Toronto Metropolitan University

Department of Electrical, Computer, & Biomedical Engineering
Faculty of Engineering & Architectural Science

Course Outline (W2024)

BME100: Introduction to Biomedical Engineering

Instructor(s)	Dr. Victor Yang [Coordinator] Office: EPH400Q Phone: (416) 979-5000 x 552143 Email: yangv@torontomu.ca Office Hours: TBA Tues after lecture
Calendar Description	This course will deal with the terminology of the medical profession; anatomy and physiology of the human body, from overall system and functional approaches; survey of present-day medical measurements and consideration of those areas in which engineering may be applied advantageously to medicine. The course will also include seminars from guest speakers from biomedical profession. Exposure to medical equipment in hospitals, and small animal handling training will also be provided. Bioethics will also be covered in the course. This course is graded on a pass/fail basis.
Prerequisites	None
Antirequisites	None
Corerequisites	None
Compulsory Text(s):	1. None
Reference Text(s):	1. "Introduction to Biomedical Engineering", Second Edition by John Enderle, Susan M. Blanchard, Joseph Bronzino
Learning Objectives (Indicators)	At the end of this course, the successful student will be able to: 1. Students will be able to improve their knowledge base for natural sciences through research for the project. Further, the in-class quizzes provide students with terminologies to help them recognize and describe terminologies and concepts related to chemistry, biology, etc. (**1a**) 2. Students will be able to improve their knowledge base for engineering fundamentals through research for the project. The project should present an engineering solution for a medical problem. Further, the in-class quizzes provide students with terminologies that recalls principles and theories in engineering fundamentals such as Newton's laws, mass law, etc. (**1c**) 3. Students will, by the end of the course, recognize medical terminologies that helps them converse with scientists, physicians and engineers. This aims to prepare the students for the medical and biology related courses in the 2nd year of their studies. (**1d**) 4. Demonstrate the ability to work in a team and quantify individual and group project contributions. (**6a**) 5. For the project report, students must select a topic that is current and developing. The topics selected are evaluated for their relevance to the public interest. (**8b**)

	6. The project report must be based on a current biomedical problem. The results of the project should explain the impact of the project on environment. (**9a**) 7. Demonstrate knowledge of the ethical principles in general or in application of knowledge, results of research, or creative expression. (**10a**) 8. Demonstrate the significance of time management in group work. (**11b**) 9. Ability to use google scholar to obtain peer-reviewed journal articles and books. (**12a**) **NOTE:***Numbers in parentheses refer to the graduate attributes required by the Canadian Engineering Accreditation Board (CEAB).*
Course Organization	1.0 hours of lecture per week for 13 weeks 1.0 hours of lab per week for 12 weeks 0.0 hours of tutorial per week for 12 weeks
Teaching Assistants	TBA
Course Evaluation	**Theory** Lecture and Lab/Tutorial Participation 40 % **Laboratory** Project Report (Written): 35 % Project Presentation (Oral): 15 % Project Slide Deck (Poster): 10 % TOTAL: 100 % **Note:** In order for a student to pass a course, a minimum overall course mark of 50% must be obtained. In addition, for courses that have both **"Theory and Laboratory"** components, the student must pass the Laboratory and Theory portions separately by achieving a minimum of 50% in the combined Laboratory components and 50% in the combined Theory components. Please refer to the **"Course Evaluation"** section above for details on the Theory and Laboratory components (if applicable).
Examinations	No Exams.
Other Evaluation Information	To pass the course, a student must achieve a minimum overall grade of 50%. Attendance is mandatory. The Participation grade, like the class, is an all-or-nothing component. If the student is found to be absent during any class or lab, with no valid medical note, he/she will receive 0% for the Participation grade. Note that BME100 is a pass-fail course.
Other Information	None

Course Content

Week	Hours	Chapters / Section	Topic, description
1	1		Introduction (Instructor Bio Course outline Project requirements and fundamental background)
2-4	3		Anatomy and Physiology - Introduction to human Anatomy and Physiology - Examples of neuroanatomy and brain function - Computed Tomography (CT) and Magnetic Resonance Imaging (MRI). - Ethics and Health Canada - Introduction to ethics in clinical trials, REB, and Health Canada ITA
5-6	2		Introduction to Biomechanics - Examples of vascular system, bleeding, and Health Canada Special Access Program with Doppler high frequency ultrasound of imaging blood flow in tumor during surgery - Examples of historical and modern electrocautery with plasma interaction with biological tissue
7-8	2		Tissue Microstructure and Histology - Introduction to histology, pathology, and microscopy - Modern optical imaging and laser interaction with biological tissue - Application in brain tumor treatment
9	1		Computer Assisted Surgery - Surgical navigation using near infrared and other tracking technologies - Examples spine surgery and brain surgery
10	1		Introduction to Medical Robotics - Robotic assisted surgeries and procedures - Rehabilitation robotics (example: spinal cord injury)
11	1		Amplifiers, Signal Acquisition, and Intravascular Cardiac Imaging - Coronary artery disease and intravascular imaging - Transimpedence amplifier, signal acquisition, and sampling
12	1		Introduction to Biomaterials - Clinical applications of Biomaterials - Conductive polymers in Biomedical Engineering

13	1		Stents, stent delivery device, and aneurysm repair - Mechanical thrombectomy for stroke treatment - Stent and aneurysm repair

Laboratory(L)/Tutorials(T)/Activity(A) Schedule

Week	L/T/A	Description
1-2	How to conduct a literature review	Introduction to literature review Instructions on how to complete the project report Q&A session
3-10	In-class project discussion	Finalize the groups formation Brainstorm for the proposal, idea generation Group work to complete the project
11-12	Project presentation	Each group must present the findings of their project in lab sessions

University Policies & Important Information

Students are reminded that they are required to adhere to all relevant university policies found in their online course shell in D2L and/or on the Senate website

Refer to the Departmental FAQ page for furhter information on common questions.

Important Resources Available at Toronto Metropolitan University

- The Library provides research workshops and individual assistance. If the University is open, there is a Research Help desk on the second floor of the library, or students can use the Library's virtual research help service to speak with a librarian.
- Student Life and Learning Support offers group-based and individual help with writing, math, study skills, and transition support, as well as resources and checklists to support students as online learners.

- You can submit an Academic Consideration Request when an extenuating circumstance has occurred that has significantly impacted your ability to fulfill an academic requirement. You may always visit the Senate website and select the blue radio button on the top right hand side entitled: **Academic Consideration Request (ACR)** to submit this request.

  For Extenuating Circumstances, Policy 167: Academic Consideration allows for a once per semester ACR request without supporting documentation if the absence is less than 3 days in duration and is not for a final exam/final assessment. Absences

more than 3 days in duration and those that involve a final exam/final assessment, require documentation. Students must notify their instructor once a request for academic consideration is submitted. See Senate Policy 167: Academic Consideration.

- If a student is requesting accommodation due to a religious, Aboriginal and/or spiritual observance, they must submit their request via the online Academic Consideration Request (ACR) system **within the first two weeks of the class or, for a final examination, within two weeks of the posting of the examination schedule**. If the required absence occurs within the first two weeks of classes, or the dates are not known well in advance as they are linked to other conditions, these requests should be submitted with as much lead time as possible in advance of the required absence.

- If taking a remote course, familiarize yourself with the tools you will need to use for remote learning. The Remote Learning Guide for students includes guides to completing quizzes or exams in D2L Brightspace, with or without Respondus LockDown Browser and Monitor, using D2L Brightspace, joining online meetings or lectures, and collaborating with the Google Suite.
- Information on Copyright for Faculty and students.

Accessibility

- Similar to an accessibility statement, use this section to describe your commitment to making this course accessible to students with disabilities. Improving the accessibility of your course helps minimize the need for accommodation.
- Outline any technologies used in this course and any known accessibility features or barriers (if applicable).
- Describe how a student should contact you if they discover an accessibility barrier with any course materials or technologies.

Academic Accommodation Support

Academic Accommodation Support (AAS) is the university's disability services office. AAS works directly with incoming and returning students looking for help with their academic accommodations. AAS works with any student who requires academic accommodation regardless of program or course load.

- Learn more about Academic Accommodation Support.
- Learn how to register with AAS.

Academic Accommodations (for students with disabilities) and Academic Consideration (for students faced with extenuating circumstances that can include short-term health issues) are governed by two different university policies. Learn more about Academic Accommodations versus Academic Consideration and how to access each.

Wellbeing Support

At Toronto Metropolitan University, we recognize that things can come up throughout the term that may interfere with a student's ability to succeed in their coursework. These circumstances are outside of one's control and can have a serious impact on physical and mental well-being. Seeking help can be a challenge, especially in those times of crisis.

If you are experiencing a mental health crisis, please call 911 and go to the nearest hospital emergency room. You can also access these outside resources at anytime:

- **Distress Line:**24/7 line for if you are in crisis, feeling suicidal or in need of emotional support (phone: 416-408-4357)
- **Good2Talk:**24/7-hour line for postsecondary students (phone: 1-866-925-5454)
- **Keep.meSAFE:** 24/7 access to confidential support through counsellors via My SSP app or 1-844-451-9700

If non-crisis support is needed, you can access these campus resources:

- **Centre for Student Development and Counselling:** 416-979-5195 or email csdc@torontomu.ca
- **Consent Comes First - Office of Sexual Violence Support and Education:** 416-919-5000 ext 3596 or email osvse@torontomu.ca
- **Medical Centre:** call (416) 979-5070 to book an appointment

We encourage all Toronto Metropolitan University community members to access available resources to ensure support is reachable. You can find more resources available through the Toronto Metropolitan University Mental Health and Wellbeing website.