

BMED 3161 Systems Physiology II

Credit: 2-5-4

Prerequisite(s): BMED 2300 and 3160 and CEE/ISYE/MATH 3770 (w/concurrency)

Catalog Description

Quantitative model-oriented approaches to the study of human physiologic functions and integrative analysis of the control of homeostatic processes.

Text

Human Physiology, Silverthorn, D.U., Prentice Hall, Upper Saddle River, NJ, 3rd edition, 2003.

Objectives

The goals of this course are to introduce students to the major organ systems and the corresponding function(s). The concepts of homeostasis and the means by which several organ systems combine to maintain homeostasis will be discussed. In addition, the students will apply engineering skills learned in other biomedical engineering courses to solving physiological problems. Laboratory experiments will be used to both help reinforce the lecture topics and to develop experimental skills in the students.

Outcomes

By the end of this course the students will:

1. become familiar with anatomical structures and physiologic functions of major organ systems (Program Outcome 1)
2. understand homeostatic processes and integration of human organ systems (Program Outcome 1)
3. develop quantitative skills for analyzing physiologic processes (Program Outcomes 2 and 4)
4. develop the ability to address the challenges associated with the interaction between living systems and non-living materials and systems when designing and conducting experiments (Program Outcomes 4)
5. develop the ability to measure, statistically analyze, and interpret experimental data from living systems (Program Outcomes 2 and 4)
6. complete an open-ended team-based experimental design project that will culminate in a poster presentation (Program Outcomes 2, 4, 5 and 6).

Topical Outline

1. Introduction to Physiology and Pathophysiology
2. Review of Cell Physiology
3. Membranes and Transport
4. Action Potentials and Excitable Cells
5. Cell-Cell Communication
6. Homeostasis
7. Anatomical Compartments and Body Fluids

8. Sensory Physiology and Spinal Cord
9. Brain and Higher Order Function
10. Autonomic Nervous System
11. Neural Injury/Disease
12. Muscle Physiology
13. Neuro-muscular Integration
14. Endocrine System – Hormones/Pituitary
15. Endocrine System – Thyroid/Adrenal
16. Endocrine System – Disease
17. Cardiovascular Physiology – Heart
18. Cardiovascular Physiology – Peripheral Vasculature and Blood
19. Cardiovascular Physiology – Blood Pressure and Disease
20. Respiratory Physiology – Lungs
21. Respiratory Physiology – Gas Transport
22. Renal Physiology and Fluid Balance
23. Cardio-Respiratory-Renal Integration
24. Inflammation/Immune Function
25. Immune Diseases

Laboratory Modules

1. Neural Anatomy/Physiology
 - a. EEG measurements
2. Skeletal Muscle Anatomy/Physiology
 - a. EMG measurements (human)
 - b. EMG measurements (frog)
3. Cardiovascular Anatomy/Physiology
 - a. ECG measurements (human)
 - b. ECG measurements (frog)
4. Blood Pressure
 - a. Pulse and pressure measurements
5. Respiratory Anatomy/Physiology
 - a. Pulmonary function measurements
6. Research Project