

**LAST REVIEW:** 2009-2010      **NEXT REVIEW:** 2014-2015      **STATUS:** A

**COURSE TITLE:** Body Systems for the Paramedic

**COMMON COURSE NUMBER:** EMS2010

**CREDIT HOURS:** 3

**CONTACT HOUR BREAKDOWN**

**CLOCK HOURS:**

Lecture: 48

Lab: 0

Clinic:

Other:

**PREREQUISITE(S):** None

**COREQUISITE(S):** None

**COURSE DESCRIPTION** This course presents basic information of the structure and function of the human body. The general concepts of anatomy and physiology for the assessment and management of emergency patients by the paramedic in the prehospital field area will be emphasized. The interaction of the body systems as they maintain homeostasis with particular attention placed on the nervous, cardiovascular and respiratory systems will be covered. United States Department of Transportation (USDOT) National Standard Paramedic Curriculum anatomy and physiology objectives will be included.

## **UNIT TITLES**

### **UNIT TITLES:**

1. Introduction to structure and function of the body
2. Cells and tissues
3. Organ systems of the body
4. Integumentary system and body membranes
5. Skeletal system
6. Muscular system
7. Nervous system
8. The Senses
9. Endocrine system
10. Blood
11. Circulatory system
12. Lymphatic system and immunity
13. Respiratory system
14. Digestive system

15. Nutrition and metabolism
16. Urinary system
17. Fluid and electrolyte balance
18. Acid-base balance
19. Reproductive systems
20. Growth and development

COURSE OVERVIEW: Course Overview:

Upon successful completion of this course, the students should be able to

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### Unit 1 Introduction to the Structure and Function of the Body

1. Define the terms *anatomy* and *physiology*.
2. List and discuss in order of increasing complexity the levels of organization of the body.
3. Define the term *anatomical position*.
4. List and define the principal directional terms and sections (planes) used in describing the body and the relationship of body parts to one another.
5. List the nine abdominopelvic regions and the abdominopelvic quadrants.
6. List the major cavities of the body and the subdivisions of each.
7. Discuss and contrast the axial and the appendicular subdivisions of the body. Identify a number of specific anatomical regions in each area.
8. Explain the meaning of the term *homeostasis* and give an example of a typical homeostatic mechanism.

### Unit 2 Cells and Tissues

1. Identify and discuss the basic structure and function of the three major components of a cell.
2. List and briefly discuss the functions of the primary cellular organelles.
3. Compare the major passive and active transport processes that act to move substances through cell membranes.
4. Compare and discuss DNA and RNA and their function in protein synthesis.
5. Discuss the stages of mitosis and explain the importance of cellular reproduction.
6. Explain how epithelial tissue is grouped according to shape and arrangement of cells.
7. List and briefly discuss the major types of connective and muscle tissue.
8. List the three structural components of a neuron.

### Unit 3 Organ Systems of the Body

1. Define and contrast the terms *organ* and *organ system*.
2. List the 11 major organ systems of the body.

3. Identify and locate the major organs of each major organ system.
4. Briefly describe the major functions of each major organ system.
5. Identify and discuss the major subdivisions of the reproductive system.

#### **Unit 4      The Integumentary System and Body Membranes**

1. Classify, compare the structure of, and give examples of each type of body membrane.
2. Describe the structure and function of the epidermis and dermis.
3. List and briefly describe each accessory organ of the skin.
4. List and discuss the three primary functions of the integumentary system.
5. Classify burns and describe how to estimate the extent of a burn injury.

#### **Unit 5      The Skeletal System**

1. List and discuss the generalized functions of the skeletal system.
2. Identify the major anatomical structures found in a typical long bone.
3. Discuss the microscopic structure of bone and cartilage, including the identification of specific cell types and structural features.
4. Explain how bones are formed, how they grow, and how they are remodeled.
5. Identify the two major subdivisions of the skeleton and list the bones found in each area.
6. List and compare the major types of joints in the body and give an example of each.

#### **Unit 6      The Muscular System**

1. List, locate in the body, and compare the structure and function of the three major types of muscle tissue.
2. Discuss the microscopic structure of a skeletal muscle sarcomere and motor unit.
3. Discuss how a muscle is stimulated and compare the major types of skeletal muscle contractions.
4. Name, identify on a model or diagram, and give the function of the major muscles of the body discussed in this chapter.
5. List and explain the most common types of movement produced by skeletal muscles.

#### **Unit 7      The Nervous System**

1. List the organs and divisions of the nervous system and describe the generalized functions of the system as a whole.
2. Identify the major types of cells in the nervous system and discuss the function of each.
3. Identify the anatomical and functional components of a three-neuron reflex arc. Compare and contrast the propagation of a nerve impulse along a nerve fiber and across a synaptic cleft.
4. Identify the major anatomical components of the brain and spinal cord and briefly comment on the function of each.
5. Compare and contrast spinal and cranial nerves.
6. Discuss the anatomical and functional characteristics of the two divisions of the autonomic nervous system.

## **Unit 8      The Senses**

1. Classify sense organs as special or general and explain the basic differences between the two groups.
2. Discuss how a stimulus is converted into a sensation.
3. Discuss the general sense organs and their functions.
4. List the major senses.
5. Describe the structure of the eye and the functions of its components.
6. Discuss the anatomy of the ear and its sensory function in hearing and equilibrium.
7. Discuss the chemical receptors and their functions.

## **Unit 9      The Endocrine System**

1. Distinguish between endocrine and exocrine glands and define the terms *hormone* and *prostaglandin*.
2. Identify and locate the primary endocrine glands and list the major hormones produced by each gland.
3. Describe the mechanisms of steroid and protein hormone action.
4. Explain how negative and positive feedback mechanisms regulate the secretion of endocrine hormones.
5. Identify the principal functions of each major endocrine hormone and describe the conditions that may result from hyposecretion or hypersecretion.
6. Define *diabetes insipidus*, *diabetes mellitus*, *gigantism*, *goiter*, *cretinism*, and *glycosuria*.

## **Unit 10      Blood**

1. Describe the primary functions of blood.
2. Describe the characteristics of blood plasma.
3. List the formed elements of blood and identify the most important function of each.
4. Discuss anemia in terms of red blood cell numbers and hemoglobin content.
5. Explain the steps involved in blood clotting.
6. Describe ABO and Rh blood typing.
7. Define the following medical terms associated with blood: *hematocrit*, *leukocytosis*, *leukopenia*, *polycythemia*, *sickle cell anemia*, *phagocytosis*, *acidosis*, *thrombosis*, *erythroblastosis fetalis*, *serum*, *fibrinogen*, *Rh factor*, *anemia*.

## **Unit 11      The Circulatory System**

1. Discuss the location, size, and position of the heart in the thoracic cavity and identify the heart chambers, sounds, and valves.
2. Trace blood through the heart and compare the functions of the heart chambers on the right and left sides.
3. List the anatomical components of the heart conduction system and discuss the features of a normal electrocardiogram.
4. Explain the relationship between blood vessel structure and function.
5. Trace the path of blood through the systemic, pulmonary, hepatic portal, and fetal circulations.

6. Identify and discuss the primary factors involved in the generation and regulation of blood pressure and explain the relationships between these factors.

### **Unit 12                    The Lymphatic System and Immunity**

1. Describe the generalized functions of the lymphatic system and list the primary lymphatic structures.
2. Define and compare nonspecific and specific immunity, inherited and acquired immunity, and active and passive immunity.
3. Discuss the major types of immune system molecules and indicate how antibodies and complements function.
4. Discuss and contrast the development and functions of B and T cells.
5. Compare and contrast humoral and cell-mediated immunity.

### **Unit 13                    The Respiratory System**

1. Discuss the generalized functions of the respiratory system.
2. List the major organs of the respiratory system and describe the function of each.
3. Compare, contrast, and explain the mechanism responsible for the exchange of gases that occurs during internal and external respiration.
4. List and discuss the volumes of air exchanged during pulmonary ventilation.
5. Identify and discuss the mechanisms that regulate respiration.

### **Unit 14                    The Digestive System**

1. List in sequence each of the component parts or segments of the alimentary canal from the mouth to the anus and identify the accessory organs of digestion.
2. List and describe the four layers of the wall of the alimentary canal. Compare the lining layer in the esophagus, stomach, small intestine, and large intestine.
3. Discuss the basics of protein, fat, and carbohydrate digestion and give the end products of each process.
4. Define and contrast mechanical and chemical digestion.
5. Define *peristalsis*, *bolus*, *chyme*, *jaundice*, *ulcer*, and *diarrhea*.

### **Unit 15                    Nutrition and Metabolism**

1. Define and contrast *catabolism* and *anabolism*.
2. Describe the metabolic roles of carbohydrates, fats, proteins, vitamins, and minerals.
3. Define basal metabolic rate and list some factors that affect it.
4. Discuss the physiological mechanisms that regulate body temperature.

### **Unit 16                    The Urinary System**

1. Identify the major organs of the urinary system and give the generalized function of each.
2. Name the parts of a nephron and describe the role each component plays in the formation of urine.

3. Explain the importance of filtration, tubular reabsorption, and tubular secretion in urine formation.
4. Discuss the mechanisms that control urine volume.
5. Explain how the kidneys act as vital organs in maintaining homeostasis.

### Unit 17                      Fluid and Electrolyte Balance

1. List, describe, and compare the body fluid compartments and their subdivisions.
2. Discuss avenues by which water enters and leaves the body and the mechanisms that maintain fluid balance.
3. Discuss the nature and importance of electrolytes in body fluids and explain the aldosterone mechanism of extracellular fluid volume control.
4. Explain the interaction between capillary blood pressure and blood proteins.
5. Give examples of common fluid imbalances.

### Unit 18                      Acid-Base Balance

1. Discuss the concept of pH and define the term *acid-base balance*.
2. Define the terms *buffer* and *buffer pair* and contrast strong and weak acids and bases.
3. Contrast the respiratory and urinary mechanisms of pH control.
4. Discuss compensatory mechanisms that may help return blood pH to near-normal levels in cases of pH imbalances.
5. Compare and contrast metabolic and respiratory types of pH imbalances.

### Unit 19                      The Reproductive Systems

1. List the essential and accessory organs of the male and female reproductive systems and give the generalized function of each.
2. Describe the gross and microscopic structure of the gonads in both sexes and explain the developmental steps in spermatogenesis and oogenesis.
3. Discuss the primary functions of the sex hormones and identify the cell type or structure responsible for their secretion.
4. Identify and describe the structures that constitute the external genitals in both sexes.

5. Identify and discuss the phases of the endometrial or menstrual cycle and correlate each phase with its occurrence in a typical 28-day cycle.

**Unit 20**

**Growth and Development**

1. Discuss the concept of development as a biological process characterized by continuous modification and change.
2. Discuss the major developmental changes characteristic of the prenatal stage of life from fertilization to birth.
3. Discuss the three stages of labor that characterize a normal vaginal birth.
4. Identify the three primary germ layers and several derivatives in the adult body that develop from each layer.
5. List and discuss the major developmental changes characteristic of the four postnatal periods of life.
6. Discuss the effects of aging on the major body organ systems.



**Common Course Number:**

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**Unit 13**

**General Outcome:**

**1.0 The student shall:**

**Specific Measurable Learning Outcomes:**

**Upon successful completion of this unit, the student shall be able to:**

**13.1**

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