BME 106 - Introduction to Human Physiology II

1 Credit, 1 Contact hour
Instructor: Bruno Mantilla, Ph.D.

Textbook(s)/Materials Required:
Human Physiology. Sherwood. (required). Publisher: Thomson Brooks/Cole; 7 edition (December 26, 2008) ISBN-10: 0495391840

Description:
One of the core elements of this discipline is being able to understand the biological world and the engineering world at the same time. In addition biomedical engineers need to prepare their minds for analyzing, quantifying, thinking, and solving problems at the interface of engineering, medicine and biology. This course sets the basic concepts for future interfacing between engineering and physiology. BME 106 offers an overview and the fundamental concepts of the cardiovascular and respiratory systems, and the close interaction between them. BME 106 also introduces the basic concepts of immunology and how the body defenses act to protect the human organism. This is the second of two parts in which the student is introduced to the concept that the human body is an interacting complex system. By the end of the semester the student should understand and know the essentials of the cardiovascular, respiratory, and immunological systems.

Prerequisites: none

Learning Outcomes:
1. **Heart:** Understanding of the structure and function of the heart, not only the electrical but also the mechanical properties; and their interrelation for proper functioning.
2. **Blood:** Understand the function of each of the components of the blood and how they relate to each other, forming a specialized delivery system to tissues and organs.
3. **Hemodynamics and blood vessels:** Understand the intricate relation between structure and function of the different blood vessels. Study and learn the mechanical properties of the vessels. Explore the engineering approach to blood pressure, flow and resistance.
4. **Immunology:** Recognize the two main immunological responses. Identify the different types of white blood cells and their main function during cellular and humoral response.
5. **Respiratory system:** Understand the factors determining ventilation and perfusion. Learn the importance of hemoglobin structure and function. Review the different ways of evaluating the pulmonary function.

ABET Outcomes expected of graduates of BME BS program by the time that they graduate:

(A) an ability to apply knowledge of mathematics, science, and engineering
(B) an ability to design and conduct experiments, as well as to analyze and interpret data
(C) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

(D) an ability to function on multi-disciplinary teams
(E) an ability to identify, formulate, and solve engineering problems
(F) an understanding of professional and ethical responsibility
(G) an ability to communicate effectively
(H) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(I) a recognition of the need for, and an ability to engage in life-long learning
(J) a knowledge of contemporary issues
(K) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
(L) an understanding of biology and physiology
(M) the capability to apply advanced mathematics (including differential equations and statistics), science, and engineering to solve problems at the interface of engineering and biology
(N) an ability to make measurements on and interpret data from living systems
(O) an ability to address problems associated with the interaction between living and non-living materials and systems

Outcome # 1. Students will understand the fundamental structure, conductive system and mechanical events of the heart .		
Strategies & Actions	**Program Outcomes**	**Assessment Methods**
The heart structure and functioning are covered in class lectures and class discussions. EKG and PV loop, how they are originated and used are discussed during the lectures.	L	Tests.
Outcome # 2. Students will understand the main components of the blood; the characteristics of each blood cell, their structure and function.		
Strategies & Actions	**Program Outcomes**	**Assessment Methods**
Structure of red and white blood cells are explained at the class. Hemoglobin molecular structure and clinical behavior are also discussed. Clinical examples and correlations are introduced. Also, existing problems and opportunities for engineering research and solutions are highlighted.	L	Tests.
Outcome # 3. Students will understand the basic histology and physiology of the arterial and venous system		
Strategies & Actions	**Program Outcomes**	**Assessment Methods**
Macro and micro structure of the arteries, arterioles, capillaries and veins are explained at the class. Blood flow and circulation are discussed with special	L	Tests.

emphasis on the quantification and analysis of the normal and altered states. Also, existing problems and opportunities for engineering research and solutions are highlighted.		
Outcome # 4. Students will understand the basic responses of the human body against and insult or injury.		
Strategies & Actions	**Program Outcomes**	**Assessment Methods**
Students are introduced to the complex immunological system. The primary and secondary immunological responses are explained. A further explanation on the different types of white blood cells is introduced.	L	Tests.
Outcome # 5. Students will understand the fundamental anatomy, histology and physiology of the respiratory system.		
Strategies & Actions	**Program Outcomes**	**Assessment Methods**
The airways and lung structure and functioning are covered in class lectures and class discussions. Spirometry, and the engineering approach to lung function evaluation is discussed during the lectures	L	Tests.