

# **ECE 601: FOUNDATIONS OF BIOLOGY IN ENGINEERING**

## **Fall 2021**

### **Course Description and Aims**

This biomedical engineering core course focuses on equipping students with the foundational knowledge in human biology through a problem-solving oriented treatment of biological phenomena at the human physiology level. The overarching aim of this course is to develop students' literacy in human biology and to show them how various physiological phenomena can be analytically explained and justified with numbers.

ECE 601 serves well as a bridging course for engineering science students with undergraduate-level math skills but have limited or no prior knowledge of human physiology. It also serves as an engineering bridging course for biology students who previously learned human physiology from a qualitative perspective but have limited or no prior exposure to quantitative analysis.

### **Teaching Staff**

Billy Y. S. Yiu, Ph.D.

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### **Course Prerequisites**

For engineering science students: Background in undergraduate-level circuit analysis (ECE 140 and 240, or equivalent) is preferred.

For biology students: Prior completion of one undergraduate physiology course (BIOL 273, or equivalent) is preferred.

### **Textbook**

Costanzo. *Physiology*. 6<sup>th</sup> Ed. Elsevier, 2018.

### **Course Learning Outcomes**

By the end of this course students should be able to demonstrate a threshold level of mastery of the following learning outcomes:

1. Describe foundational biology principles at the human physiology level
2. Identify various factors that regulate physiological operations
3. Present human physiology concepts from a quantitative analysis perspective

### **Course Teaching and Learning Activities**

This course will be taught mostly using the synchronous online lecturing format. There will be two online classes every week, to be held on Mondays and Fridays (1pm to 2:20pm Eastern time). The tentative course contents for each week are listed below.

<b>Sept 10 &amp; 13:</b>	Circulation in the human body
<b>Sept 17 &amp; 20:</b>	Physiology of the heart
<b>Sept 24 &amp; 27:</b>	Electrocardiogram and related instrumentation design
<b>Oct 1 &amp; 4:</b>	Respiratory physiology
<b>Oct 8:</b>	Reynolds number and surface tension in physiology
<b>Oct 11 &amp; 15:</b>	<b>No Class – Reading Week</b>

<b>Oct 18:</b>	<u>In-Class Trivia #1</u>
<b>Oct 22 &amp; 25:</b>	Water balance and the kidney
<b>Oct 29, Nov 1:</b>	<u>Webinar Day</u>
<b>Nov 5, 8 &amp; 12:</b>	Diffusion and membrane transport in human physiology
<b>Nov 15 &amp; 19:</b>	ATP hydrolysis, diffusion potential and osmosis
<b>Nov 22 &amp; 26:</b>	Acid-base balance
<b>Nov 29:</b>	<u>In-Class Trivia #2</u>
<b>Dec 2 &amp; 6:</b>	<b>No class – Work on final assignment</b>

### **Grade Breakdown**

In-class discussions                    10%

- Actively answer questions in the weekly in-class questioning period

Post-class reading quiz                10%

- Mini checkpoints that require you to read the relevant textbook sections and answer quiz questions on LEARN
- Due dates: Sept 24, Oct 8, Oct 29, Nov 19

In-class trivia sessions                20%

- Two group practice problem-based tutorials to strengthen your quantitative physiology skills
- Trivia dates: Oct 18, Nov 29

Webinar assignment                    20%

- Work in groups of 3 to deliver a quantitative physiology short class on an assigned topic
- Presentation date: Oct 29 & Nov 1

Final assignment                        40%

- Mix of conceptual problems and literature review tasks
- Due date: Dec 6
- To be announced on Nov 22 (2 weeks before deadline)
- Serve as summative assessment activity for ECE 601