

# **BE 606: Quantitative Physiology for Engineers**

## **Spring 2021**

Lectures: MW 12:20-2:05 pm, EPC 204

Discussion: F 12:20-1:10 pm, EPC 204

Recommended Textbooks (not required):

- Quantitative Human Physiology: An introduction, by Joseph Feher (2<sup>nd</sup> edition, Academic Press)
- Medical Physiology: Guyton and Hall (13<sup>th</sup> edition, Elsevier)

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Grading:

Homework	25%
Project	15%
Participation	10%
Two Exams	50%

Problem sets are due at the beginning of class. Any assignment turned in late will be assessed a penalty of 2 points (10%) per 24 hours, beginning immediately after the time the homework is due. You are encouraged to discuss homework problems with your classmates; however, you are not allowed to directly copy a classmate's work or to let a classmate copy your homework.

Cheating or plagiarism on an assessment (homework, exam, or project), as well as unauthorized communication during exams, will result in an automatic zero for that assessment.

Exams missed due to illness will be considered unexcused unless you call ahead of time to explain the situation and reschedule the exam and you bring a signed letter from your physician.

Class Philosophy:

- Cover basic knowledge of physiology, with an emphasis on how engineering approaches to physiological systems can be impactful.
- Quantitative descriptions of physiological processes (such as principles, measurements, instrumentation, and mathematical modeling), with an emphasis on the electrical, mechanical, and chemical aspects, in addition to biology and physiology.
- Assessments will focus primarily on quantitative problem solving, but some aspects of physiological systems will have to be memorized.

BE 606 Spring 2021 Course schedule

M	Jan. 25	1. Membranes and transport	Edwards
W	Jan. 27	2. Cellular metabolism	Edwards
M	Feb. 1	3. Ionic equilibrium and action potentials	Edwards
W	Feb. 3	4. Cellular signaling and synaptic transmission	Edwards
M	Feb. 8	5. Neural coding principles	Sen
W	Feb. 10	6. Sensory systems: visual system	Sen
T	Feb. 16	7. Sensory systems: auditory system <i>(note change of day)</i>	Sen
W	Feb. 17	8. Adaptation, modulation, and plasticity	Sen
M	Feb. 22	9. Skeletal muscle cells: contractile mechanisms	Edwards
W	Feb. 24	10. Smooth muscle	Edwards
M	Mar. 1	11. Fluid and solute exchange in the microcirculation	Edwards
W	Mar. 3	12. Drug delivery to GI tract (10 am – 12 pm)	Traverso
M	Mar. 8	<b>Midterm exam</b>	
W	Mar. 10	13. Renal system: tubular reabsorption	Edwards
M	Mar. 15	14. Renal system: glomerular filtration	Edwards
W	Mar. 17	15. Overview of the cardio-vascular system	Chen
M	Mar. 22	16. Cardiac cycle and cardiac output	Chen
W	Mar. 24	17. Regulation of perfusion and cardiac output	Chen
M	Mar. 29	18. Renal system: Regulation of electrolyte balance	Edwards
W	Mar. 31	<i>No class – Wellness day</i>	
M	Apr. 5	19. Cardiac electrophysiology	Helm
W	Apr. 7	20. Arrhythmias and cardiac synchronization therapy	Helm
M	Apr. 12	21. Valve function and valvular heart disease	Padera
W	Apr. 14	22. Respiratory system: structure and gas exchange	Suki
M	Apr. 19	<i>No class: Patriots' Day</i>	
W	Apr. 21	23. Respiratory system: mechanics of breathing	Stamenovic
M	Apr. 26	24. Allometric scaling	Suki
W	Apr. 28	<b>Review for final exam</b>	

Assignment due dates

HWK1	Due on 02/08 (M)	Transport, action potentials, signaling
HWK2	Due on 02/22 (M)	Sensory systems
HWK3	Due on 03/22 (M)	Renal system
HWK4	Due on 04/12 (M)	Cardio-vascular system
<b>Project</b>	Due on 04/19 (W)	Physiological feedback loops
HWK5	Due on 04/26 (M)	Respiratory system