

Department of Biomedical Engineering

BME 111 – INTRO TO HUMAN

COURSE INSTRUCTOR: Dr. Zain Siddiqui zs67@njit.edu	CLASS HOURS 3 Credits Schedule: 3 hour lecture per week Professional Component: Medical / Biological Topics Topics: Cell Structure; Cell Physiology; Nervous System Structure; Nervous System Physiology, Muscle, Heart, Pulmonary System, Cardiovascular, Blood Pressure, Immunology.	Textbook: Fundamentals of Human Physiology, 4th Edition Lauralee Sherwood - West Virginia University ISBN-10: 0840062257 ISBN-13: 9780840062253 720 Pages Paperback ©2012 Published	OFFICE HOURS Thursday 1:30 pm or by appointment Prerequisites: NONE Required
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PHYSIOLOGY

Description:

One of the core elements in Biomedical Engineering is being able to understand the interaction between the biological world and the engineering world. Furthermore, biomedical engineers need to prepare their minds for analyzing, quantifying, and creating new devices in order to solve problems at the interface of engineering, medicine and biology. This course sets the basic concepts for future interfacing between engineering and physiology. BME 111 offers an overview of human physiology. The course introduces the fundamental concept of homeostasis and how the interactions between cells, tissues and different human body systems achieve it. The student is also introduced to the complex field of neurophysiology, and to the fundamental concepts of blood, cardiovascular, respiratory and immune systems. By the end of the semester, the student should understand and know the essentials of the nervous. Muscular, cardiac, vascular, blood, respiratory and immune systems.

Objectives:

1. **Cell differentiation, cell specialization & Homeostasis:** Cell differentiation & specialization. Cell to cell interaction, tissues, organs and systems. Homeostasis, feedback system as a fundamental mechanism in physiology.
2. **Nervous System Structure and Function:** Brain and spinal cord are complex organs composed of numerous regions and nuclei. The students should understand the intricate and complex associations between the different areas of the brain, as well as the hierarchical structure and functioning of the Peripheral and Central Nervous System.
3. **Muscle:** Structure and function of the muscle. Understand the electrical and mechanical properties of muscle contraction at a molecular level.

4. **Heart:** Understand the structure and function of the heart. Understand the electrical and mechanical properties of the heart, and their interaction with other systems for proper functioning.
5. **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.
6. **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.
7. **Respiratory system:** Understand the factors determining ventilation and perfusion. Learn the importance of hemoglobin structure and function. Review the different ways of evaluating pulmonary function.

GRADING Exams: 88 % Class participation & quizzes: 12%

Four exams, (22% each), for a total of 88% of the grade.

No makeup examinations will be administered. If a valid and documented excuse for a missed exam is provided, the weight of the **Exam 4** will increase to compensate for the missed grade. **All tests are cumulative.**

Week	Course outline	CHAPTER
1	Intro, Levels of Org. (cell, tissue, organ, system), homeostasis. Cells structure & organelles. Plasma Membrane, Cell to cell Adhesions	1 - 3
2	Intro, Levels of Org. (cell, tissue, organ, system), homeostasis. Cells structure & organelles. Plasma Membrane, Cell to cell Adhesions	1 - 3
3	Membrane transport, Resting Potential, Graded Potential, Action Potential, Synapses, EPSP – IPSPS EXAM 1	3 - 4
4	Neuroanatomy I (Spinal Cord) // Neuroanatomy II (Brain) Neuroanatomy. Central nervous system (CNS) overview, CNS cell types, Cells Protection & Nourish.	handouts 5
5	CNS – Cortex, Basal Ganglia-Thalamus-Hypothalamus CNS -, Memory & Learning-, Cerebellum, Brain Stem, Spinal Cord	5
6	Peripheral nervous system (P NS)–Affer., Pain - Vision PNS–Affer., Hearing & Balance	6
7	PNS– Effer. Somatic NS-. Autonomic NS. Sympathetic & parasympathetic divisions. EXAM 2	7
8	Muscle structure, molecular basis of contraction, muscle mechanics, control of motor movement	8
9	Heart Anatomy - Electrical Activity The Heart Mechanical Events - (Cardiac-Cycle) - Cardiac output & control	9
10	Blood Vessels & Blood Pressure –Blood Flow –Arteries Arterioles - Veins-Baroreceptors EXAM 3	10
11	Respiratory System –Anatomy-Mechanics.	12
12	Respiratory System – Gas Exchange- Gas Transport-Control of Respiration	12
13	Blood & Body Defenses- Plasma-RBC-WBC-Platelets. Innate Immunity	11
14	B Lymphocytes – T lymphocytes Adaptive immunity	11
15	EXAM 4	11

The Course Outline may be modified at the discretion of the instructor or in the event of extenuating circumstances. Students will be notified in class of any changes to the Course outline and schedule.