Course Information Form (CIF)

Course Code: BIO 111

Course Title: Basic Anatomy and Physiology

Department: Natural Sciences
PCS Code: 1.2 - Occupational/Technical Instruction
CIP Code: 26.0403
Repeatability: 0

Effective Date: Summer 2026

Credit Hours

Catalog Notation: 3-3-4
Credit Hour Distribution:

Lecture: 3	Lab: 3	Clinical: 0	**Total: 4**

General Course Information

Catalog Description

General survey of basic human body structure and function. Includes basic chemistry, cells and tissues, metabolism, skeletal, muscular, circulatory, respiratory, digestive, reproductive, urinary, nervous, and endocrine systems, and special senses. Lab activities include use of models, the Anatomage, and cadavers.

General Course Objectives

To serve as a course for students with limited biology backgrounds to prepare them for BIO 121-122.

Minimum Placement Levels

English	Reading	Math
None	Placement out of CCS 098	None

Prerequisites

None

Methods of Evaluation

11-13 objective exams, 5 lab practical exams, 1-3 essay exams, 7-10 lab exercises, 3-5 case studies, and cumulative final exam.

Instructional Materials and Additional Supplies

Essentials of Human Anatomy and Physiology, 12th Ed, © 2018 Pearson; Marieb and Keller. Bundled with Lab Manual for Essentials of Human Anatomy and Physiology and Mastering A&P . Bundle price $279.97 new. 9780134771366

Essentials of Human Anatomy and Physiology, 12th Ed, © 2018 Pearson; Marieb and Keller. Textbook by itself; from $122.66 from the publisher. 9780134395326

Laboratory Manual for Essentials of Human Anatomy and Physiology, 12th ed. © 2018 Pearson; Marieb and Jackson, bundled with textbook.
Laboratory Manual for Essentials of Human Anatomy and Physiology, 12th ed. © 2018 Pearson; Marieb and Jackson, Stand alone: $53.32 from the publisher. 9780134424835
Mastering A&P, Digital Program; Pearson, Bundled with textbook.
Mastering A&P, Stand alone, $94.99 from publisher. 9780134652627

Course Content

General Learning Outcomes (GLOs)

- Communication: Students will demonstrate the ability to read, write, listen, and speak effectively.

Course Segments and Student Learning Outcomes

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Unit 1: Introduction	1. Define anatomy and physiology. 2. Explain how anatomy and physiology are related. 3. Name the six levels of structural organization that make up the human body and explain how they are related. 4. Name the eleven organ systems of the body and briefly state the major functions of each system. 5. Identify all major organs discussed and classify them by organ system. 6. List eight functions that humans must perform to maintain life. 7. List the five survival needs of the human body. 8. Verbally describe or demonstrate the anatomical position. 9. Use proper anatomical terminology, including orientation and directional terms, regional terms, and terms for planes and sections. 10. Locate the major body cavities and list the major organs in each cavity. 11. Describe the location of the four abdominopelvic quadrants. 12. Define the term homeostasis, explain its importance, and list the three major components of homeostatic control systems. 13. Define negative feedback and describe its role in maintaining homeostasis and normal body function. 14. Explain how positive feedback is different than negative feedback.	3	3	0

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Unit 2: Basic Chemistry	1. Differentiate between kinetic energy and potential energy. 2. List four major energy forms and provide one example of how each is used in the body. 3. Define an element and list the four major elements that make up most of the human body. 4. List the three major subatomic particles, and describe their relative masses, charges, and positions in the atom (basic atomic structure). 5. Define radioisotope and describe briefly how radioisotopes are used in diagnosing and treating disease. 6. Define molecule and explain how molecules are related to compounds. 7. Describe different types of chemical bonds; contrast synthesis, decomposition, and exchange reactions. 8. Distinguish organic compounds from inorganic compounds. 9. Explain the unique characteristics of water and the importance of water to homeostasis, and provide several examples of its roles. 10. Differentiate between a solution, solute, solvent, and colloid. 11. Define and differentiate between the three types of electrolytes: salt, acid, and base. 12. Explain the concept of pH and the values on the pH scale, and state the pH of blood. 13. Explain the relationship between monomers and polymers. 14. Explain the roles of dehydration synthesis and hydrolysis in the formation and breakdown of organic molecules. 15. Compare and contrast carbohydrates and lipids in terms of their building blocks (monomers), general structures, and functions in the body. 16. Name the monomers from which all proteins are constructed and describe general protein structure. 17. Define enzyme and explain the role of enzymes. 18. Compare and contrast the structures and functions of DNA and RNA. 19. Explain the importance of ATP in the body and provide the general reversible reaction by which it is made and broken down.	3	3	0
Unit 3: Cells and Tissues	1. Name and describe the four major concepts of Cell Theory. 2. List the four elements that make up most living matter. 3. Define generalized cell (also called composite cell); list and identify its three main components. 4. List the structures of the cell nucleus and explain the functions of each of them. 5. Describe the chemical composition and organization of the plasma membrane (fluid mosaic model) and explain how it contributes to membrane functions. 6. Compare the structure and function of tight junctions, desmosomes, and gap junctions. 7. Identify the organelles and indicate the major function of each. 8. Differentiate between intracellular and extracellular fluid and explain their relationship. 9. Differentiate between passive and active membrane transport processes. 10. Explain simple and facilitated diffusion, osmosis, filtration, active transport (solute pumping) and vesicular transport (exocytosis, endocytosis, receptor-mediated endocytosis, phagocytosis, and pinocytosis). 11. Explain isotonic, hypertonic, and hypotonic solutions, and predict the direction of water movement between these types of solutions. 12. Define cell life cycle and list the two major periods that occur during it. 13. Briefly describe the process of DNA replication: when and where it occurs, what happens, and why it is essential. 14. List the two events that occur during cell division and explain the major events that occur during each stage of mitosis and during cytokinesis. 15. Explain the relationship between a gene and a protein. 16. Explain the process of protein synthesis, including the roles of DNA and the three major varieties of RNA during protein synthesis. 17. Name the four major tissue types and their main subcategories. 18. Explain how the four major tissue types differ structurally and functionally. 19. Give the chief locations of the various tissue types in the body. 20. Describe the process of tissue repair (wound healing). 21. Define neoplasm and explain benign and malignant neoplasms.	3	3	0

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Unit 4: Skin and Membranes	1. List the general functions of each membrane type (cutaneous, mucous, serous, and synovial) and list specific locations for each. 2. Compare the structures (tissue makeup) of the major membrane types. 3. List and explain the major functions of the integumentary system. 4. Recognize and name the epidermis, dermis (papillary and reticular layers), hair and hair follicle, sebaceous gland, and sweat gland. 5. Name the layers of the epidermis and describe the characteristics of each. 6. Explain the major factors that determine skin color and describe the function of melanin. 7. Describe the distribution and function of the epidermal appendages: sebaceous glands, sweat glands, hair, and nails. 8. Differentiate between first-, second-, third-, and fourth-degree burns. 9. Define and explain the importance of the "rule of nines". 10. Summarize the characteristics of basal cell carcinoma, squamous cell carcinoma, and malignant melanoma. 11. Describe how aging affects the integumentary system.	3	3	0
Unit 5: Skeletal System	1. Differentiate between the axial and appendicular skeleton and list the bones in each. 2. List and explain five major functions of the skeletal system. 3. Describe the microscopic structure of compact bone and spongy bone and identify the structures of compact bone (see the Skeletal System Structure List). 4. Name the four main groups of bones, classified by shape, and provide examples of each. 5. Identify the major parts of a long bone (see the Skeletal System Structure List). 6. Explain the role of bone salts and the organic matrix in making bone both hard and flexible. 7. Briefly describe the process of bone formation (ossification) in the fetus and summarize the events of bone remodeling throughout life, including the hormones involved. 8. Name and describe major types of fractures and differentiate between simple (closed) and compound (open) fractures. 9. Describe the four stages in bone fracture healing. 10. Describe how the skull of a newborn or fetus differs from that of an adult and explain the function of fontanels. 11. Name the parts of a typical vertebra, and explain in general how cervical, thoracic, and lumbar vertebrae differ from one another. 12. Discuss the importance of intervertebral discs and spinal curvatures. 13. Describe each of the three major types of abnormal spinal curvatures (scoliosis, lordosis, kyphosis). 14. Name the components of the thoracic cage and differentiate between true and false ribs. 15. Describe important differences between a male and a female pelvis. 16. Name the three major structural categories of joints and compare the amount of movement allowed by each. 17. Describe and identify on a model or illustration the major components of a typical synovial joint. 18. Describe major changes in skeletal development at fetal, infant, youth, and adult stages of life. 19. Explain selected skeletal system disorders. 20. Identify on microscope slides/micrographs, skeletons, bones, models, illustrations, or the Anatomage all structures listed on the Skeletal System Structure List.	3	3	0

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Unit 6: Muscular System	1. Describe similarities and differences in the structure and function of the three types of muscle tissue and indicate where each is found in the body. 2. Define muscular system. 3. Define and explain the relationship between and the roles of the following: endomysium, perimysium, epimysium, tendon, and aponeurosis. 4. Describe the microscopic structure of a skeletal muscle. 5. Explain the organization of actin- and myosin-containing myofilaments and how they produce muscle contraction. 6. Describe how an action potential is initiated in a muscle cell. 7. Describe the events of muscle cell contraction. Include what happens in the motor neuron, the neuromuscular junction, and the muscle cell. 8. Explain graded response, tetanus, isotonic and isometric contractions, and muscle tone. 9. Describe three pathways for ATP regeneration during muscle activity. 10. Explain oxygen deficit and muscle fatigue, and list possible causes of muscle fatigue. 11. Describe the effects of aerobic and resistance exercise on skeletal muscles and other organs. 12. Define origin, insertion, prime mover, antagonist, synergist, and fixator as they relate to muscles and movement. 13. Demonstrate and identify the different types of body movements. 14. List seven criteria used in naming muscles. 15. Describe the location and functions for the major muscles. 16. Explain the importance of a nerve supply and exercise in keeping muscles healthy. 17. Describe the changes that occur in aging muscles. 18. Identify on models, illustrations, or the Anatomage all structures listed on the Muscular System Structure List.	3	3	0
Unit 7: Nervous System	1. Explain the structural and functional classifications of the nervous system, including the central nervous system, peripheral nervous system, sensory (or afferent) division, motor (or efferent) division, somatic nervous system, voluntary nervous system, and autonomic nervous system (or involuntary nervous system). 2. Differentiate between the central nervous system and peripheral nervous system and list the major components of each. 3. Describe the structures and functions of neurons and neuroglia, including microglia, ependymal cells, oligodendrocytes, Schwann cells, and satellite cells. 4. Describe the general structure of a neuron and name its important anatomical regions. 5. Explain the structure, formation, and function of the myelin sheath. 6. Differentiate between the composition and location of gray matter and white matter. 7. Classify neurons according to their structure and function; list the types of general sensory receptors and describe their functions. 8. Describe the events that lead to generation and conduction of a nerve impulse and describe how it is passed from one neuron to another. 9. Explain a reflex arc and list and explain the functions of its components. 10. Name the effectors in somatic and autonomic reflexes. 11. Identify on a brain model or diagram and indicate the functions of the major regions of the cerebral hemispheres, diencephalon, brain stem, and cerebellum. 12. Name the three meningeal layers, describe their locations, and state their functions. 13. Discuss the formation and function of cerebrospinal fluid and the blood-brain barrier. 14. Describe the following neurological disorders: concussion, brain contusion, intracranial hemorrhage, cerebral edema, CVA, TIA, Alzheimer's disease, Parkinson's disease, and Huntington's disease. 15. Describe the general organization of the spinal cord. 16. Describe the general structure of a nerve. 17. Contrast the effect of the parasympathetic and sympathetic divisions on the following organs: heart, lungs, digestive system, and blood vessels. 18. Briefly describe the causes, signs, and consequences of the following congenital disorders: spina bifida, anencephaly, and cerebral palsy. 19. Define senility and list some possible causes.	3	3	0

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Unit 8: Special Senses	1. Identify the accessory eye structures on a dissection, model, or illustration and list their functions. 2. Name the layers of the wall of the eye and indicate the major functions of each. 3. Differentiate between rods and cones in terms of basic structure, location, numbers, and functions. 4. Explain blind spots, cataracts, and glaucoma. 5. Trace the pathway of light from the front of the eye to the retina. 6. Describe how an image forms on the retina. 7. Explain the following terms: accommodation, astigmatism, emmetropia, hyperopia, myopia, and refraction. 8. Describe the convergence and pupillary reflexes. 9. Identify the structures of the external, middle, and internal ear, and list the functions of each. 10. Distinguish between static and dynamic equilibrium. 11. Describe how the equilibrium organs help maintain balance. 12. Explain the function of the spiral organ in hearing. 13. Differentiate between sensorineural deafness and conductive deafness, and list possible causes of each. 14. Explain how a person can localize the source of a sound. 15. Describe the location, structure, and function of olfactory and taste receptors. 16. Name the five basic taste sensations; list factors that modify sense of taste. 17. Describe changes that occur with age in the special sense organs.	3	3	0
Unit 9: Endocrine System	1. Differentiate between amino-acid based hormones, steroid hormones, and prostaglandins, and explain the relationship between a hormone and its target organ. 2. Differentiate between the two major mechanisms by which hormones bring about their effects in the body: direct gene activation and second messenger systems. 3. Explain negative feedback and describe its role in regulating blood levels of hormones. 4. Explain how endocrine glands are stimulated to release their hormones (hormonal stimuli, humoral stimuli, and neural stimuli). 5. Describe the difference between endocrine and exocrine glands. 6. Identify the major endocrine organs on models, illustrations, and the Anatomage. 7. List and discuss general functions of hormones secreted by each endocrine gland listed. 8. Discuss how hormones promote body homeostasis, and provide specific examples. 9. Describe major pathological consequences of hypersecretion and hyposecretion of the hormones considered in this unit. 10. Explain the relationship between the hypothalamus and each lobe of the pituitary gland. 11. Indicate the endocrine role of the kidneys, intestine, heart, and placenta. 12. Describe aging effects on the endocrine system and homeostasis.	3	3	0

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Unit 10: Cardiovascular System	1. Describe the composition and volume of whole blood. 2. Describe the composition of plasma and discuss its importance in the body. 3. List the cell types making up the formed elements of blood and describe their major functions. 4. Describe anemia, sickle cell anemia (also called sickle cell disease), sickle cell trait, polycythemia, leukopenia, leukocytosis, leukemia, thrombocytopenia, hemophilia, and hemolysis. 5. Explain the general process of hematopoiesis and the roles of hemocytoblasts and erythropoietin. 6. List and explain the three major phases of hemostasis. 7. Describe the blood-clotting process (coagulation). 8. Describe the ABO and Rh blood groups, including the roles of antigens and antibodies, and explain the basis for a transfusion reaction. 9. Trace the pathway of blood through the heart and name the major heart structures. 10. Compare the pulmonary and systemic circuits. 11. Explain the operation of the heart valves and how they relate to heart murmur. 12. Describe the cardiac circulation system. 13. List and explain the functions of the components of the intrinsic conduction system of the heart and describe the pathway of impulses through this system. 14. Define cardiac cycle and explain the events that occur during each of its major phases. 15. Explain the components of an electrocardiogram (ECG). 16. Define cardiac output, explain how it is calculated, and list factors that can alter it. 17. Compare and contrast the structure and function of arteries, veins, and capillaries. 18. Discuss the unique features of the arterial circulation of the brain and hepatic portal circulation. 19. Explain pulse and name several pulse points. 20. Define blood pressure and describe factors that can affect it. 21. Define hypertension and atherosclerosis, and describe possible health consequences of these conditions. 22. Explain the process by which materials are exchanged across capillary walls. 23. Describe fetal circulatory shunts and bypasses. 24. On models, dissections, illustrations, and the Anatomage, identify all structures on the Cardiovascular Structure List.	3	3	0

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Unit 11: Lymphatic System and Defense	1. Explain the formation of lymph, how it travels, and where it returns to the cardiovascular system. 2. Describe the locations and functions of lymph nodes, tonsils, thymus, Peyer's patches, spleen, and mucosa-associated lymphoid tissue (MALT). 3. Differentiate between the innate defense system (nonspecific) and the adaptive defense system (specific defense system). 4. Provide and briefly explain examples of innate body defenses, including surface membrane barriers (first line of defense) and cellular and chemical defenses (second line of defense). 5. Explain the major steps in the inflammatory response (inflammation). 6. Explain the functions of complement and interferon. 7. Describe how a fever protects the body. 8. Describe the general characteristics of the immune response. 9. Differentiate between humoral immunity and cellular immunity. 10. Explain the difference between an antigen and a hapten. 11. Differentiate between B lymphocytes and T lymphocytes; relate them to the two types of specific immunity, and explain their general roles. 12. Explain the importance of and provide examples of antigen-presenting cells. 13. Explain the process by which B and T lymphocytes develop immunocompetence, where this occurs for each of them, and how it is related to self-tolerance. 14. Explain humoral immunity and the roles of plasma cells and memory cells. 15. Explain the functions of antibodies. 16. Distinguish between active and passive immunity. 17. Describe the general structure of an antibody. 18. Name the five classes of antibodies and explain the general function of each. 19. Describe how antibodies lead to neutralization, agglutination, and precipitation. 20. Explain the roles of helper, regulatory, cytotoxic, and memory T cells in the cellular immune response. 21. List and briefly describe the four major types of transplants (autografts, isografts, allografts, and xenografts) and explain the importance of immunosuppressive therapy. 22. Describe the mechanisms involved and provide examples of allergies (immediate and delayed hypersensitivities, anaphylactic shock), autoimmune diseases, and immunodeficiencies (SCID, AIDS).	3	3	0
Unit 12: Respiratory System	1. Name the organs that are part of the respiratory tract. 2. Trace the path of air from the nasal cavity to the alveoli of the lungs; identify the structures on illustrations, models, or the Anatomage; and describe the function of each. 3. Describe several protective mechanisms of the respiratory system. 4. Describe the structure and function of the lungs and the pleural coverings. 5. Describe the structure of the respiratory membrane. 6. Differentiate between cellular respiration, external respiration, internal respiration, pulmonary ventilation, inspiration (inhalation/inhaling), and expiration (exhalation/exhaling). 7. Describe the relationship between volume and pressure, and explain how the respiratory muscles cause volume changes that lead to air flow into and out of the lungs (pulmonary ventilation or breathing). 8. Describe the following respiratory volumes: tidal volume, vital capacity, expiratory reserve volume, inspiratory reserve volume, and residual air. 9. Name several nonrespiratory air movements and explain how they modify or differ from normal respiratory air movements. 10. Describe the process of gas exchange in the lungs and in the tissues. 11. Describe how oxygen and carbon dioxide are transported in the blood. 12. Name the brain areas involved in the control of respiration and explain their functions. 13. Name several factors that influence respiratory rate. 14. Explain the relative importance of oxygen and carbon dioxide in modifying breathing rate and depth. 15. Explain why it is not possible to stop breathing voluntarily indefinitely. 16. Describe apnea, hyperventilation, and hypoventilation. 17. Describe symptoms and probable causes of COPD and lung cancer. 18. Describe normal changes that occur in respiratory system functioning from infancy to old age.	3	3	0

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Unit 13: Digestive System	1. Describe the layers of the wall of the alimentary canal. 2. Explain how villi aid digestive processes in the small intestine. 3. List the accessory digestive organs and describe the general functions of each. 4. Name and describe the deciduous and permanent teeth and describe the basic anatomy of a tooth. 5. Describe the composition and functions of saliva. 6. Name the main digestive products of the pancreas and of the liver. 7. List and describe the six main activities of the digestive system. 8. Describe how foodstuffs in the digestive tract are mixed and moved along the tract. 9. Describe the function of local hormones in digestion. 10. Trace the path food takes as it passes through the digestive system and explain in general what happens in each area. 11. List major enzymes or enzyme groups involved in digestion and name the foodstuffs on which they act. 12. Describe the mechanisms of swallowing, vomiting, and defecation. 13. Name the end products of protein, fat, and carbohydrate digestion. 14. List the six nutrient categories; note important dietary sources and their main cellular uses. 15. Define metabolism, anabolism, and catabolism. 16. Describe the uses of carbohydrates, fats, and proteins in cell metabolism. 17. Describe the metabolic roles of the liver. 18. Explain the importance of energy balance in the body and indicate consequences of energy imbalance. 19. Describe how body temperature is regulated. 20. Name important congenital disorders of the digestive system and significant inborn errors of metabolism. 21. Describe the effect of aging on the digestive system.	3	3	0
Unit 14: Urinary System	1. Describe the location of the kidneys in the body. 2. Identify the following regions of a kidney (longitudinal section): hilum, cortex, medulla, medullary pyramids, calyces, pelvis, and renal columns. 3. Explain the functional significance of the nephron and describe its anatomy. 4. Describe the process of urine formation, identifying the areas of the nephron that are responsible for filtration, reabsorption, and secretion. 5. Describe the function of the kidneys in excretion of nitrogen-containing wastes. 6. Describe the composition of normal urine. 7. List abnormal urinary components and characteristics. 8. Describe the general structure and function of the ureters, urinary bladder, and urethra. 9. Compare the path and length of the male urethra to that of the female. 10. Explain the process of micturition. 11. Describe the difference in control of the external and internal urethral sphincters. 12. Name and differentiate the three main fluid compartments of the body. 13. Explain how antidiuretic hormone (ADH) regulates water balance by the kidney. 14. Explain how aldosterone regulates sodium ion and potassium ion balance in the blood. 15. Compare and contrast the relative speed of buffers, the respiratory system, and the kidneys in maintaining the acid/base balance of the blood. 16. Describe three common congenital problems of the urinary system. 17. Describe the effect of aging on urinary system functioning.	3	3	0

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Unit 15: Reproductive System	1. Discuss the common purpose of the reproductive system organs. 2. Identify male reproductive organs and discuss the general function of each. 3. Name endocrine and exocrine products of the testes. 4. Discuss the composition of semen; name the structures that produce it. 5. Trace the path of a sperm from the testis to the body exterior. 6. Define circumcision, erection, ejaculation, and vasectomy. 7. Describe spermatogenesis and meiosis. 8. Describe sperm structure and relate its structure to its function. 9. Describe effects of FSH/LH on testis function. 10. Identify organs of the female reproductive system; discuss the general function of each. 11. Describe functions of the vesicular follicle and corpus luteum of the ovary. 12. Explain the process of oogenesis. 13. Describe the influence of FSH and LH on ovarian function. 14. Describe the phases and controls of the menstrual cycle. 15. Describe the structure and function of the mammary glands. 16. Explain the events that occur during fertilization. 17. Describe several ways pregnancy alters or modifies the functioning of the body. 18. List and describe the stages of labor. 19. List common reproductive system problems seen in adult and aging men and women.	3	3	0

Total Contact Hours

Lecture Hours	Lab Hours	Clinical Hours
45	45	0