Written communications include posters in the formats of the professional societies in their disciplines. **Course Pre-requisite:** BIOL 2240 or BIOL 4222.

BIOL 4301K - Developmental Biology (4 credit: 3.3.4)¹

Lecture and laboratory activities will emphasize classical methods of analysis and the series of embryonic stages from gametogenesis to histogenesis. Also, basic conceptual topics such as nuclear totipotency, cell determination, cytoplasmic localization, induction, and morphogenesis are interspersed. **Course Pre-requisite:** BIOL 2108K.

BIOL 4401K - Comparative Vertebrate Anatomy (4 credit: 3.3.4)¹

Course lectures will include comparative structure and evolutionary relationships among a series of chordates from amphioxus to mammals with thorough laboratory dissections of at least one representative from each of the vertebrate classes. **Course Pre-requisite:** BIOL 2108K

BIOL 4501K - Immunology (4 credit: 3.3.4)¹

Biology 4501 is an introductory level course in immunology. Lecture and laboratory exercises cover the basic concepts of immune system, antigen, autoimmune diseases, tumor immunology, specific and non-specific types of immune responses. **Course Pre-requisite:** BIOL 3333K or BIOL 2107K

BIOL 4601K – Plant Physiology (4 credit: 3.3.4)¹

Lecture and laboratory exercises study vascular plant functions, including absorption and translocation of water and solutes, transpiration, photosynthesis, respiration, growth and development and hormonal regulation. **Course Pre-requisite:** BIOL 2311K

BIOL 4701K - Cell/Molecular Biology (4 credit: 3.3.4)¹

This course is designed to acquaint students with the organization and function of the cell utilizing cellular and molecular techniques to investigate structure and function. **Course Pre-requisite:** BIOL 2108K or BIOL 3333K.

BIOL 4703K – Genetic Engineering (4 credit: 3.3.4)¹

This course is intended to bring students up to the leading edge of research in developing genetically altered organisms. Focus will be on concepts and laboratory techniques of transgenic organisms, transformations; screening and selection of transgenic organisms. **Course Pre-requisite:** BIOL 2702K

Suggested courses for Biotech concentration and various tracks for interest of profession:

1. Biotechnology concentration:

Students wishing to earn a concentration in biotechnology are required to take the following courses as part of their biology course sequence: BIOL 2702K, BIOL 3506, BIOL 3701, and BIOL 4703K. Please note that satisfactory completion of these courses also fulfills the 13 hours of biology electives required for the major with no additional electives needed. Please note, the student's senior research project (required as a part of BIOL 4222K) must be related to the field of biotechnology. For detailed information discuss with biotech program coordinator.

2. Pre-Med Track (medical/dental/pharmacy):

Based on current admissions criteria for medical based professional programs, biology students interested in the pre-med track are advised to place emphasis on the following courses: (Required courses in bold)

- Biology: **Principles of Biology I (2107K), Principles of Biology II (2108K),**
 (BIOL) **Principles of Genetics (3501K), and Cell Molecular Biology (4701K),**
 Human Anatomy and Physiology I (2411K), Human Anatomy and
 Physiology II (2412K).
- Chemistry: **Principles Chemistry I (1211K), Principles**
 Chemistry II (1212K), Organic
- (CHEM) **Chemistry I (2301K), Organic Chemistry II (2302K), Biochemistry**
 (3250K)
- Physics:
- (PHYS) **Introductory Physics I (1111K), Introductory Physics II (1112K)**

Due to the recent addition of behavioral and social sciences portions to the Medical College Admission Test (MCAT), students interested in **medical school** are also encouraged to take the following courses:

General Psychology (PSYC 1101), Basic Skills in Behavioral Science (PSYC 1002) or Basic Skills in the Behavioral Science (SOC 2001), Introduction to Anthropology (SOC 2031), and/or Social Basis of Human Behavior (SOC 2282). For further discussion, contact pre-med advisor.

3. **Graduate program/ Research track:**

Biology students interested in the graduate program/research track are recommended to take the following courses as part of their biology course sequence: BIOL 2000, BIOL 2001 (optional), BIOL 2240, BIOL 2250, BIOL 2320K, **BIOL 4001**, **BIOL 4222K**, and BIOL 4223. Please note that bold courses are required for completion of the biology major. All other courses can be used to satisfy the 13 hours of biology electives required for the major.

4. **Bioenergy Track:**

Biology students interested in the bioenergy track are recommended to take BIOL 2501 and BIOL 3103 as part of their biology course sequence. Please note that satisfactory completion of these courses may be used towards 13 hours of biology electives required for the major.

5. **Public Health Track:**

Biology students interested in the public health track are recommended to take BIOL 2330 and BIOL 3801 as part of their biology course sequence. Please note that satisfactory completion of these courses may be used towards 13 hours of biology electives required for the major.

6. Food Safety Track:

Biology students interested in the food safety track are recommended to take BIOL 2601 and BIOL 3201 as part of their biology course sequence. Please note that satisfactory completion of these courses may be used towards 13 hours of biology electives required for the major.