Schulich MEDICINE & DENTISTRY | Western Science

Bachelor of Medical Sciences (BMSc) Program

Department of Medical Biophysics
MEDBIO 4455A: Biological Control Systems

Course Syllabus for Fall 2024

THRIVE together

Western University is committed to a **thriving campus**; therefore, your health and wellness matter to us! The following link provides information about the resources available on and off campus to support students: https://www.uwo.ca/health/ Your course coordinator can also **guide you** to resources and/or services should you need them.

1. Technical Requirements:

Laptop with MATLAB installed

Working microphone (to attend remote office hours)

Working webcam (to attend remote office hours)

2. Important Dates:

Classes Begin	Reading Week	Classes End	Study day(s)	Exam Period
September 5	October 12–20	December 6	December 7–8	December 9–22

September 30, 2024, is National Day for Truth and Reconciliation and is a non-instructional day
December 2, 2024: Last day to withdraw from a first-term half course without academic penalty

3. Contact Information

Course Coordinator	Contact Information

Teaching Assistant	Contact Information

4. Course Description and Design

Delivery Mode: In person

An introduction to linear systems and control theory as applied to organ system regulation and adaptation. Emphasis is placed on biophysical models of the cardiovascular and respiratory systems and interactions of those systems with medical devices.

Antirequisite: ECE 4455A/B.

Prerequisite(s): MEDBIO 3501F and MEDBIO 3505F, or permission of the department.

Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

Timetabled Sessions

Component	Date(s)	Time and Location
Lecture		

☑ Attendance at all class sessions is expected.

All course material will be posted to OWL: https://westernu.brightspace.com/d2l/login. Any changes will be indicated on the OWL site and discussed with the class.

If students need assistance, they can seek support on the OWL Brightspace Help. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

Current versions of all popular browsers (e.g., Safari, Chrome, Edge, Firefox) are supported with OWL Brightspace. Update your browser frequently to ensure it is current. All JavaScript and cookies should be enabled.

5. Learning Outcomes

Upon successful completion of this course, students will be able to:

- Explain the physiological and biophysical basis of biomedical systems models and analyze those models using concepts from systems analysis and control theory.
- Demonstrate the use of biomedical systems models to inform the design of medical devices.
- Employ software tools to investigate the dynamic behaviour of biomedical systems.
- Investigate and critique hypotheses, modeling approaches, and conclusions presented in primary-source biomedical engineering and medical physiology literature.
- Identify and analyze ethical issues arising from allocation of scarce medical resources and from use of biomedical models to make decisions about public health or safety concerns.

6. Course Content and Schedule

Week	Dates	Topic
1		Introduction to Biomedical Modeling
2		
2, cont.		Cardiac Electrophysiology and Implantable Cardioverter Defibrillators
3		
4		
5		
5, cont.		Cardiovascular Mechanics and Left Ventricular Assist Devices
6		
7		*Thanksgiving and Reading Week*
8		Cardiovascular Mechanics and Left Ventricular Assist Devices, continued
9		
9, cont.		Respiratory Mechanics and Mechanical Ventilation
10		
11		
12		
12, cont.		Respiratory Regulation and Prevention of Unstable Periodic Breathing
13		
14		

7. Participation and Engagement

- ☑ Students are expected to engage with the course content as much as possible, including reading assigned case studies and journal articles before the deadlines recommended on the course OWL site and completing advance preparation for in-class MATLAB investigations and ethics discussions as directed on the OWL site.
- ☑ Students can participate by contributing to ethics discussions on Oct. 2 and Nov. 19.
- ☑ Students can participate by working collaboratively with their classmates during MATLAB investigation sessions. A schedule of these sessions will be posted on OWL.

8. Assessment and Evaluation

Below is the evaluation breakdown for the course. Any deviations will be communicated.

Assessment	Format	Weighting	Due Date(s)	Flexibility
Homework (3)	Mixed format	35%		72 hour no late penalty
Quizzes (4)	Multiple choice	20%		Not applicable
Minute Papers (2)	Written	5%		Not applicable
Final Project	Mixed format	40%		Not applicable

Designated Assessment: Instructors are permitted to designate one assessment per course per term as requiring supporting documentation to receive academic consideration. See below for information on academic consideration policy and missed course work. For this course, the following assessment has been designated as requiring supporting documentation:

- Final Project

Information about flexibility in assessment

- ☑ Flexibility in assessment has been applied to this course; therefore, academic consideration requests may be denied on the assessments where flexibility is included
- ☑ This course employs flexible deadlines for **homework assignments**. The assignment deadlines can be found above in the course outline. For each assignment, students are expected to submit the assignment by the deadline listed. Should illness or extenuating circumstances arise, students are permitted to submit their assignment up to 72 hours past the deadline without a late penalty. Homework assignments submitted beyond 72 hours past the deadline without academic consideration will not be accepted unless alternate arrangements are agreed to *in advance* by the instructor. Requests for academic consideration supported by documentation must be submitted within 48 hours of the original deadline. The instructor reserves the right to deny such academic considerations, given the deadline flexibility provided. If you have a long-term academic consideration or an accommodation for disability that allows greater flexibility than provided here, please reach out to your instructor at least one week prior to the posted deadline.

General information about assessments

- ☑ All assignments are due at 11:59 pm Eastern time unless otherwise specified
- ☑ Students are responsible for ensuring that the correct file version is uploaded; incorrect submissions including corrupt files could be subject to a mark of 0.
- ☑ A student might not receive the same grade as their group members if it is determined that the distribution of work was not equal.
- ☑ After an assessment is returned, students should wait 24 hours to digest feedback before contacting their evaluator; to ensure a timely response, reach out within 7 days.
- ☑ Any grade appeals on homework assignments, quizzes, or minute papers must be received within 3 weeks of the grade being posted.

Click here for a detailed and comprehensive set of policies and regulations concerning examinations and grading. The table below outlines the University-wide grade descriptors.

A+	90-100	One could scarcely expect better from a student at this level
A	80-89	Superior work which is clearly above average
B	70-79	Good work, meeting all requirements, and eminently satisfactory
C	60-69	Competent work, meeting requirements
D	50-59	Fair work, minimally acceptable
F	below 50	Fail

Information about late or missed assessments:

- ☑ Homework assignments will be accepted without penalty until the end of a grace period lasting 24 hours after the posted due date.
- ☑ The OWL quiz tool will not permit late submission of quizzes.
- ☑ Minute papers will be completed during class sessions and must be submitted at the end of that class period. Late submissions of minute papers will not be accepted.
- ☑ If a student submits an absence self-report or receives an accommodation for a missed quiz or minute paper, the weight of that assessment will be transferred to the final project.

INC (Incomplete Standing): If a student has been approved by the Academic Advising Office (in consultation with the instructor/department) to complete term work at a later date, an INC will be assigned. Students with INC will have their course load in subsequent terms reduced to allow them to complete outstanding course work. Students may request permission from Academic Advising to carry a full course load for the term the incomplete course work is scheduled.

9. Communication

- ☑ Students should check the course OWL Brightspace site every 24-48 hours
- ☑ Students should email their instructor and teaching assistant using their uwo e-mail addresses.
- ☑ Emails will be monitored daily; students will receive a response in 24-48 hours.

10. Office Hours

- ☑ Office hours will be held hybrid format (*i.e.*, in person in ACEB 2405 and remotely using Zoom).
- ☑ Office hours will be held Thursdays, 3:00-4:00 pm, beginning September 12.
- ☑ Office hours will be drop-in format.
- ☑ Office hours may be used for individual or small-group consultations.

11. Resources

- ☑ All resources, including required and recommended reading and MATLAB scripts for systems models will be posted in OWL Brightspace
- ☑ There is no required textbook or study guide.

12. Professionalism & Privacy

Western students are expected to follow the Student Code of Conduct. Additionally, the following expectations and professional conduct apply to this course:

- ☑ All course materials created by the instructor(s) are copyrighted and cannot be sold/shared (e.g., Must Knows Facebook group, Course Hero, Chegg, etc.).
- ☑ Recordings are not permitted (audio or video) without explicit permission.
- ☑ Permitted recordings are not to be distributed.
- ☑ Students will be expected to take an academic integrity pledge before some assessments.

Western is committed to providing a learning and working environment that is free of harassment and discrimination. All **students**, staff, and faculty have a role in this commitment and have a responsibility to ensure and promote a safe and respectful learning and working environment. Relevant policies include Western's Non-Discrimination/Harassment Policy (M.A.P.P. 1.35) and Non-Discrimination/Harassment Policy – Administrative Procedures (M.A.P.P. 1.35). Any **student,** staff, or faculty member who experiences or witnesses' behaviour that may be harassment or discrimination **must report the behaviour** to the Western's Human Rights Office. Harassment and discrimination can be human rights-based, which is also known as EDI-based, (sexism, racism, transphobia, homophobia, islamophobia, xenophobia, antisemitism, and ableism) or non-human rights-based (personal harassment or workplace harassment).

13. How to Be Successful in this Class

Students enrolled in this class should understand the level of autonomy and self-discipline required to be successful.

1. Invest in a planner or application to keep track of your courses. Populate all your deadlines at the start of the term and schedule your time throughout the course.
2. Make it a daily habit to log onto OWL Brightspace to ensure you have seen everything posted to help you succeed in this class.
3. Follow checklists created on OWL Brightspace or create your own to help you stay on track.
4. Take notes during lectures and class discussions. Keeping handwritten notes or notes in a Word or PDF document will help you learn more effectively.
5. Connect with others. Try forming an online study group and try meeting on a weekly basis for study and peer support.
6. Do not be afraid to ask questions. If you are struggling with a topic, contact your instructor and/or

teaching assistant.

14. Western Academic Policies and Statements

A. Absence from Course Commitments

Students must familiarize themselves with the Policy on Academic Consideration – Undergraduate Students in First Entry Programs

Students missing course work for medical, compassionate, or extenuating circumstances can request academic consideration by completing a request at the central academic consideration portal. Students are permitted one academic consideration request per course per term **without** supporting documentation. Note that supporting documentation is **always** required for academic consideration requests for examinations scheduled by the office of the registrar (e.g., December and April exams) and for practical laboratory and performance tests (typically scheduled during the last week of the term).

Students should also note that the instructor may **designate** one assessment per course per term that requires supporting documentation. This designated assessment is described elsewhere in this document. Academic consideration requests may be denied when flexibility in assessment has already been included. Examples of flexibility in assessment include when there are assessments not required for calculation of the final grade (e.g. 8 out of 10 quizzes) or there is flexibility in the submission timeframe (e.g. 72 hour no late penalty period).

Please note that any academic considerations granted in this course will be determined by the instructor of this course, in consultation with the academic advisors in your Faculty of Registration, in accordance with information presented in this course syllabus. Supporting documentation for academic considerations for absences due to illness should use the Student Medical Certificate or, where that is not possible, equivalent documentation by a health care practitioner.

Accommodation for Religious Holidays

Students should review the policy for Accommodation for Religious Holidays. Where a student will be unable to write examinations and term tests due to a conflicting religious holiday, they should inform their instructors as soon as possible but not later than two weeks prior to writing the examination/term test. In the case of conflict with a midterm test, students should inform their instructor as soon as possible but not later than one week prior to the midterm.

Special Examinations

A Special Examination is any examination other than the regular examination, and it may be offered only with the permission of the Dean of the Faculty in which the student is registered, in consultation with the instructor and Department Chair. Permission to write a Special Examination may be given on the basis of compassionate or medical grounds with appropriate supporting documents. To provide an opportunity for students to recover from the circumstances resulting in a Special Examination, the University has implemented Special Examinations dates. These dates as well as other important information about examinations and academic standing can be found here.

B. Academic Offenses

Scholastic offences are taken seriously, and students are directed here to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence.

Computer-marked multiple-choice tests and/or exams may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.

C. Accessibility Statement

Please contact the course instructor if you require material in an alternate format or if you require any other arrangements to make this course more accessible to you. You may also wish to contact Accessible Education (AE) at 661-2111 x 82147 for any specific question regarding an accommodation or review The policy on Accommodation for Students with Disabilities

D. Correspondence Statement

The centrally administered **e-mail account** provided to students will be considered the individual's official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at his/her official university address is attended to in a timely manner. You can read about the privacy and security of the UWO email accounts here.

E. Discovery Credit Statement

Students are permitted to designate up to 1.0 Discovery Credit course (or equivalent) for pass/fail grading that can be counted toward the overall course credits required for their degree program. The details of this policy and the deadlines can be found here.

15. BMSUE Academic Policies and Statements

Cell Phone and Electronic Device Policy (for in-person tests and exams)

The Schulich School of Medicine & Dentistry is committed to ensuring that testing and evaluation are undertaken fairly across all our departments and programs. For all tests and exams, it is the policy of the School that any electronic devices, e.g., cell phones, tablets, cameras, smart glasses, smart watch or iPod are strictly prohibited. These devices MUST be left either at home or with the student's bag/jacket at the front of the room and MUST NOT be at the test/exam desk or in the individual's pocket. Any student found with one of these prohibited devices will receive a grade of zero on the test or exam. Non-programmable calculators are only allowed when indicated by the instructor. The program is not responsible for stolen/lost or broken devices.

Copyright and Audio/Video Recording Statement

Course material produced by faculty is copyrighted and to reproduce this material for any purposes other than your own educational use contravenes Canadian Copyright Laws. You must always ask permission to record another individual and you should never share or distribute recordings.

Rounding of Marks Statement

Across the Basic Medical Sciences Undergraduate Education programs, we strive to maintain high standards that reflect the effort that both students and faculty put into the teaching and learning experience during this course. All students will be treated equally and evaluated based only on their actual achievement. ***Final grades*** on this course, irrespective of the number of decimal places used in marking individual assignments and tests, will be calculated to one decimal place and rounded to the nearest integer, e.g., 74.45 becomes 74, and 74.50 becomes 75. Marks WILL NOT be bumped to the next grade or GPA, e.g., a 79 will NOT be bumped up to an 80, an 84 WILL NOT be bumped up to an 85, etc. The mark attained is the mark you achieved, and the mark assigned; requests for mark "bumping" will be denied.

Statement on the use of Generative Artificial Intelligence (AI) Platforms

The use of generative artificial intelligence (GenAI) tools will not be discouraged in course taught in the Faculty of Engineering, including ECE/MEDBIO 4455A/B. As we pride ourselves on building the future, we cannot hide from the use of GenAI tools to contribute to the understanding of course materials. However, the use of GenAI tools in any assignment or contribution during the course will have to be disclosed as a resource.

GenAI tools use will not be permitted in any type of examination or other assessments where the faculty have prohibited their use. If use of GenAI tools is detected by the instructor in these instances, academic offences penalties might be imposed against the student.

16. Support Services

- Students who are in emotional/mental distress should refer to Mental Health @Western Health https://www.uwo.ca/health/ for a complete list of options about how to obtain help.
- To connect with a case manager or set up an appointment, please contact support@uwo.ca.
- Other important links:
    - Academic Advising (Science and Basic Medical Sciences)
    - Appeal Procedures
    - Registrarial Services
    - Student Development Services
    - Student Health Services

Statement on Gender-Based and Sexual Violence

Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced sexual or gender-based violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts at:

https://www.uwo.ca/health/student_support/survivor_support/get-help.html.