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Biology (BIOL) 2258 Human Anatomy & Physiology I (5 Units) CSU

Prerequisite: None

Advisory: Eligibility for English 1500, Math 1500, and successful completion of CHEM 1510 and BIOL 1500 or BIOL 1510 strongly recommended.

Hours and Unit Calculations:

48 hours lecture (96 Outside of class hours); 96 hours lab (192 Total Student Learning Hours) 5 Units

Catalog Description: This is the first semester of a one-year course sequence which examines the physiological principles, function, organization, integration and homeostasis of the human body at the cellular, tissue, organ, organ system and organismal level: integumentary system, skeletal, smooth and cardiac muscles, nervous system, and sensory organs. This course is primarily intended for Nursing, Allied Health, Kinesiology, and other health related majors. Not open to students who have credit of C or better in Biology 2250 and/or Biology 2257.

Type of Class/Course: Degree Credit

Texts: Tortora, Gerard J. and Bryan H. Derrickson *Principles of Anatomy and Physiology*. 14th ed. Hoboken: John Wiley & Sons, Inc. 2014.

Additional Required Materials:

Allen and Harper. *Laboratory Manual for Anatomy and Physiology*. 6th ed. John Wiley & Sons, 2017.

Instructor syllabus and individual handouts for each laboratory exercise.

Course Objectives:

By the end of the course, a successful student will be able to:

1. Describe and distinguish various roles of major classes of biomolecules in living cells,
2. Describe key functional features of different types of human cells and how they communicate,
3. Distinguish between the major tissue types,
4. Identify structures and functions of major organ systems and the physiological mechanisms underlying their operation,
5. Relate structure and function at the cellular through system levels of organization of human body systems,
6. Demonstrate an understanding of how organ systems of the body are integrated and regulated,
7. Demonstrate an understanding of how homeostasis is maintained in the body,

8. Demonstrate knowledge of metabolic and physiological disorders of the major organ systems,
9. Describe structural or anatomical changes that occur in disease, injury, or gaining of the human body systems,
10. Demonstrate the ability to identify and palpate structures of the human body,
11. Analyze experimental data to demonstrate physiological properties, and
12. Demonstrate an understanding of the scientific method, experimental design, and the philosophy of science. Apply the scientific method and philosophy of science by designing components of and carrying out physiological experiments.

Course Scope and Content:

- Unit I Introduction to Anatomy and Physiology
- A. History of anatomy and physiology
 - B. Levels of structural organization
 - C. Review of human body systems
 - D. Homeostasis of the human body
 - E. Control of homeostasis (negative and positive feedback loops)
 - F. Basic anatomical terminology
 - G. Medical imaging techniques
- Unit II Chemical Organization of the Cell
- A. Basic atomic structure
 - B. Chemical bonds used in living cells
 - C. Chemical elements used in cells
 - D. Water characteristics important to cellular function
 - E. Electrolyte functions in cells
 - F. Maintaining pH in body fluids
 - G. Structure and function of major macromolecules in cells
- Unit III Cell Structure and Function
- A. Cell size and shape
 - B. Movement of materials across cell membranes
 - C. Active cell processes
 - D. Cell structures
 - E. Organization of cells
 - F. Cell to cell communication
 - G. Control of cellular processes by nucleic acids
 - H. Reproduction of somatic cells: normal and abnormal
- Unit IV Histology
- A. Structure, function, and classification of epithelial tissue
 - B. Structure, function, and classification of connective tissue
 - C. Structure, function, and classification of muscle tissue
 - D. Structure, function, and classification of nervous tissue
- Unit V Integumentary System
- A. Layers of the skin
 - B. Accessory structures of the skin
 - C. Function of the Integumentary system

- D. Skin properties and conditions
- E. Role of the Integumentary system in maintaining homeostasis
- F. Clinical application

Unit VI

The Skeletal System

- A. Functions of the skeleton
- B. Histology of bone
- C. Bone development, growth, and repair
- D. Joint classification
- E. Bone fractures and disorders
- F. Role of bone tissue in homeostasis
- G. Classification and identification of bones
- H. Clinical application

Unit VII

The Muscular System

- A. Histology of muscles
- B. Structure and function of muscle tissue
- C. Microscopic functional anatomy of skeletal muscle during contraction and relaxation
- D. Excitation of skeletal muscle, membrane potentials, and action potentials
- E. Sliding filament theory of muscle contractions
- F. Physiological properties of muscle
- G. Types of muscle contractions
- H. Structural and functional characteristics of skeletal muscle
- I. Basic structure and function of smooth muscle
- J. Clinical application: abnormal contractions of muscle tissue
- K. Role of the Muscular System in maintaining homeostasis

Unit VIII

The Nervous System

- A. Function of the Nervous System
- B. Classification of nervous tissue
- C. Types of neurons
- D. Physiological properties of neurons
- E. Electrical properties of cells: membrane permeability, active transport, and Na^+/K^+ pumps, resting potential
- F. Nerve impulse, membrane potential and action potential
- G. The nervous message: synapse function and types of neurotransmitters
- H. Effects of chemicals and drugs on the synapse
- I. Anatomical and functional classification of the nervous system
- J. Central nervous system and anatomy of the developing brain
- K. Component structures of the brain
- L. Cerebral spinal fluid formation and function
- M. Spinal cord structure and function
- N. Components of the peripheral nervous system
- O. Spinal and cranial nerve distribution and function
- P. Components of a reflex arc
- Q. Clinical application

Unit IX

The Autonomic Nervous System

- A. Autonomic nervous system structural and functional anatomy

- B. Structure and function of the parasympathetic division
- C. Structure and function of the sympathetic division
- D. Effects of sympathetic and parasympathetic stimulation
- E. Effects of drugs on the ANS
- F. Clinical application
- G. Role of the Nervous System in maintaining homeostasis

Unit X

Sensory Receptors and Special Senses

- A. Structure and function of sensory receptors
- B. Anatomy of the eye
- C. Physiology of the eye: lens accommodation, retinal stimulation, nervous message transmission to Central Nervous System visual centers
- D. Common disorders of the eye
- E. Innervation of the ear for hearing and equilibrium
- F. Anatomy of the ear: middle ear, internal ear, otolithic organs
- G. Physiology of hearing: steps in sound perception
- H. Physiology of equilibrium: static and dynamic
- I. Motion sickness related to equilibrium sense
- J. Clinical application

Course Scope and Content: Laboratory

Unit I

Basic Laboratory Calculations and Concepts of Concentration

- A. Laboratory calculations including the metric system and conversions, atomic number, atomic mass, serial dilution math problems, and molar and percent solution calculations.
- B. Performing osmosis experiments to demonstrate effects of concentration, molecular weight, and temperature on rates of diffusion.
- C. Preparation of serial dilutions
- D. Safety issues in handling blood specimens

Unit II

Cellular Metabolism and Biomolecules

- A. Demonstration of the major groups of biomolecules through basic chemical and physical reactions.
- B. Perform experiments to test for the presence of simple sugars, starches, and proteins in an unknown solution.
- C. Experimentation of digestion of complex biomolecules.

Unit III

Cells and Tissues

- A. Introduction to the microscope
- B. Elementary tissue identification

Unit IV

Anatomy of Integumentary System

- A. Identification of skin layers and accessory structures using skin model
- B. Observation of skin histological slides

Unit V

Anatomy of Skeletal System

- A. Identifications of bones and bone markings
- B. Observation of bone histological slides

- Unit VI The Anatomy of the Muscular System
- A. Muscle identification and muscle features
 - B. Observation of muscle histological slides
 - C. Muscle construction using Clay Maniken's
- Unit VII Using the PowerLab System to Study Human Muscle Physiology
- A. Explanation and demonstration of the Powerlab System with typical electrodes and transducers
 - B. Conduct an exercise to determine the motor points in human muscle
 - C. Determination of the major characteristics of human muscle
 - D. Determination of factors that affect fatigue in human muscle groups
 - E. Making electromyograms of human muscle activity in antagonistic muscles.
- Unit VIII Anatomy of the Nervous System
- A. Identification of structures of the brain
 - B. Identification of structures of the spinal cord
 - C. Peripheral Nervous System identification
- Unit IX Special Senses
- A. Identification of eye structures
 - B. Dissection of cow eye
 - C. Identification of ear structures
 - D. Experimentation on visual sense
 - E. Experimentation on auditory sense
 - F. Experimentation on gustatory sense
 - G. Experimentation on proprioceptive sense
 - H. Experimentation on tactile sense

Learning Activities Required Outside of Class

The students in the class will spend a minimum of 6 hours per week outside of the regular class time doing the following:

1. Studying course lecture notes, handouts, and textbook reading,
2. Answering question on study assignments,
3. Completing required reading as assigned, and
4. Completing written work as assigned.

Methods of Instruction

1. Assigned reading from text and selected references
2. Lectures and demonstrations given by instructor using models, charts, multimedia, and preserved specimens.
3. Dissection of selected organs
4. Multimedia presentations
5. Construction of representative anatomical organ systems using clay models
6. IPAD flashcards
7. Practice lab exams

8. Performance of laboratory exercises under direct supervision of the instructor

Methods of Evaluation

1. Substantial writing assignments, including:
 - a. Focus questions
 - b. Essay exams
 - c. Laboratory reports
2. Computational or non-computational problem-solving demonstrations, including:
 - a. Unit exams
 - b. Lecture and lab quizzes
3. Skills demonstrations, including:
 - a. Dissection
 - b. Construction of muscles using Clay Maniken's
4. Proctored, closed book/closed note examinations that include:
 - a. Multiple choice
 - b. Completion
 - c. Identification
 - i. Surface anatomy
 - ii. Models, charts, preserved specimens

Laboratory Category: Extensive Laboratory

Pre delivery criteria: All of the following criteria are met by this lab.

1. Curriculum development for each lab.
2. Published schedule of individual laboratory activities.
3. Published laboratory activity objectives.
4. Published methods of evaluation.
5. Supervision of equipment maintenance, laboratory setup, and acquisition of lab materials and supplies.

During laboratory activity of the laboratory: All of the following criteria are met by this lab.

1. Instructor is physically present in lab when students are performing lab activities.
2. Instructor is responsible for active facilitation of laboratory learning.
3. Instructor is responsible for active delivery of curriculum.
4. Instructor is required for safety and mentoring of lab activities.
5. Instructor is responsible for presentation of significant evaluation.

Post laboratory activity of the laboratory: All of the following criteria are met by this lab.

1. Instructor is responsible for personal evaluation of significant student outcomes (lab exercises, exams, practicals, notebooks, portfolios, etc.) that become a component of the student grade that cover the majority of lab exercises performed during the course.
2. Instructor is responsible for supervision of laboratory clean up of equipment and materials.

Supplemental Data:

TOP Code:	04100: Anatomy and Physiology
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SAM Priority Code:	E: Non-Occupational
Distance Education:	No
Funding Agency:	Y: Not Applicable(funds not used)
Program Status:	I: Program Applicable
Noncredit Category:	Y: Not Applicable, Credit Course
Special Class Status:	N: Course is not a special class
Basic Skills Status:	N: Course is not a basic skills course
Prior to College Level:	Y: Not applicable
Cooperative Work Experience:	N: Is not part of a cooperative work experience education program
Eligible for Credit by Exam:	No
Eligible for Pass/No Pass:	C: Pass/No Pass
Taft College General Education:	LNS: Local GE Natural Science
Disciplines List:	Biology, Nursing