

# Human Physiology / Systems Physiology Syllabus

- Instructor:** Andrey Vyshedskiy, Ph.D., Adjunct Professor, BU  
**Education:** PhD in Neurobiology, MS in Biomedical Engineering, BS in Astrophysics.  
**email:** vysha@bu.edu  
**Class website:** <http://www.stethographics.com/a>
- Class meets:** Thursday nights from 6-9 pm
- Textbooks:** "Human Physiology: The mechanisms of body functions" by Widmaier 14<sup>th</sup> edition; 13<sup>th</sup>, 12<sup>th</sup>, 11<sup>th</sup>, 10<sup>th</sup>, 9<sup>th</sup>, 8<sup>th</sup> or 7<sup>th</sup> editions by Vander, Sherman and Luciano are very similar. 14<sup>th</sup> edition is available in BU bookstore bound together with Systems Physiology Lab Manual.  
 -Physiology Lab Manual by Widmaier, Physiology Laboratory Manual
- Office hours:** 1 hour after the lecture
- Grading:**
- |  |     |
|--|-----|
| Exam I (2-hour)  | 22% |
| Exam II (2-hour)   | 22% |
| Final Exam   | 26% |
| Labs   | 25% |
| Homework (available on the website; write the answers, make a photograph of your answers and email it before the class to <a href="mailto:imaginationmailer@gmail.com">imaginationmailer@gmail.com</a> ) | 5%  |
- Absolute Scale:**
- |         |      |
|---------|------|
| 92-100  | = A  |
| 86-91.9 | = A- |
| 82-85.9 | = B+ |
| 76-81.9 | = B  |
| 71-75.9 | = B- |
| 67-70.9 | = C+ |
| 62-66.9 | = C  |
| 58-61.9 | = C- |
| 52-57.9 | = D  |
- Labs:** All students must attend, complete and enjoy the laboratory portion of the course. Lab director: Angela Seliga [amseliga@bu.edu](mailto:amseliga@bu.edu) and [lovealegna@gmail.com](mailto:lovealegna@gmail.com), SCI413, 590 Commonwealth Avenue, Tel: 617-358-5877
- Exams:** Closed books
- How to get A:**
- **Read the textbook before each lecture.**
  - **Ask questions in class.** If you are afraid of being embarrassed, consider the benefits: increased adrenaline will wake you up and enable to remember the answers forever!
  - **Review slides** after each lecture before starting homework.
  - We review each homework in class. **Ask questions during reviews.**
  - Exams are your opportunity to generalize information!
  - Before each exam: 1. review slides (and the textbook if you have time).
  - 2. Printout a fresh copy of homeworks and do it again.
  - 3. Ask me any remaining questions, no matter how small or insignificant.
- Make-ups:** Make-ups are allowed in exceptional circumstances, talk to me as soon as possible
- Snow:** Find out if class is cancelled by calling: (617) 353-7669

#		Topic	Reading, approximate pages	
			15 <sup>th</sup> edition	14 <sup>th</sup> edition
		<b>Cellular Physiology</b>		
1	1	Movement of molecules across cell membranes, Osmosis, Body fluids	4-5, 23-25, 95-117	4-5, 23-24, 95-117
	2	Principles of electricity, Ion channels; Mediated transport systems	143-148	143-148
	W	Watch: -Single cell electrophysiology in the fly brain: <a href="http://www.youtube.com/watch?v=vw_w1TveM5E">http://www.youtube.com/watch?v=vw_w1TveM5E</a> ; <a href="http://www.youtube.com/watch?v=mJJGZP9Dtq4">http://www.youtube.com/watch?v=mJJGZP9Dtq4</a> -How the cell's equilibrium potential is established: <a href="https://www.youtube.com/watch?v=4kx9_0YwShE">https://www.youtube.com/watch?v=4kx9_0YwShE</a>		
2	1	Neural control mechanisms: Resting membrane potential, Action potential	136-142, 148-157	136-142, 148-157
	D	Movement of molecules across cell membranes		
3	1	Synaptic transmission, exocytosis, endocytosis; postsynaptic cell. Signaling at the neuromuscular junction, other types of synapses	157-170, 260-263	157-170, 260-263
	D	Action Potential		
	W	- Christof Koch a in the National Geographic Live! - Mapping the Brain (22min, 2014: at 8min there is the best presentation of a slice of a mouse brain with synapses): <a href="https://www.youtube.com/watch?v=7_drJyNMxbw">https://www.youtube.com/watch?v=7_drJyNMxbw</a>		
4	1	CNS, Autonomic nervous system. Organization of the brain. Executive control, Prefrontal cortex: lateral prefrontal cortex versus medial prefrontal cortex. Posterior cortex. Cerebellum. Organization of the somatosensory cortex. Sleep.	172-188	171-188
	D	Synaptic Transmission		
	W	- 3D brain: <a href="http://www.g2conline.org/2022">http://www.g2conline.org/2022</a> - The Brain: Teaching Modules. (1997). <a href="http://www.learner.org/resources/series142.html">http://www.learner.org/resources/series142.html</a> : 1. Organization and Evaluation of Brain Function, 25. Frontal Lobes and Behavior: The Story of Phineas Gage -Daniel Wolpert. TED: <a href="http://www.ted.com/talks/daniel_wolpert_the_real_reason_for_brains.html">http://www.ted.com/talks/daniel_wolpert_the_real_reason_for_brains.html</a> -Penfield Brain Mapping: <a href="https://www.youtube.com/watch?v=l1SAC1HcAzc">https://www.youtube.com/watch?v=l1SAC1HcAzc</a> SLEEP: -The Science of Sleep (2008): <a href="http://www.cbsnews.com/videos/the-science-of-sleep/">http://www.cbsnews.com/videos/the-science-of-sleep/</a> -The Brain: Teaching Modules. (1997). <a href="http://www.learner.org/resources/series142.html">http://www.learner.org/resources/series142.html</a> : 13. Sleep and Circadian Rhythms, 14. Sleep: Brain Functions, 15. REM Sleep and Dreaming -Characteristics of sleepwalking: <a href="http://www.youtube.com/watch?v=HNj04OmQ60U">http://www.youtube.com/watch?v=HNj04OmQ60U</a> . -A child with cataplexy: <a href="http://youtu.be/qVu-IcLoZtU">http://youtu.be/qVu-IcLoZtU</a> ; A dog with narcolepsy: <a href="http://www.youtube.com/watch?v=X0h2nleWTwl">http://www.youtube.com/watch?v=X0h2nleWTwl</a> -Eleven Days Without Sleep: The Haunting Effects Of A Record-Breaking Stunt - Eyes Wide Open: Hidden Brain : NPR: <a href="https://www.npr.org/2017/11/06/562305141/eleven-days-without-sleep-the-haunting-effects-of-a-record-breaking-stunt">https://www.npr.org/2017/11/06/562305141/eleven-days-without-sleep-the-haunting-effects-of-a-record-breaking-stunt</a>		
5	1	Skeletal muscle	257-286	255-283
	D	Autonomic nervous system and CNS		
	W	Good muscle animation: <a href="https://youtu.be/ousflrOzQHc">https://youtu.be/ousflrOzQHc</a>		
6	1	The frontal cortex in conscious experiences: The frontal cortex in conscious experiences: from scheduling muscle movements to scheduling thoughts.	234-256	232-254
	D	Skeletal Muscle, Review		
	W	-Becoming Human - 3 parts long Documentary: <a href="https://youtu.be/UFu7yghK9GQ?list=PLLoRNYgorqAm6g8udHKvGXEBwfg1keD">https://youtu.be/UFu7yghK9GQ?list=PLLoRNYgorqAm6g8udHKvGXEBwfg1keD</a> -Washoe, Koko, and the social exchange of language in non-human primates: <a href="http://www.youtube.com/watch?v=3V_rAY0g9DM">http://www.youtube.com/watch?v=3V_rAY0g9DM</a> -Kanzi in a research session, converting human language to arbitrary symbols (3min): <a href="http://www.youtube.com/watch?v=wRM7vTrIis">http://www.youtube.com/watch?v=wRM7vTrIis</a> ; another video on Kanzi (6min): <a href="http://youtu.be/pEk138lqaFo">http://youtu.be/pEk138lqaFo</a> . - The best movie about Kanzi (4 x 15 min, 1990): (1) <a href="http://youtu.be/dBUHwoFnuB4">http://youtu.be/dBUHwoFnuB4</a> ; (2) <a href="http://youtu.be/MTFL7BgWloY">http://youtu.be/MTFL7BgWloY</a> ; (3) <a href="http://youtu.be/P-9Ub1-LaAA">http://youtu.be/P-9Ub1-LaAA</a> ; (4) <a href="http://youtu.be/h7ldghtkKmA">http://youtu.be/h7ldghtkKmA</a> -Podcast: Counting Neurons with Dr. Suzana Herculano-Houzel from Brain Science with Ginger Campbell, MD: Neuroscience for Everyone in Podcasts. <a href="https://itunes.apple.com/us/podcast/brain-science-ginger-campbell-md-neuroscience-for-everyone/id210065679?mt=2&amp;i=100038481791">https://itunes.apple.com/us/podcast/brain-science-ginger-campbell-md-neuroscience-for-everyone/id210065679?mt=2&amp;i=100038481791</a>		

7	1	<b>Midterm Exam</b> (up to and including Skeletal muscle lecture)		
	D	Exam Discussion		
		<b>System Physiology</b>		
8	1	Homeostasis: Temperature regulation	5-19, 593-598	5-19, 583-589
	2	Blood	363-365, 669-670	361-363, 669-670
	W	Temperature regulation by Wim Hof: <a href="https://www.youtube.com/watch?v=VaMjhwFE1Zw">https://www.youtube.com/watch?v=VaMjhwFE1Zw</a>		
9	1	Heart cycle, Electrical Properties of the Heart, ECG, Control of cardiac output	365-444, 293-295	365-442, 290-295
	2	Vascular system, Regulation of arterial blood pressure		
	D	Homeostasis		
10	1	Respiration, Gas Exchange, Control of respiration	445-487	442-483
	D	Cardiovascular system, Respiratory system, Review		
11	1	<b>Midterm Exam (up to and including lecture 9, Respiration)</b>		
	D	Exam Discussion		
12	1	Gastrointestinal system: motility, secretion and absorption	531-561	526-563
	2	Smooth muscle	287-292	284-290
	W	- TED: Rob Knight: How our microbes make us who we are: <a href="https://www.ted.com/talks/rob_knight_how_our_microbes_make_us_who_we_are?language=en">https://www.ted.com/talks/rob_knight_how_our_microbes_make_us_who_we_are?language=en</a> - Insulin discovery by Frederick Banting, Charles Best, James Collip, John Mc Leod: <a href="https://youtu.be/KqpAtsdmenA">https://youtu.be/KqpAtsdmenA</a>		
13	1	The Kidneys regulation of water and ions	488-525	484-525
	D	Gastrointestinal system		
14	1	Hormonal control systems	320-358	318-349
	2	Reproduction	604-639	Lecture slides
	D	Kidney, Review		
	W	Fertilization video: <a href="http://youtu.be/BFrVmDgh4v4">http://youtu.be/BFrVmDgh4v4</a>		
15	1	<b>Final Exam</b> (Cumulative) 6-9 PM		