

# Virginia Western Community College

## BIO 142

### Human Anatomy and Physiology II

#### Prerequisites

Completion of Biology 141 with a grade of "C" or higher within the past three years.

#### Course Description

Biology 142, Human Anatomy and Physiology is the second of a two-semester sequence that integrates anatomy and physiology of the human body. The purpose of BIO 142 is to provide students with knowledge of human anatomy and how the major organ systems contribute to homeostasis. Continues study of anatomy and physiology including endocrine system, blood and cardiovascular system, lymphatic system and immunity, respiratory system, urinary system, fluid, electrolyte, and acid-base balance, digestive system and nutrient metabolism, reproductive system, and prenatal development. Part II of II.

**Semester Credits: 4      Lecture Hours: 3      Lab/Clinical/Internship Hours: 3**

#### Required Materials

##### **Textbook:**

1) Human Anatomy & Physiology, E.N. Marieb, 11th ed., Pearson Publishing; 2) Human Anatomy & Physiology Laboratory Manual, Cat Version with PhysioEx 9.1, E.N. Marieb, 13th ed., Pearson Publishing.; 3) Modified Mastering A&P software (access code). \*NOTE: These materials are bundle together under one ISBN. ISBN: 9780135161890

##### **Other Required Materials:**

Safety Goggles for Lab

#### Course Outcomes

**At the completion of this course, the student should be able to:**

- Understand the structure and function of the organ systems covered and be able to integrate anatomy and physiology of each system.
- Understand some pathological conditions of systems studied.
- Relate anatomy and physiology of organ systems covered to clinical situations.
- Correctly identify gross and microscopic specimens in the lab and understand principles of physiology studied in lab.
- Describe the structure and function of the endocrine system and its role in maintaining homeostasis.
- Describe the composition of blood, both formed elements and plasma, and the functions of each component.
- Describe the processes of hematopoiesis and hemostasis.
- Explain the classifications and compatibility of blood groups.

- Describe the structure and function of the cardiovascular system, including hemodynamics.
- Compare and contrast prenatal and postnatal circulation.
- Describe the structure and function of the lymphatic system, including its relationship with the cardiovascular and immune systems.
- Compare and contrast innate and adaptive immunity, including a comparison of humoral and cell-mediated responses.
- Describe the structure and function of the respiratory system, including lung volumes and capacities, gas exchange, and gas transport.
- Describe the structure and function of the digestive system, including the functions of the enzymes and hormones involved in digestion.
- Describe the metabolism of macromolecules and the roles of vitamins and minerals.
- Describe the structure and function of the urinary system, including its role in blood pressure regulation.
- Explain the homeostatic regulation of fluids, electrolytes, and pH, including physiological and chemical buffering systems, and a brief description of common acid-base disorders.
- Describe the structure and function of the male and female reproductive systems.
- Describe the process of fertilization, general embryonic and fetal development, development of the placenta and extraembryonic membranes, pregnancy, and parturition.

## Topical Description

### Chapter 16: The Endocrine System

- Overview
- Chemistry of Hormones
- Mechanisms of Hormone Action
- Target Cell Specificity
- Half-Life, Onset, and Duration of Hormone Activity
- Interaction of Hormones at Target Cells
- Control of Hormone Release
- Pituitary-Hypothalamic Relationships
- Anterior Pituitary Hormones
- Posterior Pituitary and Hypothalamic Hormones
- Thyroid gland
  - Location and Structure
  - Thyroid Hormone
  - Calcitonin
- Parathyroid Glands
- Adrenal Glands
  - Adrenal Cortex
  - Adrenal Medulla
- Pineal Gland
- Other Endocrine Glands and Tissues
  - Pancreas
  - Gonads
  - Hormone Secretion by Other Organs

### Chapter 17: Blood

- Overview
  - Components
  - Physical characteristics and volume
  - Functions
- Blood Plasma
- Formed elements
- Hemostasis
  - Vascular Spasm
  - Platelet Plug formation
  - Coagulation
  - Clot Retraction and Repair
  - Fibrinolysis
  - Factors Limiting Clot Growth or Formation
  - Disorders of Hemostasis
- Transfusion and Blood Replacement
- Diagnostic Blood Tests

Chapter 18: Cardiovascular System: The Heart

- Heart Anatomy
  - Size, Location, and Orientation
  - Coverings of the Heart
  - Layers of the Heart Wall
  - Chambers and Associated Great Vessels
  - Pathway of Blood Through the Heart
  - Coronary Circulation
  - Heart valves
- Cardiac Muscle Fibers
  - Microscopic Anatomy
  - Mechanism and Events of Contraction
  - Energy Requirements
- Heart Physiology
  - Electrical Events
  - Heart Sounds
  - Mechanical Events: Cardiac Cycle
  - Cardiac Output

Chapter 19: Cardiovascular System: Blood Vessels

- Structure of Blood Vessel Walls
- Arterial system
  - Elastic Arteries
  - Muscular Arteries
  - Arterioles
- Capillaries
  - Types of Capillaries
  - Capillary Beds
- Venous System
  - Venules
  - Veins
- Introduction to Blood Flow, Blood Pressure, and Resistance
  - Definition of Terms
  - Relationship Between Flow, Pressure, and Resistance
- System Blood Pressure
  - Arterial Blood Pressure
  - Capillary Blood Pressure
  - Venous Blood Pressure
- Maintaining Blood Pressure
  - Short-term Mechanisms: Neural and Hormonal Controls
  - Long-term Mechanisms: Renal Regulation
  - Monitoring Circulatory Efficiency

- Alterations in Blood Pressure
- Blood Flow Through Body Tissues: Tissue Perfusion
  - Blood Flow Through Capillaries and Capillary Dynamics
  - Circulatory Shock
- Circulatory Pathways: Blood Vessels of the Body
  - Pulmonary and Systemic Circulations
  - Aorta and Major Arteries of Systemic Circulation
  - Arteries of Head and Neck
  - Arteries of Upper Limbs and thorax
  - Arteries of Abdomen
  - Arteries of Pelvis and Lower Limbs
  - Venae Cavae and Major Veins of Systemic Circulation
  - Veins of Head and Neck
  - Veins of Upper Limbs and Thorax
  - Veins of Abdomen
  - Veins of Pelvis and Lower Limbs
  - Atherosclerosis

#### Chapter 20: Lymphatic System and Lymphoid Organs and Tissues

- Lymphatic Vessels
  - Distribution and Structure of Lymphatic Vessels
  - Lymph Transport
- Lymphoid Cells and Tissues
- Lymph Nodes
  - Structure of the Lymph Node
  - Circulation in the Lymph Node
- Other Lymphoid Organs
  - Spleen
  - Thymus
  - Tonsils
  - Aggregates of Lymphoid Follicles

#### Chapter 21: Immune System (see notes)

- Innate Defenses
- Adaptive Defenses

Chapter 22: Respiratory System

- Functional Anatomy of Respiratory System
  - Nose and Paranasal Sinuses
  - Pharynx
  - Larynx
  - Trachea
  - Bronchi and Subdivisions
  - Lungs and Pleurae
- Mechanics of Breathing
  - Pressure Relationships in thoracic Cavity
  - Pulmonary Ventilation
  - Physical Factors Influencing Pulmonary Ventilation
  - Respiratory Volumes and Pulmonary Function Tests
- Gas Exchange Between Blood, Lungs, and Tissues
  - Basic Properties of Gases
  - Composition of Alveolar Gas
  - External Respiration
  - Internal Respiration
- Transport of Respiratory Gases by Blood
  - Oxygen Transport
  - Carbon Dioxide Transport
- Control of Respiration
  - Neural Mechanisms
  - Factors Influencing Breathing Rate and Depth
- Respiratory Adjustments
  - Exercise
  - High Altitudes
- Homeostatic Imbalances of the Respiratory System
  - Chronic Obstructive Pulmonary Disease
  - Asthma
  - Tuberculosis
  - Lung Cancer

Chapter 23: Digestive System

- Digestive Processes and Basic Functional concepts
- Digestive System Organs
  - Relationship to the Peritoneum
  - Blood Supply
  - Histology of Alimentary Canal
  - Enteric Nervous System of the Alimentary Canal
- Mouth and Associated Organs
  - Mouth
  - Tongue
  - Salivary Glands
  - Teeth
- Pharynx
- Esophagus

- Digestive Processes: Mouth to Esophagus
  - Mastication and Deglutition
- Stomach
  - Gross and Microscopic Anatomy
  - Digestive Processes
- Small Intestine and Associated Structures
  - Small Intestine
  - Liver and Gallbladder
  - Pancreas
  - Regulation of Bile and Pancreatic Secretion and Entry into Small Intestine
- Large Intestine
  - Gross and Microscopic Anatomy
  - Bacterial Flora
  - Digestive Processes Occurring in the Large Intestine
- Chemical Digestion
  - Mechanism of Chemical Digestion: Enzymatic Hydrolysis
  - Chemical Digestion of Carbohydrates, Proteins, Lipids, and Nucleic Acids
- Absorption
  - Carbohydrate, Protein, Lipid, Nucleic Acid Absorption
  - Vitamin and Electrolyte Absorption
  - Water Absorption
  - Malabsorption of Nutrients

Chapter 24: Nutrition, Metabolism, and Energy Balance (see notes)

Chapter 25: Urinary System

- Kidney Anatomy
  - Location and External Anatomy
  - Internal Anatomy
  - Blood and Nerve Supply
  - Nephrons
- Kidney Physiology: Mechanisms of urine Formation
  - Glomerular Filtration
  - Tubular Reabsorption
  - Tubular Secretion
  - Regulation of Urine Concentration and Volume
- Urine
  - Physical Characteristics
  - Chemical Composition
- Ureters
- Urinary Bladder
- Urethra
- Micturition

Chapter 26: Fluid, Electrolyte, and Acid-Base Balance

- Body Fluids
  - Body Water Content

- Fluid Compartments
- Composition of Body Fluids
- Fluid Movement Among Compartments
- Water Balance and ECF Osmolality
  - Regulation of Water Intake
  - Regulation of Water Output
  - Influence of ADH
  - Disorders of Water Balance
- Electrolyte Balance
  - Central Role of Sodium
  - Regulation of Sodium Balance
  - Regulation of Potassium Balance
  - Regulation of Calcium Balance
- Acid-Base Balance
  - Chemical Buffer Systems
  - Respiratory Regulation of H<sup>+</sup>
  - Renal Mechanisms of Acid-Base Balance
  - Abnormalities of Acid-Base Balance

### Chapter 27: The Reproductive System

- Anatomy of the Male Reproductive System
  - Scrotum
  - Testes
  - Penis
  - Male Duct System
  - Accessory Glands
  - Semen
- Physiology of the Male Reproductive System
  - Spermatogenesis
  - Hormonal Regulation of Male Reproductive Function
- Anatomy of the Female Reproductive System
  - Ovaries
  - Female Duct System
  - External Genitalia and Female Perineum
  - Mammary Glands
- Physiology of Female Reproductive System
  - Ovarian Cycle
  - Hormonal Regulation of Ovarian Cycle
  - Uterine (Menstrual) Cycle
  - Effects of Estrogen and Progesterone

### Laboratory Topics

- Week 1: Endocrine System Overview and Histology
- Week 2: Endocrine System Physiology
- Week 3: Blood



- Week 4: Anatomy of the Heart
- Week 5: Cardiovascular Dynamics and Cardiovascular Physiology
- Week 6: Lab Practical
- Week 7: Anatomy of Blood Vessels
- Week 8: Respiratory System Mechanics & Anatomy of the Respiratory System
- Week 9: Anatomy of the Digestive System
- Week 10: Dissection: Blood Vessel, Respiratory, Digestive
- Week 11: Lab Practical 2
- Week 12: Anatomy of the Urinary System
- Week 13: Renal Physiology
- Week 13: Acid Base Balance
- Week 14: Anatomy of the Reproductive System, Dissection
- Week 15: Lab Practical 3

### **Notes to Instructors**

1. Departmental policy dictates that instructors do not allow students to keep tests.
2. A comprehensive final exam counting 15% - 20% of the total grade will be given at the end of the semester.
3. Syllabus should state what the course grade will be based on, such as tests, quizzes, a comprehensive final exam, and any other assignments made by the instructor.
4. Instructors can combine topics within chapter 21 (Immune System) with those taught in chapter 20 (lymphatic system).
5. It is at the discretion of the instructor to cover topics within Chapter 24 (Nutrition, Metabolism, and Energy Balance).