

# ECE 601: FOUNDATIONS OF BIOLOGY IN ENGINEERING

Fall 2024

## **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 quantitatively.

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**

Hassan Nahas, Ph.D.

Lecturer, Department of Electrical and Computer Engineering

E-mail: [hassan.nahas@uwaterloo.ca](mailto:hassan.nahas@uwaterloo.ca)

Office: EIT-4133 (Email to schedule appointment)

## **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.

## **Textbooks**

Costanzo. *Physiology*. 6 th 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**

There will be lectures every week, to be held on Tuesdays and Thursdays (2:30 pm to 3:50 pm Eastern time) in EIT 3151.

The tentative course contents for each week are listed below.

Week	Topic
Sep 5	Circulation in the human body
Sept 10 & 12	Physiology of the heart
Sept 17 & 19	Electrocardiogram and related instrumentation design
Sept 24 & 26	No Class
Oct 1 & 3	Respiratory physiology
Oct 8 & 10	Reynolds number and surface tension in physiology
Oct 15 & 17	No Class, Reading Week
Oct 22 & 24	Midterm Review, In-Class Midterm Quiz
Oct 29 & 31	Water balance and kidney
Nov 5 & 7	Diffusion and membrane transport in human physiology
Nov 12 & 14	
Nov 19 & 21	ATP hydrolysis, diffusion potential and osmosis,
Nov 26 & 28	Acid-base balance
Dec 3	Review

### **Grade Breakdown**

Component	Description	Value
In-class discussion	Actively answer questions in questioning period at the end of each class.	5%
Assignments	Problem sets based on lecture material. Tentative Due Dates: Sept 29, Nov 8, Dec 1	30%
Midterm Quiz	About lecture material before midterm.	15%
Final Exam	About all lecture material in the semester. Summative assessment.	50%

### **Academic integrity**

In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. [Check the [Office of Academic Integrity](#) for more information.]

### **Grievance**

A student who believes that a decision affecting some aspect of their university life has been unfair or unreasonable may have grounds for initiating a grievance. Read [Policy 70, Student Petitions and Grievances, Section 4](#). When in doubt, please be certain to contact the department's administrative assistant who will provide further assistance.

## **Discipline**

A student is expected to know what constitutes academic integrity to avoid committing an academic offence, and to take responsibility for their actions. [Check the [Office of Academic Integrity](#) for more information.] A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) or about “rules” for group work/collaboration should seek guidance from the course instructor, academic advisor, or the undergraduate associate dean. For information on categories of offences and types of penalties, students should refer [to Policy 71, Student Discipline](#). For typical penalties, check [Guidelines for the Assessment of Penalties](#).

## **Appeals**

A decision made or penalty imposed under [Policy 70, Student Petitions and Grievances](#) (other than a petition) or [Policy 71, Student Discipline](#) may be appealed if there is a ground. A student who believes they have a ground for an appeal should refer to [Policy 72, Student Appeals](#).

## **Note for Students with Disabilities**

[AccessAbility Services](#), located in Needles Hall, Room 1401, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with AccessAbility Services at the beginning of each academic term.

## **Turnitin.com**

Text matching software (Turnitin®) may be used to screen assignments in this course. Turnitin® is used to verify that all materials and sources in assignments are documented. Students' submissions are stored on a U.S. server, therefore students must be given an alternative (e.g., scaffolded assignment or annotated bibliography), if they are concerned about their privacy and/or security. Students will be given due notice, in the first week of the term and/or at the time assignment details are provided, about arrangements and alternatives for the use of Turnitin in this course.

It is the responsibility of the student to notify the instructor if they, in the first week of term or at the time assignment details are provided, wish to submit alternate assignment.