BME350H1 – Biomedical Systems Engineering I: Organ Systems 2022

I CONTACT INFORMATION

INSTRUCTOR

Dawn Kilkenny
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Office hours: By appointment only

TEACHING ASSISTANTS

Labs 1 & 2:
Karly Franz
karly.franz@mail.utoronto.ca

IBME TEACHING LAB COORDINATOR
Gary Hoang

Labs 3 & 4:
Soheila Shokrollahzade
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BIOMEDICAL SYSTEMS MAJOR CHAIR

Rodrigo Fernandez-Gonzalez
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ENGSCI YEAR 3 & 4 ADVISOR

Brendan Heath
engsci34@utoronto.ca
Office hours: 9:00 am – 4:30 pm

II COURSE OVERVIEW

COURSE DESCRIPTION

We will examine multiple organ systems in the human body of significant interest to Biomedical Engineers. This will include the endocrine and nervous communication systems, cardiovascular system, respiratory system and renal system, among others. We will discuss the structures and mechanisms responsible for proper function of these complex systems, with reference to the disease state. The integration of different organ systems will be stressed, with specific focus on the structure-function relationship. Application of biomedical engineering technologies in maintaining system homeostasis will also be referenced.

COURSE LEARNING OUTCOMES

Upon completion of this course, you will:

a. understand the complementary nature of physiology and anatomy
b. predict physiological function based on the structure/function relationship
c. appreciate the complexity and effectiveness of organ systems in maintaining homeostasis
d. discuss biomedical engineering strategies for maintenance of normal physiological function

GRADUATE ATTRIBUTES

As a course within a program at an accredited Canadian engineering institution (Engineering Science Biomedical Systems Engineering Major) and in accordance with the Washington Accord, BME350H1 fulfils requirements that meet the graduate attribute of ***Knowledge Base for Engineering***. The specific outcomes include:

i) Demonstration of competence in Natural Science
ii) Demonstration of competence in specialized engineering knowledge appropriate to the BMS program

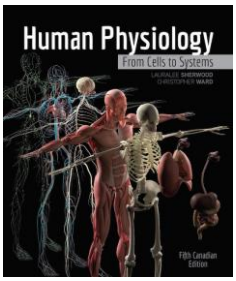
COURSE REQUISITES

This course assumes you have a basic understanding of human biology and are familiar with biological vocabulary.

Prerequisite: BME205H1 Corequisite: BME395H1

TEXT RESOURCES

The following textbook is used by the instructor. This textbook is not required; however, this version or an earlier version is recommended as a supporting resource. Readings from this text will be identified for all topics of discussion.



Human Physiology From Cells to Systems
Lauralee Sherwood & Christopher Ward
5th Canadian Edition (shown left)
Hardcopy ISBN: 978-0-17-691235-2
Digital Platform ISBN: 978-0-17-691238-3
Nelson © 2022

Supplemental readings: The instructor & TAs may provide supporting documentation such as published literature, related to lecture topics, tutorials and/or labs.

III HOW THE COURSE IS ORGANIZED

The BME350H1 Course Schedule is organized such that one organ system will be discussed each week. Lectures will be supported by discussion-based tutorials and laboratory practical sessions with companion tutorials. Several tutorials will provide lab introductions and post-lab discussions; there will also be several case studies included in the tutorial curriculum. All course components will occur in-person as scheduled by the Registrar's Office.

There are four (4) practical lab sessions in this course; please consult the Course Schedule on Quercus for relevant dates. These labs have been designed to allow you opportunity to interact with relevant biomedical instrumentation, engage in biosignal data collection and analysis, and discuss how biosignal changes reflect organ system physiological responses. Labs 1 & 2 will be led by Karly in the IBME Design Studio (MB78) and will be supported by companion tutorials in MatLab coding and signal analysis. Labs 3 & 4 will be led by Soheila & Evan in the IBME UG Teaching Laboratory (MB325; one TA per section). Passing completion of Laboratory Safety Training is required to participate in BME350H1 labs.

Prof. Kilkenny's slidedecks will be made available as PDFs on the Quercus course site. Familiarizing yourself with content in advance of relevant sessions will make discussions more fruitful and reinforce your learning.

IV EVALUATION/GRADING SCHEME (Mandatory deliverables)

MARK DISTRIBUTION

Deliverable	Number	Collective Weight
Lab sessions (incl. 10 associated tutorials)	4	30%
Tests	2	30%
Final Assessment	1	40%
		100%

SPECIFIC DELIVERABLE INFORMATION

- **Laboratory & tutorial practical sessions**:
    - Four (4) sessions:
        - Lab 1 EMG Reflex
        - Lab 2 Cardiorespiratory Response
        - Lab 3 Measuring Urea Concentration to Discern Renal Function
        - Lab 4 Red Blood Cell Typing

- Every lab will be preceded by an introductory tutorial
- Every lab will be followed by a post-lab discussion tutorial
- Lab 1 will include other supporting tutorial sessions
- Tutorials will include pre-lab quizzes and exit quizzes, as appropriate
- Assessments also include participation, teamwork, and safe lab practice

- **Tests**:
  - Two (2) in-person tests (Oct. 5th and Nov. 2nd)
  - Scheduled during tutorial timeslots
  - One (1) hour will be available to complete each test
  - Tested material NOT cumulative

- **Final summative assessment**
  - Date TBD by Registrar's Office
  - Cumulative in-person examination

Note: *if an unexpected technical issue occurs with a university system (e.g., Portal services, network outage) that affects availability or functionality of course materials, instrumentation, and/or facility access, it may be necessary to revise the timing or weighting of these deliverables.*

V COURSE POLICIES

COMMUNICATING WITH THE INSTRUCTORS

Please use email to communicate with Prof. Kilkenny or your TAs. Responses can be expected within 24 hr Monday - Friday or 48 hr on weekends. Please DO NOT email the laboratory coordinator.

General questions should be posted to the course Quercus Discussion Board.

CLASS ETIQUETTE

BME350H1 is a safe space. Whether in-person or online, please respect the comments of, and interactions with, others.

We must each take responsibility for the impact that our language, actions, and interactions have on others. The Faculty of Engineering denounces discrimination, harassment, and unwelcoming behaviour in any form. You have rights under the Ontario Human Rights Code. If you experience or witness any form of harassment or discrimination, including but not limited to acts of racism, sexism, Islamophobia, anti-Semitism, homophobia, transphobia, ableism, and/or ageism, please tell someone as Engineering takes these reports extremely seriously. You can talk to anyone you feel comfortable approaching, including course professors or TAs, the EngSci BMS academic

advisor, our Assistant Dean, Diversity, Inclusion and Professionalism, the Engineering Equity Diversity & Inclusion Action Group, any staff member or a U of T Equity Office.

COVID-19 ETIQUETTE

Please comply with UofT recommendations regarding entry to campus teaching spaces. Recognize that while there is not a mask mandate currently in place, there are individuals in our community that prefer to remain masked. Please be respectful of others. Failure to comply with evolving UofT policy may result in cancellation of BME350H1 course activities.

ONLINE ETIQUETTE

Review discussion threads in Quercus before posting your own questions or comments to avoid redundancy. Ensure your comments are constructive when providing feedback to classmates. Consider whether your comment is appropriate to share with the entire class; it may be more effective to connect with a specific TA or the course instructor directly.

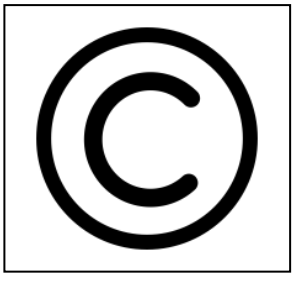
COURSE SUBMISSION DEADLINES

Deadlines for course deliverables are to be respected. Late submissions will not be accepted without due cause. No additional time will be provided if you arrive late to write a scheduled test or exam. Should you have a medical issue or emergency, please contact Prof. Kilkenny as soon as possible given that a Term Work Petition may be required.

VI INSTITUTIONAL POLICIES AND SUPPORT

ACADEMIC INTEGRITY

Academic integrity is essential to our pursuit of learning and scholarship, and to ensuring that your individual academic achievement. As a result, the University treats cases of cheating and plagiarism very seriously. The University of Toronto's Code of Behaviour on Academic Matters outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences.



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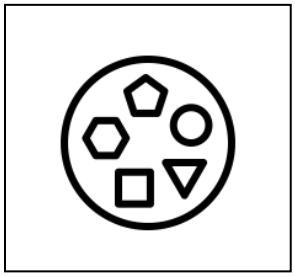
ACCESSIBILITY NEEDS
The University of Toronto is committed to accessibility. If you require accommodations for a disability, or have any accessibility concerns about this course, teaching spaces or course materials, please contact Accessibility Services as soon as possible.



INCLUSIVITY - You belong at UofT!
The University of Toronto commits to all students, faculty, and staff that you can learn, work, and create in a welcoming, respectful, and inclusive environmentBME350H1 encourages diverse perspectives because this is how we will innovate and improve our collective academic success.

Remember that you are not alone. Find a comprehensive list of clubs and groups that support people who identify in many diverse ways. Working together, we can all achieve our full potential.

MENTAL HEALTH SUPPORT
As a university student, you may experience a range of health challenges that could result in significant barriers to achieving your personal and academic goals. The University of Toronto and the Faculty of Applied Science & Engineering offer a wide range of free and confidential services that can assist you during these times.

As a U of T Engineering student, you have an Academic Advisor (Brendan Heath) who can support you by advising on personal matters that impact your academics. Other resources that you may find helpful are listed on the U of T Engineering Mental Health & Wellness webpage, and a small selection are also included here:

- Graduate Engineering Council of Students' Mental Wellness Commission
- Health & Wellness and the On-Location Health & Wellness Engineering Counsellor
- SKULE Mental Wellness
- U of T Engineering Learning Strategist and Academic Success
- Registrar's Office
- Scholarships & Financial Aid Office & Advisor

If you find yourself feeling distressed and in need of more immediate support resources, consider reaching out to the counsellors at My Student Support Program (MySSP) or visiting the Feeling Distressed webpage.

OTHER SERVICES & SUPPORT FOR STUDENT SUCCESS

The following are other relevant links to help you with academic and/or technical service and support:

- General student services and resources at Student Life
- Full library service through University of Toronto Libraries
- Resources on conducting online research through University Libraries Research
- Resources on academic support from the Academic Success Centre
- Learner support at the Writing Centre
- Information about Accessibility Services
- Engineering Learning Strategist
- Information for Technical Support/Quercus Support (Portal Info)

Icons from thenounproject.com