Class Meetings: Tuesdays and Thursdays, 8:00-10:00AM

Instructor: Paul Leavis, Ph.D.
Email: Paul.Leavis@Tufts.edu
Department of Medical Education, TUSM
Phone: (617) 636-2741

Office Hours: Contact me via email or to schedule office meetings

Teaching Assistant: Ying Zhu

Semester hour units: 3 SHUs

Prerequisites: Biology

Course Description:
This course will cover the functions of mammalian organisms as we understand them at various levels of organization - organ system, organ, cellular and subcellular levels. Our goal is to provide a working knowledge of the fundamental properties and regulation of these systems so that the student can understand and relate this material to that learned in other basic science courses with particular emphasis on those related to nutrition.

Course Objectives:
The student is expected to demonstrate an understanding of:

1. The organization of the cell and its organelles with particular emphasis on the structure and function of cell membranes and their role in the control of the transport of solutes into and out of the cell. The physical principles of membrane transport including diffusion of uncharged and charged solutes, osmosis.

2. The mechanisms involved in the generation and maintenance of the nerve impulse including the resting potential, the generation of an action potential, its propagation within a neuron, synaptic transmission. Organization of sensory and motor systems.

3. Mechanics and molecular basis of muscle contraction. Stretch and tension receptors in muscle; stretch reflex.

4. The cardiovascular system including electrophysiological and mechanical aspects of the cardiac cycle, hemodynamics and circulation, EKG, hemostasis, blood groupings, immunology.
5. Physiology of respiration including the mechanics of breathing, pulmonary ventilation/perfusion, gas laws, transport of oxygen and carbon dioxide in the blood, respiratory control of acid-base balance, control of breathing.

6. Renal function in maintaining the body's balance of electrolytes, water, hydrogen ions, nutrients- includes glomerular filtration, renal absorption and secretion, counter-current exchange in concentration of urine.

7. Gastro-intestinal physiology including control of gastro-intestinal motility, salivary gland function, nature and control of stomach and pancreatic secretions, the biliary system, digestion and absorption in the small and large intestines.

8. The organization and function of the endocrine system including the synthesis, storage and actions of peptide and steroid hormones, second messenger systems, feedback pathways. Structure of the neuro- and adenohypophysis, thyroid, adrenal, pancreas, parathyroid glands and their hormones.

Text/Materials:

Recommended but not required text: Vanders Human Physiology, McGraw-Hill Publishing Co. NY, 15th Ed. Any recent textbook of Physiology or Anatomy and Physiology will be a substitute for the above. I'll be happy to check out your text book if you're not sure of its adequacy. A TEXTBOOK IS NOT REQUIRED

Canvas: Materials in the form of short powerpoint presentations and notes will be available for each topic.

Academic Conduct: Each student is responsible for upholding the highest standards of academic integrity, as specified in the Friedman School’s Policies and Procedures Handbook and Tufts University policies (http://students.tufts.edu/student-affairs/student-life-policies/academic-integrity-policy). It is the responsibility of each student to understand and comply with these standards, as violations will be sanctioned by penalties ranging from failure on an assignment and the course to dismissal from the school.

Classroom Conduct: Students are expected to attend class. The classroom is informal and questions and/or discussions are welcome. You are welcome to email me at any time to set up a meeting.

Assessment and grading: There will be three in-class exams. Your grade will be based upon the average of three in-class exams, each worth 33%.

A passing grade in the course is B- or better. Course grades will be based on the below:

A > 94%
A- 90 - <94%
B+ 87 - <90%
B 84 - <87%
B- 80 - <84%

Accomodation of Disabilities: Tufts University is committed to providing equal access and support to all students through the provision of reasonable accommodations so that each student may access their curricula and achieve their personal and academic potential. If you have a disability that requires reasonable accommodations please contact the Friedman School Assistant Dean of Student Affairs at 617-636-6719 to make arrangements for determination of appropriate accommodations. Please be aware that accommodations cannot be enacted retroactively, making timeliness a critical aspect for their provision.
### COURSE SCHEDULE:
All lectures are from 8 – 10 AM

<table>
<thead>
<tr>
<th>Date</th>
<th>LECTURE TOPIC</th>
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<tbody>
<tr>
<td>Jan 17</td>
<td>Introduction to the course, membrane structure. Membrane transport, diffusion,</td>
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<td></td>
<td>osmosis,</td>
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<td>Jan 22</td>
<td>Membrane potentials; the neuron, resting and action potentials, conduction of</td>
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<td>impulses</td>
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<td>Jan 24</td>
<td>The synapse, excitatory and inhibitory, summation, convergence and divergence,</td>
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<td>simple reflex</td>
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<td>Jan 29</td>
<td>Spinal cord; structure and function of Sensory and motor systems</td>
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<td>Jan 31</td>
<td>Autonomic nervous system</td>
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<td>Feb 5</td>
<td>Muscle mechanics, types of con-Muscle traction, elastic and contractile</td>
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<td></td>
<td>elements of muscle</td>
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<tr>
<td>Feb 7</td>
<td>Molecular details of muscle contraction and regulation</td>
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<td>Feb 12</td>
<td>Smooth muscle</td>
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<td>Feb 14</td>
<td>Intro to cardiology, properties of myocardium, pacemaker activity Spread of</td>
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<td>action potential, EKG</td>
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<td>Feb 19</td>
<td>EXAM #1 (covers 1/18 – 2/13)</td>
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<td>Feb 21</td>
<td>NO CLASS</td>
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<td>Feb 26</td>
<td>Contractile activity of atria and ventricles, valve function, heart sounds,</td>
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<td>Feb 28</td>
<td>Vascular physiology, peripheral circulation, blood pressure</td>
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<td>Mar 5</td>
<td>Respiration, mechanics of ventilation gas laws, $O_2$ and $CO_2$ diffusion</td>
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Mar 7  Respiration, gas transport, hemoglobin, O_2 saturation curve, CO_2 transport, CO

Mar 12  Respiration, oxygen uptake, control of respiration,

Mar 14  EXAM#2

Mar 16-25  SPRING RECESS

Mar 26  Renal system, functional anatomy, renal plasma flow, GFR

Mar 28  Renal system, reabsorption, secretion, electrolyte, nutrient reabsorption in PCT

April 2  Renal system, final control of sodium and water reabsorption

April 4  Gastro-intestinal system, alimentary tract, motility, mechanical breakdown of foods, exocrine function of salivary glands

April 9  Digestion of macronutrients, liver, pancreas, absorption of nutrients

April 11  Endocrinology, general mechanisms of hormone action, feedback & homeostasis, endocrine organs

April 16  Endocrinology - pituitary/hypothalamic axis

April 18  Endocrinology – thyroid /metabolism, adrenal glands

April 23  Endocrinology – pancreas, diabetes

April 25  Endocrinology- reproduction

May 5-12  EXAM#3