

CUYAMACA COLLEGE
COURSE OUTLINE OF RECORD

Biology 141 – Human Physiology

3 hours lecture, 3 units

Catalog Description

Study of the function and interrelationships of the nervous, endocrine, muscular, circulatory, respiratory, digestive, and reproductive systems of the human body. Relates these systems to the maintenance of homeostasis and the effects of exercise, behavior and disease on human physiology.

Prerequisite

“C” grade or higher or “Pass” in BIO 130, 131 or equivalent

Entrance Skills

Without the following skills, competencies and/or knowledge, students entering this course will be highly unlikely to succeed:

- 1) Understand the principles and the applications of the methods of scientific inquiry.
- 2) Perform the basic activities used by scientists in answering biological questions including design of experiments, collection of data, presentation of data in the form of tables, charts and graphs, and critical analysis and interpretation of data.
- 3) Recognize cellular structures and functions and its variations among different cell types.
- 4) Explain the basic chemical principles governing cellular metabolism.
- 5) Identify the chemical properties and functions of carbohydrates, lipids, proteins and nucleic acids.
- 6) Compare and contrast anaerobic to aerobic respiration.
- 7) Recognize the relationship between genes and chromosomes and how the genetic material is transmitted from parents to offspring.
- 8) Describe the relationship between the inheritance of genes and the expression of traits.
- 9) Identify the major organs of the human body and relate each to function.

Course Content

- 1) The Chemistry of Life (biomolecules)
- 2) Homeostasis and feedback systems, including role of bone tissue in homeostasis
- 3) Cell structure and function
- 4) Membrane structure, signaling, and cell to cell communication
- 5) Major body control systems
- 6) Integumentary system functions
- 7) Endocrine physiology
- 8) Reproductive physiology
- 9) Neurophysiology
- 10) Muscle structure and physiology
- 11) Membrane potential and action potential
- 12) Sensory organ functions
- 13) Cardiac /cardiovascular system physiology
- 14) Lymphatic system functions and immunology
- 15) Respiratory system function and regulation
- 16) Excretory physiology, including urinary system function and regulation
- 17) Digestive physiology
- 18) Thermoregulation

Course Objectives

Students will be able to:

- 1) Identify physiological parameters regulated by homeostatic mechanisms and distinguish between mechanisms that operate at different levels of the biological hierarchy (e.g., regulation of blood pressure versus local perfusion).
- 2) Diagram the components of a given homeostatic controlled variable (like glucose) from stimulus to response including feedback loops.
- 3) Design a generalized human cell relating key structures to their specific functions.
- 4) Compare and contrast the four major classes of biological macromolecule, the monomers used to construct them, their chemical behavior, and their roles in normal physiology, exercise and disease.
- 5) Relate the structure of the cell membrane to its transport and signaling functions.
- 6) Predict the physiological consequences of endocrine pathologies involving major glands and hormones.
- 7) Compare and contrast the functions of the male and female reproductive tracts including gametogenesis, hormonal control of reproductive cycles and behaviors, fertilization, pregnancy and parturition.
- 8) Demonstrate the mechanisms by which a neuron transmits information electrically down its axon and chemically across a synaptic cleft.
- 9) Construct a map of the nervous system with functional links between its major divisions, organs, pathways and effectors.
- 10) Explain how the excitation of muscle fibers produces muscular contractions, and relate the force of this contraction to variations in fiber type and organization, muscle type, exercise and health.
- 11) Chart the flow of blood through the cardiovascular system, relating each structure encountered to its function (e.g., the heart generates pressure to drive the flow of blood while capillaries permit gas exchange).
- 12) Predict changes in cardiovascular function due to exercise or disease.
- 13) Manipulate a model of normal respiratory physiology to explain respiratory conditions arising from disease or environment (e.g., emphysema, high altitude, etc.).
- 14) Explain how kidney function integrates with other systems to regulate osmolarity, gas exchange, excretion of wastes and acid/base balance.
- 15) Trace the path of a balanced meal through the gastrointestinal tract, describing its chemical and mechanical digestion and absorption.

Method of Evaluation

A grading system will be established by the instructor and implemented uniformly. Grades will be based on demonstrated proficiency in subject matter determined by multiple measurements for evaluation, one of which must be essay exams, skills demonstration or, where appropriate, the symbol system.

- 1) Exams (objective, subjective) and quizzes that assess students' ability to recognize, apply and integrate fundamental principles of physiology such as homeostasis.
- 2) Homework assignments that require students to identify and describe key physiological concepts, solve problems related to novel physiological scenarios, and formulate hypotheses in response to case studies in physiology.
- 3) Research projects in which students identify a physiological problem of interest, locate relevant source material in the physiological literature, analyze the topic in a written or oral presentation, and specify directions for future research.

Special Materials Required of Student

None

Minimum Instructional Facilities

Smart classroom

Method of Instruction

- 1) Integrated classroom lecture, discussion and study
- 2) Group discussion
- 3) Group study
- 4) Peer tutoring

Out-of-Class Assignments

- 1) Assignments that require students to identify and describe key physiological concepts, solve problems related to novel physiological scenarios, and formulate hypotheses in response to case studies in physiology.
- 2) Research projects in which students identify a physiological problem of interest, locate relevant source material in the physiological literature, analyze the topic in a written or oral presentation, and specify directions for future research.

Texts and References

- 1) Required: (representative examples):
 - a. Widmaier, Eric; Hershel, Raff; Strang, Kevin. *Vander's Human Physiology: The Mechanisms of Body Functions*. 16th Edition. McGraw-Hill. 2022.
 - b. Silverthorn, Dee. *Human Physiology: An Integrated Approach*. 8th edition. Pearson, 2.
- 2) Supplemental: None

Exit Skills

Students will be able to:

- 1) Identify physiological parameters regulated by homeostatic mechanisms.
- 2) Diagram the components of a given reflex from stimulus to response including feedback loops.
- 3) Compare and contrast the roles of the four major classes of biological macromolecule and their roles in normal physiology, exercise and disease.
- 4) Relate the structure of the cell membrane to its transport and signaling functions.
- 5) Predict the physiological consequences of endocrine pathologies involving major glands and hormones.
- 6) Compare and contrast the functions of the male and female reproductive tracts including gametogenesis, hormonal control of reproductive cycles and behaviors, fertilization, pregnancy and parturition.
- 7) Demonstrate the mechanisms by which a neuron transmits information electrically down its axon and chemically across a synaptic cleft.
- 8) Construct a map of the nervous system with functional links between its major divisions, organs, pathways and effectors.
- 9) Explain how the excitation of muscle fibers produces muscular contractions, and relate the force of this contraction to variations in fiber type and organization, muscle type, exercise and health.
- 10) Chart the flow of blood through the cardiovascular system, relating each structure encountered to its function (e.g., the heart generates pressure to drive the flow of blood while capillaries permit gas exchange).
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- 12) Manipulate a model of normal respiratory physiology to explain respiratory conditions arising from disease or environment (e.g., emphysema, high altitude, etc.).
- 13) Explain how kidney function integrates with other systems to regulate osmolarity, gas exchange, excretion of wastes and acid/base balance.
- 14) Trace the path of a balanced meal through the gastrointestinal tract, describing its chemical and mechanical digestion and absorption.

Student Learning Outcomes

Upon successful completion of this course, students will be able to:

- 1) Identify how health is maintained through homeostasis by regulating physiological parameters.

- 2) Relate individual organ function to organ system cooperation to maintain homeostasis within the human body.
- 3) Given typical physiological mechanisms, use critical thinking to determine pathological states and/or deviations from typical physiology (e.g., cystic fibrosis, diabetes insipidus/mellitus, turner syndrome, XYY syndrome, etc.).