

# BIOLOGY (BIOL)

## **BIOL 1120G Human Biology 3 Credits (3)**

This course is an introduction to modern biological concepts with an emphasis on the relevance to humans and their relationships with the environment.

### **Learning Outcomes**

1. Describe the process of scientific inquiry in biology.
2. Solve problems scientifically as related to human biology.
3. Communicate biologic information.
4. Apply quantitative analysis to scientific problems in biology.
5. Apply scientific thinking to real world problems.

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## **BIOL 1120L Human Biology Laboratory 1 Credit (1)**

This course introduces exercises, experiences, and activities exploring biological concepts and theories relevant to humans and their relationship to the environment in a laboratory setting.

**Prerequisite(s)/Corequisite(s):** BIOL 1120G

### **Learning Outcomes**

1. Understand general principles of cell structure and function.
2. Understand general principles of genetics.
3. Understand basic human anatomy and physiology.
4. Communicate scientific information effectively.
5. Demonstrate an understanding of the scientific method.
6. Knowledge of appropriate laboratory skills
7. Apply quantitative reasoning and scientific thinking to real world problems.

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## **BIOL 1130G Introductory Anatomy & Physiology (non majors) 4 Credits (4)**

This course introduces the anatomy (structure) and physiology (function) of the human body, which includes the study of basic chemistry, molecules, cells, tissues, organs, organ systems, and terminology related to these concepts. (3+3P). Repeatable: up to 4 credits.

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## **BIOL 1190G Contemporary Problems in Biology 4 Credits (4)**

Fundamental concepts of biology will be presented using examples from relevant problems in ecology, medicine and genetics. For nonscience majors only. (3+3P)

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## **BIOL 1996 Topics in Biology 1-3 Credits**

Introductory level coverage of biological topics. Repeatable: up to 9 credits.

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## **BIOL 2110G Principles of Biology: Cellular and Molecular Biology 3 Credits (3)**

This course introduces students to major topics in general biology. This course focuses on the principles of structure and function of living things at the molecular, cellular and organismic levels of organization. Major topics included are introduction to the scientific process, chemistry of cells, organization of cells, cellular respiration, photosynthesis, cell division, DNA replication, transcription, and translation. Must be taken with BIOL 2110L to meet general education requirements. Repeatable: up to 3 credits.

**Prerequisite(s)/Corequisite(s):** a C- or better in MATH 1215 or higher and a C- or better in CHEM 1120G or CHEM 1215G or CHEM 1216

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## **BIOL 2110L Principles of Biology: Cellular and Molecular Laboratory 1 Credit (1)**

This course introduces students to major topics in general biology.

This course focuses on the principles of structure and function of living things at the molecular, cellular and organismic levels of organization. Major topics included are introduction to the scientific process, chemistry of cells, organization of cells, cellular respiration, photosynthesis, cell division, genetics, DNA replication, transcription, and translation. Repeatable: up to 1 credits.

**Prerequisite(s)/Corequisite(s):** BIOL 2110G; Prerequisite(s): MATH 1215 or higher, and a C- or better in CHEM 1120G or CHEM 1215G or CHEM 1216

### **Learning Outcomes**

1. Describe and apply the scientific method to solve problems in biological context
2. Demonstrate knowledge of laboratory safety skills and procedures.
3. Practice principles of scientific method while conducting laboratory activities and experiments.
4. Perform laboratory activities using relevant laboratory equipment, chemical reagents, and supplies to observe biological specimens, to measure variables, and to design and conduct experiments.
5. Operate light microscopes, prepare wet mount slides, and use stains.
6. Exhibit ability to use pipettes and other volumetric measuring devices, chemical glassware, balances, pH meters or test papers, spectrophotometers, and separation techniques, such as chromatography and/or electrophoresis to perform activities relevant to other course competencies.
7. Analyze and report data generated during laboratory activities and experiments.

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## **BIOL 2210 Human Anatomy and Physiology I for the Health Sciences 4 Credits (4)**

This course is the first of two that serve as an introduction to human anatomy and physiology for biology majors and allied health students. The course entails describing, explaining, and analyzing structure and function from the submicroscopic to the organismal level with emphasis on anatomic, directional, and sectional terminology, basic cellular structure and metabolism, tissue differentiation and characteristics, and organ system structure and function; Specifically the integumentary, skeletal, muscular, and nervous systems. (3+3P)

**Prerequisite(s)/Corequisite(s):** CHEM 1120G or CHEM 1215G

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**BIOL 2210C Human Anatomy and Physiology I Lecture & Laboratory 4 Credits (4)**

Combined BIOL 2210 and BIOL 2210L.

**Learning Outcomes**

1. Discuss the relationship between cells, tissues, organs, and organ systems, and explain how structure is related to function.
2. Describe the major structures of the skin and explain how the skin functions as an essential body organ.
3. Identify the physiological process of bone tissue and explain bone structure and articulations.
4. Explain the structure and function of muscle tissue.
5. Describe the structure and function of the nervous system.

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**BIOL 2221 Human Physiology 3 Credits (3)**

Physical and chemical operation of the organs and systems of the human body.

**Prerequisite(s):** Grade of at least C- in BIOL 2110G; BIOL 2110L; CHEM 1215G or CHEM 1120G

**Learning Outcomes**

1. Understand the central physiological principle of homeostasis
2. Be able to explain why concentration gradients are essential to maintain homeostasis
3. Understand the regulation of homeostasis by neuronal / endocrine chemical messengers
4. Understand that changes in bodily function occur throughout the entire life span of the human animal
5. Incorporate the importance of evolutionary biology to your understanding of human disease
6. Teach a physiological concept to your classmates
7. Design experiments to test physiological concepts
8. Put in plain words how the laws of thermodynamics can explain human disease.

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**BIOL 2225 Human Anatomy and Physiology II 4 Credits (4)**

This course is the second of two that serve as an introduction to human anatomy and physiology for biology majors and allied health students. The course entails describing, explaining, and analyzing structure and function from the submicroscopic to the organismal level with emphasis on specific cellular, tissue, and organ structure and physiology, and organ system structure and function; specifically the endocrine, cardiovascular, respiratory, urinary, and reproductive systems. Additionally, an analysis of these concepts is included: fluid and electrolyte balance, pregnancy, growth and development from zygote to newborn, and heredity. (3+3P)

**Prerequisite(s):** BIOL 2210, CHEM 1120G or CHEM 1215G

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**BIOL 2225C Human Anatomy and Physiology II Lecture and Laboratory 4 Credits (4)**

Combined BIOL 2225 and BIOL 2225L

**Learning Outcomes**

1. Explain the physiological processes of the endocrine, cardiovascular, immune, respiratory, digestive, urinary, and reproductive systems.
2. Identify the anatomical structures of the endocrine, cardiovascular, immune, respiratory, digestive, urinary, and reproductive systems. define the homeostatic, structure-function, and cause-effect relationship in the endocrine, cardiovascular, immune, respiratory, digestive, urinary, and reproductive systems.

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**BIOL 2310 Microbiology 3 Credits (3)**

Introduction to the basic principles of microbiology, microbial pathogenesis, host defenses and infectious diseases. The course will emphasize concepts related to the structure and function of microorganisms, including their mechanisms of metabolism and growth. Host parasite interactions will also be emphasized, including mechanisms of microbial pathogenesis and mechanisms of host defenses against infectious diseases.

**Prerequisite(s):** CHEM 1120G or CHEM 1215G or CHEM 1225G

**Corequisite(s):** BIOL 2310L

**Learning Outcomes**

1. Describe and compare the structure and function of prokaryotic and eukaryotic cells.
2. Describe and compare the techniques used for staining of and microscopic observation of bacteria including morphology.
3. Describe the nutritional requirements for bacterial growth and the impact of environmental factors on bacterial growth (temperature, pH, oxygen, etc.).
4. Describe and compare the mechanisms of aerobic respiration, anaerobic respiration, and fermentative metabolism.
5. Describe the mechanism of bacterial growth by binary fission, and laboratory methods used for observing and measuring bacterial growth.
6. Describe the mechanisms of bacterial DNA replication, RNA transcription, and translation, and compare and contrast with eukaryotic cells.
7. Describe the structure and replication strategies of viruses.
8. Describe and contrast mechanisms of innate nonspecific immunity and adaptive specific immunity.
9. Describe immune hypersensitivity reactions, autoimmune diseases, and immunodeficiency diseases. 1
10. Differentiate between host microbe relationships, mechanisms of microbial pathogenesis, differentiate between communicable and noncommunicable diseases and describe mechanisms of direct and indirect transmission of communicable diseases.

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**BIOL 2310L Microbiology Laboratory 1 Credit (1)**

This course will emphasize both the theory and hands-on application of techniques used in a microbiology laboratory for the growth and identification of bacterial species. Students will learn microscopy skills and staining techniques for the observation of bacteria. Students will also learn aseptic techniques used for isolation of bacteria, inoculation of cultures, and interpretation of selective and differential growth media for the identification of bacterial species. (3P) Provides lab.

**Prerequisite(s):** BIOL 2310 or BIOL 2320 or concurrent enrollment

**Provides Lab****Learning Outcomes**

1. Demonstrate skills of microscopy.
2. Demonstrate skills of bacterial staining.
3. Demonstrate aseptic technique for inoculation of bacterial growth media.
4. Interpret results from selective and differential media.
5. Demonstrate appropriate use of diagnostic reagents.
6. Interpret results of diagnostic assays.
7. Identify unknown bacterial species through the use of a dichotomous key, inoculation and interpretation of laboratory assays, and application of the scientific method.

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**BIOL 2320 Public Health Microbiology 3 Credits (3)**

This course introduces microbiology on the health profession level. It incorporates cell structure, metabolism, growth, controls of growth, infectious epidemiology, etiology, pathogenicity, and relative virulence of pathogens. It will lead to students assessing a clinical infection scenario from the microbiological perspective that includes making diagnoses based on data from appropriate diagnostic tests, investigating appropriate treatment options, and making recommendations for prevention.

**Prerequisite(s):** BIOL 2110G and BIOL 2110L

**Learning Outcomes**

1. Identify key physical features of various infectious agents and describe their structure and function in the pathogen
2. Describe the microbiological, serological, biochemical and genetic tests that are used to identify infectious agents in a laboratory setting and be able to interpret test results in order to identify the pathogen
3. Explain how structural and metabolic differences between infectious agents and human host can be exploited for chemotherapy
4. Explain the observed effect of a particular environmental change on the growth of a given microorganism, and the relationship between bacterial growth patterns and selected foodborne illnesses
5. Describe several mechanisms by which pathogens generate genetic diversity and the role genetic diversity plays in resistance to therapy and treatment failure
6. Explain the role of innate, and adaptive immunity in host defense
7. Describe general virulence strategies used by variety of pathogens, and different types of vaccines along with recommendations for vaccinations of specific populations
8. Demonstrate understanding of signs and symptoms of selected diseases, and be able to relate disease agents with environmental reservoirs and transmission.

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**BIOL 2505 Pathophysiology 3 Credits (3)**

This course is designed to provide the conscientious student with a solid foundation for understanding the pathophysiological processes of the human organism. Successful completion of this course will promote the general student learning outcomes. Corequisite/Prerequisites(s): AHS 154 or BIOL 2225.

**Prerequisite(s):** AHS 153 or BIOL 2210

**Learning Outcomes**

1. To describe the general concepts of disease processes and factors associated with disease causation.
2. To identify the function of basic cellular structures, determining the process of cellular malfunctions.
3. To describe the response of the body to injury and immunologic challenge.
4. To discuss the etiology, pathogenesis, and treatment modalities of frequently occurring diseases.

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**BIOL 2511 Pathophysiology I 3 Credits (3)**

The first in a two-course sequence that covers changes in body physiology that result from disease or injury. Includes a general introduction to pathophysiology as well as an overview of altered cellular and tissue biology, injury, inflammation, and neoplasia. Students will also explore deviation from fluid, hemodynamic, and endocrinologic balance. Topics related to the science of pathophysiology, including pathology, pathogenesis, etiology, epidemiology, and clinical manifestations, are also discussed throughout the course where relevant. Grade of C- or higher in microbiology is recommended.

**Prerequisite(s):** Grade of C- or higher in BIOL 2210 and BIOL 2225

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**BIOL 2512 Pathophysiology II 3 Credits (3)**

The second in a two-course sequence that covers changes in body physiology that result from disease or injury. This course focuses on the pathophysiology of the nervous, cardiovascular, lymphatic, respiratory, digestive, urinary, and reproductive systems. Topics related to the science of pathophysiology, including pathology, pathogenesis, etiology, epidemiology, and clinical manifestations, are also discussed throughout the course where relevant. Grade of C- or higher in microbiology is recommended. Repeatable: up to 3 credits.

**Prerequisite(s):** Grade of C- or higher in BIOL 2210, BIOL 2225, and BIOL 2511

**Learning Outcomes**

1. The different types of sensory modalities; the different dysfunctions of the general and special senses; the different pain theories discussed in class; the various aspects of the neuroanatomy and neuromodulation of pain; the various clinical descriptions of pain; the various aspects of temperature regulation; components of the pathogenesis of fever; the various disorders of temperature regulation; the various aspects of sleep disorders; the various components of visual dysfunction; and the various aspects of auditory, gustatory, and olfactory dysfunction.
2. The various alterations in cognitive systems; the various alterations in arousal; the outcomes of alterations in arousal; the various alterations in awareness; the various seizure disorders; the various data processing deficits; various alterations in cerebral hemodynamics; and alterations in neuromotor function.
3. The various disorders of the central and peripheral nervous systems; and the various disorders of the neuromuscular junction.
4. The components of normal blood; the process/stages of hematopoiesis; the various normal RBC laboratory values; the components and functions of the lymphatic system; the various types of imbalances of erythropoiesis; the various types of anemias and their causes; the various types of polycythemia and their causes; the processes related to hemostasis; the various alterations of white blood cells and their causes; and the various alterations of lymphoid and hemostatic function.
5. The various diseases of the veins; the various diseases of the arteries; the various aspects of atherosclerosis; features related to the pathogenesis and consequences of coronary artery disease; the disorders of the heart wall and their consequences; the various aspects of valvular dysfunction; aspects of the pathogenesis and manifestations of rheumatic disease; the causes, pathogenesis, and manifestations of infective endocarditis; the causes, manifestations, and pathophysiology of heart failure; and the various types of shock.
6. The various signs and symptoms of pulmonary disease; the various conditions caused by pulmonary disease/injury; the various disorders of the chest wall and pleura; and the causes, manifestations, and pathophysiology of selected pulmonary disorders.
7. The features and consequences of upper and lower urinary tract obstruction; the various types of urinary tract infection; the causes, pathogenesis, and clinical manifestations of glomerulonephritis; the various features of nephrotic and nephritic syndrome; and the various features (etiology, pathophysiology, and clinical manifestations) of both acute kidney injury and chronic kidney disease.
8. The various clinical manifestations of gastrointestinal dysfunction; the various aspects (etiology, pathophysiology, and clinical manifestations) of disorders of motility; the causes, manifestations, and pathophysiology of gastritis; features related to the causes, manifestations, and pathophysiology of peptic ulcer disease; features related to the etiology, pathogenesis and pathophysiology of selected malabsorption syndromes, inflammatory bowel diseases, diverticular disease of the colon, appendicitis, and irritable bowel syndrome; the various types of vascular insufficiency; the various disorders of nutrition and their causes and clinical manifestations; and the various

**BIOL 2610G Principles of Biology: Biodiversity, Ecology, and Evolution 3 Credits (3)**

This course is an introduction to the dynamic processes of living things. Major topics include the mechanisms of evolution, biological diversity, Mendelian genetics, and ecology.

**Prerequisite(s)/Corequisite(s):** grade of C- or better in MATH 1215 or higher, or a Math Placement Exam score adequate to enroll in mathematics courses beyond MATH 1215  
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**BIOL 2610L Principles of Biology: Biodiversity, Ecology, and Evolution Laboratory 1 Credit (1)**

This laboratory course is an introduction to the dynamic processes of living things. This course introduces students to the methods used in the study of Mendelian genetics, evolution, ecology, and biological diversity. Designed for students continuing in life sciences.

**Prerequisite(s)/Corequisite(s):** BIOL 2610G; grade of C- or better in MATH 1215 or higher, or a Math Placement Exam score adequate to enroll in mathematics courses beyond MATH 1215

**Learning Outcomes**

1. Describe and apply the scientific method to generate testable hypotheses in evolution and ecology.
2. Design and conduct laboratory experiments using relevant laboratory equipment and methods.
3. Analyze and report data generated during laboratory activities and experiments.
4. Communicate scientific results from experiments in evolution, ecology, and biodiversity.

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**BIOL 2996 Topics in Biology 1-3 Credits**

Specific subjects to be announced in the Schedule of Classes.  
Repeatable: for a maximum of 6 credits.

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