

ECE 601: FOUNDATIONS OF BIOLOGY IN ENGINEERING

Fall 2022

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.

Instructor, Department of Electrical and Computer Engineering

E-mail: billy.yiu@uwaterloo.ca

Office: ██████████

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*. 6th 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 in person. There will be two classes every week, to be held on ██████████. The tentative course contents for each week are listed below.

Sept 7 & 9:	Circulation in the human body
Sept 14 & 16:	Physiology of the heart
Sept 21 & 23:	Electrocardiogram and related instrumentation design
Sept 28 & 30:	Respiratory physiology
Oct 5 & 7:	Reynolds number and surface tension in physiology
Oct 12 & 14:	No Class – Reading Week

Oct 21:	<u>Mid-Term Quiz</u>
Oct 26 & 28:	Water balance and the kidney
Nov 2 & 4:	<u>Webinar Day</u>
Nov 9, 11 & 16:	Diffusion and membrane transport in human physiology
Nov 18 & 23:	ATP hydrolysis, diffusion potential and osmosis
Nov 25 & 30:	Acid-base balance
Dec 2 & 6:	No class – Prepare for Final Exam

Grade Breakdown

In-class discussions	10%
<ul style="list-style-type: none"> Actively answer questions in the weekly in-class questioning period 	
Post-class reading quiz	10%
<ul style="list-style-type: none"> Mini checkpoints that require you to read the relevant textbook sections and answer quiz questions on LEARN Due dates: Sept 23, Oct 7, Nov 11, Nov 30 	
Mid-Term Quiz	20%
<ul style="list-style-type: none"> A Quiz in the form of T/F, MCQ, and short questions Dates: Oct 21 	
Webinar assignment	20%
<ul style="list-style-type: none"> Work in groups of 3 to deliver a quantitative physiology short class on an assigned topic Presentation date: Nov 2 & 4 	
Final Exam	40%
<ul style="list-style-type: none"> Summative assessment of your concepts on foundational knowledge in human biology Date to be determined 	