CLOUD COUNTY COMMUNITY COLLEGE

Our Mission: Cloud County Community College prepares students to lead successful lives and enhances the vitality of our communities.

**GENERAL INFORMATION**

**Course Number and Title:** SC 126 Anatomy and Physiology

**Term and Year:**Academic Year 2022-2023

**Credit Hours**: 5

**Course Description**: Anatomy and Physiology is an introduction to the basic concepts of biochemistry, cytology, histology, and cellular physiology that relate to all tissues, organs and organ systems of the human body. It will include the following organ systems: integumentary, skeletal, muscular, neural, senses, endocrine, circulatory, respiratory, urinary, digestive, and reproductive. This course includes three hours of lecture and three hours of laboratory time.

**Prerequisites**: None

**Division:** Mathematics, Science, and Technical Programs

**Department**: Science

**STUDENT LEARNING OUTCOMES AND ASSESSMENT**

**Course Learning Outcomes**

For this course, students are expected to demonstrate the skills associated with the course learning goals as described by the student learning outcomes below:

Body Plan & Organization

1. Name and describe anatomical and directional terminology including the following topics:

a) anatomical position

b) body planes, sections

c) body cavities & regions

d) directional terms

e) basic terminology

f) levels of organization g) survey of body systems

Homeostasis (Combine A&P into general or foundational A&P knowledge)

2. Name and describe basic concepts of homeostasis and how homeostatic mechanisms apply to body systems including the following topics:

a) general types of homeostatic mechanisms

b) examples of homeostatic mechanisms

c) application of homeostatic mechanisms

d) predictions related to homeostatic imbalance, including disease states & disorders

Chemistry and Cellular Biology Review

3. Name and describe basic chemistry and cellular structures and function, including the following topics:

a) atoms & molecules

b) chemical bonding

c) inorganic compounds/solutions (including the concept of pH)

d) organic compounds e) energy transfer using ATP f) intracellular organization of nucleus and cytoplasm g) membrane structure & function

h) mechanisms for movement of materials across cellular membranes

i) organelles

j) protein synthesis

k) cellular respiration (introduction)

l) somatic cell division (mitosis & cytokinesis)

m) reproductive cell division

n) application of homeostatic mechanisms

o) predictions related to homeostatic imbalance, including disease states and disorders

Histology

4. Identify the basic tissues of the body and their location and explain their functions, including the following topics.

a) overview of histology & tissue types

b) microscopic anatomy, location, & functional roles of epithelial, connective, muscular and nervous tissues - membranes (mucous, serous, cutaneous & synovial) - glands (exocrine & endocrine) - tissue injury & repair

Integumentary System

5. Identify major gross and microscopic anatomical components of the integumentary system and describe the functions of the system, including the following topics.

a) general functions of the skin & the subcutaneous layer

 b) gross & microscopic anatomy of the skin

c) roles of the specific tissue layers of the skin & subcutaneous layer

d) anatomy & functional roles of accessory structures

e) application of homeostatic mechanisms

f) predictions related to homeostatic imbalance, including disease states & disorders

Skeletal System

6. Identify major gross and microscopic anatomical components of the skeletal system and explain their functional roles in osteogenesis, repair, and body movement, including the following topics.

a) general functions of bone & the skeletal system

b) structural components – microscopic anatomy

c) structural components – gross anatomy

d) physiology of embryonic bone formation (ossification, osteogenesis)

e) physiology of bone growth, repair & remodeling

f) organization of the skeletal system - gross anatomy of bones

g) classification, structure & function of joints (articulations)

h) application of homeostatic mechanisms

i) predictions related to homeostatic imbalance, including disease states & disorders

Muscular System

7. Identify major gross and microscopic anatomical components of the muscular system and explain their functional roles in body movement, maintenance of posture, and heat production, including the following topics.

a) general functions of muscle tissue

b) identification, general location, & comparative characteristics of skeletal, smooth, & cardiac muscle tissue - detailed gross & microscopic anatomy of skeletal muscle

c) physiology of skeletal muscle contraction

d) skeletal muscle metabolism

e) principles & types of whole muscle contraction - nomenclature of skeletal muscles

f) location & function of skeletal muscles

g) group actions of skeletal muscles

h) lever systems

i) application of homeostatic mechanisms

j) predictions related to homeostatic imbalance, including disease states & disorders

Nervous System

8. Identify the major gross and microscopic anatomical components of the nervous system and explain their functional roles in communication, control, and integration, including the following topics.

a) general functions of the nervous system

b) organization of the nervous system from both anatomical & functional perspectives

c) gross & microscopic anatomy of the nerve tissue

d) neurophysiology, including mechanism of resting membrane potential, production of action potentials, & impulse transmission

e) neurotransmitters& their roles in synaptic transmission

f) sensory receptors & their roles

g) division, origin, & function of component parts of the brain

h) protective roles of the cranial bones, meninges, & cerebrospinal fluid

i) structure & function of cranial nerves

j) anatomy of the spinal cord & spinal nerves

k) reflexes & their roles in nervous system function

l) physiology of sensory & motor pathways in the brain & spinal cord

m) functions of the autonomic nervous system

n) comparison of somatic & autonomic nervous systems

o) application of homeostatic mechanisms

p) predictions related to homeostatic imbalance, including disease states & disorders

Special Senses

9. Identify the major gross and microscopic anatomical components of the eye and ear and explain their functional roles in vision, hearing and equilibrium. Students should also be able to identify and locate the receptors responsible for olfaction and gustation and briefly describe the physiology of smell and taste, including the following topics.

a) gross & microscopic anatomy of the eye & ear

b) roles of specific tissues of the eye in vision

c) roles of specific tissues of the ear in hearing & equilibrium

d) olfactory receptors & their role in smell

e) gustatory receptors & their role in taste

f) general gross & microscopic anatomy of hearing & accessory structures of the ear

g) roles of specific tissues of the ear in hearing

h) roles of the accessory structures

i) role of the ear in equilibrium

j) application of homeostatic mechanisms

k) predictions related to homeostatic imbalance, including disease states & disorders

Endocrine System

10. Identify the major gross and microscopic anatomical components of the endocrine system and explain the functional roles of their respective hormones in communication, control, and integration, including the following topics.

a) general functions of the endocrine system

b) chemical classification of hormones & mechanism of hormone actions at receptors

c) control of hormone secretion

d) control by the hypothalamus& pituitary gland

e) identity, source, secretory control, & functional roles of the major hormones produced by the body - local hormones (paracrines & autocrines) & growth factors

f) hormonal response to stress

g) application of homeostatic mechanisms

h) predictions related to homeostatic imbalance, including disease states & disorders

Cardiovascular System

11. Identify the major gross and microscopic anatomical components of the cardiovascular system and explain their functional roles in transport and hemodynamics, including the following topics. Topics include:

a) general functions of the cardiovascular system

b) composition of blood plasma - identity, microscopic anatomy, numbers, formation, & functional roles of the formed elements of the blood

c) hemostasis, including coagulation of the blood

d) ABO & Rh blood grouping

e) gross & microscopic anatomy of the heart, including the conduction system - physiology of cardiac muscle contraction - blood flow through the heart

f) conduction system of the heart & the electrocardiogram

g) cardiac cycle

h) regulation of cardiac output, stroke volume & heart rate

i) anatomy & functional roles of the different types of blood vessels

j) pattern of blood circulation throughout the body, including systemic, pulmonary, coronary, hepatic portal, & fetal circulations

k) blood pressure & its functional interrelationships with cardiac output, peripheral resistance, & hemodynamics - application of homeostatic mechanisms

l) predictions related to homeostatic imbalance, including disease states & disorders

Lymphatic System & Immunity

12. Identify the major gross and microscopic anatomical components of the lymphatic system and explain their functional roles in fluid dynamics and immunity, including the following topics.

a) general functions of the lymphatic system

b) general functions of the lymphatic system

c) lymph & lymphatic vessels d) lymphatic cells, tissues, & organs

e) introduction to innate (nonspecific) defenses & adaptive (specific) defenses

f) innate (nonspecific) defenses

g) overview of adaptive (specific) defenses

h) antigens & antigen processing

i) lymphocytes & their role in adaptive immunity

j) antibodies & their role in adaptive immunity

k) applied immunology

l) application of homeostatic mechanisms

m) predictions related to homeostatic imbalance, including disease states & disorders

Respiratory System

13. Identify the major gross and microscopic anatomical components of the respiratory system and explain their functional roles in breathing/ventilation and in the processes of external and internal respiration, including the following topics. - general functions of the respiratory system

a) gross & microscopic anatomy of the respiratory tract & related organs

b) mechanisms of pulmonary ventilation - pulmonary air volumes & capacities

c) mechanisms of gas exchange in lungs & tissues

d) mechanisms of gas transport in the blood

e) control of pulmonary ventilation

f) application of homeostatic mechanisms

g) predictions related to homeostatic imbalance, including disease states & Disorders

Digestive System

14. Identify the major gross and microscopic anatomical components of the digestive system and explain their functional roles in digestion, absorption, excretion and elimination, including the following topics.

a) general functions of the digestive system

b) gross & microscopic anatomy of the alimentary canal

c) gross & microscopic anatomy of the accessory glands & organs d) peritoneum & mesenteries e) motility in the alimentary canal

f) mechanical & chemical processes of digestion

g) processes of absorption

h) hormonal & neural regulation of digestive processes

i) application of homeostatic mechanisms

j) predictions related to homeostatic imbalance, including disease states & disorders

Metabolism

15. Articulate the functional relationship among cellular, tissue and organ level metabolism, the role nutrition plays in metabolism, and the mechanisms by which metabolic rate is regulated in the body, including the following topics. - nutrition

a) introduction to metabolism

b) cellular respiration & the catabolism & anabolism of carbohydrates, lipids, & proteins

c) metabolic roles of body organs

d) energy balance & thermoregulation

e) application of homeostatic mechanisms

f) predictions related to homeostatic imbalance, including disease states & disorders

Urinary System

16. Identify the major gross and microscopic anatomical components of the urinary system and explain their functional roles, including the following topics.

a) general functions of the urinary system

b) gross & microscopic anatomy of the urinary tract, including detailed histology of the nephron - functional processes of urine formation, including filtration, reabsorption, secretion, & excretion - factors regulating & altering urine volume & composition, including the renin- angiotensin system and the roles of aldosterone& antidiuretic hormone

c) endocrine activities of the kidneys, such as vitamin D activation & secretion of erythropoietin - innervation & control of the urinary bladder

Fluid/Electrolyte& Acid/Base Balance

17. Explain the physiology of the homeostatic mechanisms that control fluid/electrolyte and acid/base balance, including the following topics.

a) regulation of water intake & output

b) description of the major fluid compartments, including intracellular, extracellular, intravascular, & interstitial - volume & chemical composition of major compartment fluids

c) movements between the major fluid compartments, causal forces, volumes, & electrolyte balance - buffer systems & their roles in acid/base balance

d) role of the respiratory system in acid/base balance

e) role of the urinary system in acid/base balance

Reproductive Systems

18. Identify the major gross and microscopic anatomical components of the reproductive system and explain their functional roles in reproduction and inheritance, including the following topics.

a) general functions of the male & female reproductive systems

b) gross & microscopic anatomy of the male & female reproductive systems

c) gametogenesis

d) specific roles of the female reproductive organs

e) specific roles of the female reproductive organs - regulation of reproductive functions

f) conception, pregnancy, & embryological & fetal development

g) parturition & labor

h) mammary gland anatomy & physiology

The learning outcomes detailed in this syllabus meet or exceed the learning outcomes specified by the Kansas Core Outcomes Project for this course as sanctioned by the Kansas Board of Regents to ensure transfer between Kansas colleges and universities. Systemwide Transfer (SWT) Code: BIO2020

In class, students are assessed on the mastery of these outcomes using the learning management system. Student names will not be used when reporting results. Outcomes-based assessment is used to improve the instructional planning, design, and quality of student learning throughout the college

**General Education Outcomes**

For this course, students are expected to demonstrate the skills associated with the college wide learning goals as described by the general education/program outcomes below:

GESc1: Apply the scientific process to evaluate current issues and circumstances

GESc2: Demonstrate scientific literacy and knowledge about the study of matter, life and the universe.

GESc3: Critically analyze events through a scientific lens.

GESc4: Demonstrate quantitative reasoning and problem-solving.

Artifacts of student work are collected from general education course and reviewed by a faculty committee to assess general education outcomes. Artifacts may also be reviewed by a professional outside the college. Student names will not be used when reviewing artifact nor reporting results. Program accomplishment is partially measured through performance on program outcomes. Outcomes-based assessment is used to improve the instructional planning, design, and quality of student learning throughout the college.

**Institutional Learning Outcomes**

For this course, students are expected to demonstrate the skills associated with the college wide learning outcomes as described below.

*Sustainability*

ILO\_S1: Students will understand the importance and implementation of sustainable practices that meet the needs of today without compromising the needs of the future.

In class, students are assessed on the mastery of these outcomes. Student names will not be used when reporting results. Outcomes-based assessment of the institutional learning outcomes is used to ensure we are meeting the mission of the college, following the guiding values and enhance instructional planning, design, and quality of student learning throughout the college.