CLFS 640: Human Physiology

Syllabus

This course will provide you with an opportunity for in depth study of the human cardiovascular, hemopoietic, respiratory, gastrointestinal, renal, and reproductive systems. We will emphasize the mechanisms responsible for maintaining homeostasis in the human organism, i.e., the neural and endocrine regulation of physiological functions. We will utilize textual materials, several enlightening and enjoyable computer-generated simulations, and a series of study questions to direct and enhance our learning.

Instructors:

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The course objectives are:

1. Discuss the function and regulation of the organ systems of humans.
2. Come to an understanding of these systems through a consideration of questions and a series of self-paced, comprehensive computer simulations of physiological systems that generate active learning and independent investigation.
3. Understand the bases for many common diseases.


Supplemental Materials: Interactive Physiology, a set of seven computer CDs (Benjamin-Cummings/Addison-Wesley Publishing Company) A package of supplemental materials and computer simulations (on disk) is available.

Unit One: Introduction to Physiology and Homeostasis

As a result of being multicellular organisms, humans have evolved an internal environment that surrounds all of the cells, tissues, and organs and is isolated from the external environment. The organ systems we will discuss maintain an optimal set of conditions within this internal environment, i.e., they maintain homeostasis through an elaborate set of feedback loops. We will investigate the components of a generalized homeostatic feedback loop.

Module 1:

- Background: the Multicellular Condition
Module 2:
- Homeostatic Systems
- Principles of a Generalized Homeostatic Systems
- Homeostatic Mechanisms in the Human Organism

Unit Two: The Autonomic Nervous System
The Autonomic Nervous System (ANS) and the Endocrine System regulate organ system function by responding to stimuli or deviations of the internal environment from the ideal set points. Thus, we must explore the ANS in some detail. Our discussions of ANS pharmacology will provide the basis for understanding the rationale behind most peripherally acting medications and other drugs.

Module 3:
- Review of Ion Channels and Membrane Potentials

Module 4:
- Design of the Human Peripheral Nervous System

Module 5:
- Structure, Function, and Organization of the Autonomic Nervous System

Module 6:
- Peripheral Nervous System Pharmacology

Unit Three: The Circulatory System
Our exploration of the structures, functions, and regulation of the Cardiovascular System will be highlighted and expanded by considerations of the related diseases.

Module 7:
- Design and Mechanics of the Cardiovascular System

Module 8:
- Blood Components Changes Reflective of Disease
- Capillary Structure and Function

Module 9:
- The Heart Anatomy As a Pump

Module 10
- Regulation of Blood Flow and Pressure

Module 11:
- Cardiovascular Diseases
- Cardiovascular Shock Hypertension
Unit Four: The Respiratory System

Module 12:
- Respiratory Structures
- Principles of Gas Exchange
- The Mechanics of Breathings

Module 13
- O2 and CO2 Transport
- Hemoglobin
- Carbonic Anhydrase and CO2

Module 14:
- Control of Respiration and Pulmonary Blood Flow

Module 15:
- Mountain Climbing, Scuba Diving, and Dolphins

Unit Five: The Renal System

Module 16:
- The Three Basic Renal Processes

Module 17:
- Renal Structures and Functions
- Cortical and Juxtamedullary Nephrons
- Nephron Function and Renal Clearance
- Urine Formation

Module 18:
- Fluid and Electrolyte Balance

Unit Six: The Digestive System

Module 19:
- Smooth Muscle: Structure, Function and Motility

Module 20:
- Gastrointestinal Anatomy

Module 21:
- Regulation of Motility and Secretion

Module 22:
- Digestion and Absorption
Unit Seven: The Reproductive Systems

Module 23:
• Reproductive Structures in the Male

Module 24:
• Reproductive Structures in the Female

Module 25:
• Fertilization and Implantation