BIOL 2420

Division: Natural Science and Mathematics
Department: Biology
Course: BIOL 2420
Title: Human Physiology
Catalog Description:

Human physiology is the study of the functions and mechanisms of the human body. A major emphasis will be the mechanisms that regulate the functions of individual organ systems. The complex interactions between systems to maintain a constant internal environment so important for normal cell function will also be discussed. This course is for students whose major course of study is an allied health profession such as nursing or physical therapy. Students interested in careers in biology, medicine or dentistry will also benefit from this course. It must be taken concurrently with BIOL 2425. Strongly recommended preparatory courses: CHEM 1110 or 1210, and BIOL 2320.

General Education Requirements: Life Science
Semesters Offered: Fall, Spring
Credit/Time Requirement: Credit: 3; Lecture: 3; Lab: 0
Clock/Hour Requirements: 0
Offered for Non-Credit: No
Corequisites: BIOL 2425

Justification:

A basic course in human physiology is required for admission into programs for nurses, physical therapists and other allied health professions. The scope of topics covered is very broad but each will be covered in sufficient detail to provide the scientific foundation for further study in all allied health professions.BIOL 2420 will be comparable to courses offered by other Utah colleges and universities: CEU, BIO 2420; DSC, BIOL 2420; SLCC, BIOL 2420; SUU, BIOL 2420; U of U, BIOL 2420.BIOL 2420 AND 2425 together will be comparable to courses offered by the other Utah colleges and universities that combine the lecture and lab into one course: USU, BIO 2420; UVSC, ZOOL 2420; WSU, BIO 2200; Westminster, BIOL 104.

Student Learning Outcomes:

Upon successful completion of this course, students will:

- know the functions and mechanisms of the human body, including control mechanisms, and how the individual organ systems function and how they interact with other organ systems to maintain a constant internal environment and still carry out their individual functions
- have begun to understand the functional complexity of the living human organisms and be introduced

to some examples of disorders and disease states occurring when one or more body systems are compromised.

Content:

This course will include:

- Introduction to science and the scientific method as a method of learning
- Introduction to physiology
- Homeostasis: the discussion of homeostasis continues through all systems
- Chemistry
    - basic chemistry
    - atoms, molecules, ions
        - covalent
        - ionic
        - hydrogen bonding
    - solutions, mixtures, colloids
        - pH and buffers
        - biological chemistry
- carbon chains and rings, functional groups, polymers
    - lipids
    - carbohydrates
    - amino acids and proteins
    - nucleic acids
- Cells
    - the biology of cells
    - cell structure and function
    - cell theory
    - cell structures in eukaryotes
    - functions of eukaryote cell structures
    - membrane components
    - diffusion, osmosis, facilitated diffusion, active transport
    - cytoplasmic organelles
    - cytoskeleton and related structures
    - cell nucleus and gene expression
    - DNA structure, replication, mutations and repair
    - transcription and RNA processing
    - translation or protein synthesis
    - genetic code, mRNA, tRNA, rRNA, ribosomes
- Tissues
    - tissue types
    - epithelial tissue, characteristics, classification, functions and locations
    - connective tissues, characteristics, general and specialized connective tissues
    - muscle tissue, types, locations and functions
    - nervous tissue, characteristics, cell types in nervous tissue
    - tissue organization into organs and systems

- Enzymes and Energy
    - enzymes as catalysts; mechanism of action and nomenclature
    - control of enzyme activity and metabolic pathways
    - bioenergetics
    - energy transformation; endothermic and exothermic chemical reactions; enzymes
- Cellular Respiration and Fermentation
    - glycolysis
    - Krebs cycle and oxidative phosphorylation in mitochondrion matrix and cristae
    - lactic acid
    - alcoholic fermentation
    - metabolism of lipids and proteins
- Cell Function and Communication
    - extracellular environment
    - diffusion and osmosis
    - membrane transport
    - the membrane potential
    - cell signaling
- Neurons and Neuroglia
    - neurons and glial cells
    - electrical activity in axons
    - the synapse
    - neurotransmitters
    - synaptic integration
- The Nervous System
    - organization of the central nervous system
    - function of the cerebrum
    - functions of the diencephalons
    - functions of the midbrain, pons, cerebellum, and medulla oblongata
    - spinal cord tracts
    - cranial and spinal nerves
    - divisions and function of the autonomic nervous system
- Sensory Perception
    - general sensory perception
    - special sensory perception
    - gustatory
    - olfactory
    - vestibular cochlear
    - vision
- Endocrine System
    - hormone classification and mechanism of action
    - glands of the endocrine system, their respective hormones, mechanism of action and control
- Muscle
    - structure of skeletal muscles at both macro and microscopic level
    - contraction mechanism of muscle
    - neural control of skeletal muscle
    - Cardiac and smooth muscle

- Circulatory System
    - functions and components of the circulatory system
    - blood; composition, function, clotting, and homeostasis
    - heart structure and function
    - the cardiac cycle and heart sounds
    - electrical activity of the heart and the electroccardiogram
    - blood vessels
    - diseases and conditions of the cardiovascular system
    - the laws and principles of hemodynamics
    - blood pressure, hypertension, shock and congestive heart failure
- Defense and the Lymphatic System
    - the organs, tissues, vessels, and cells of the lymphatic system
    - nonspecific defense mechanisms
    - immunity
    - functions and interaction of both B and T lymphocytes
    - dysfunctions and conditions of the immune system
- Respiratory System
    - the respiratory system and its function
    - the levels of respiration
    - physical aspects of ventilation
    - gas exchange
    - regulation of breathing
    - hemoglobin function
    - carbon dioxide transport and pH effect
- The Urinary System
    - kidney function
    - control of Sodium and water balance
    - control of electrolyte balance and pH
    - renal plasma clearance
    - blood pressure control
- The Digestive System
    - digestive system functions
    - gastric function and control
    - small intestine function, activity and control
    - large intestine function
    - function and control of the liver, gallbladder, and pancreas
- Nutrition
    - nutrition requirements
    - regulation of energy metabolism
    - Islets of Langerhans and diabetes mellitus
    - calcium and phosphate balance
- Reproduction
    - sexual reproduction
    - development of the reproductive system
    - endocrine regulation of reproduction
    - male reproductive system functions and control

        - female reproductive system functions, controls, and cycles
    - Development
        - fertilization
        - gastrulation
        - development of the embryo
        - development of the fetus
        - birth

General Education Outcomes:

1) Read effectively, constructively, and critically.

Students read the text throughout the course. Tests, homework, essay questions, discussions, etc. all measure the student s ability to effectively read and understand the text. Throughout the semester, students will complete homework assignments with multiple types of questions, including true/false, multiple choice, fill-in-the-blank/short answer, and essay questions. Effectively completing the homework will require reading effectively, constructively, and critically.

2) Write clearly, informatively, and persuasively.

During the semester the student will be presented with essay questions in both homework and tests. The essay questions will be evaluated for clarity, information content, and persuasive presentation of content.

7) Apply scientific reasoning to a variety of contexts.

Students will demonstrate scientific reasoning throughout the various topics considered in course content in their responses to tests, quizzes, discussions, etc.

Key Performance Indicators:

Since different faculty and adjunct faculty teach the lecture course, teaching styles will vary, as will evaluation methods. The evaluation methods used will include

- tests and quizzes: 70-90%
- final exam 10-20%
- homework, study guide, special projects, and/or reports: 0-10%.

- The final examination will be comprehensive with questions on topics from each chapter comprising about 4-6% of the questions.

Representative Text and/or Supplies:

- Stuart Ira Fox, *Human Physiology*, current edition, McGraw Hill, New York, NY.

Optimum Class Size: 24
Maximum Class Size:

Signatures:

I hereby submit this course syllabus:

Allan Stevens, , Professor

I hereby find this course consistent with the goals and resources of the Biology Department:

Allan Stevens, , Professor, Chair

I hereby find this course consistent with the goals and resources of the Natural Science and Mathematics Division:

Dan Black, EdD, Associate Professor, Dean

I have discussed the need for library resources related to this class with the person submitting the syllabus:

Lynn Anderson, MLIS, Technical Services Librarian (Main Campus)

Michelle Olsen, MLS, Campus Librarian (Richfield Campus)