1. Course Information

Medical Biophysics 4455B:
Biological Control Systems
Winter Term 2017

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, respiratory, and neuromuscular systems and interactions of those systems with medical devices.

Antirequisite: Electrical & Computer Engineering 4455B.

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

Extra Information: 3 lecture hours, 0.5 course.

Lectures:
Mondays 10:30 – 11:20 am SEB 1056
Wednesdays 10:30 – 11:20 am SEB 1056
Fridays 10:30 – 11:20 am SEB 1056

Senate regulation regarding the student’s responsibility regarding requisites:

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.

2. Instructor Information

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<tr>
<th>Instructor</th>
<th>Email</th>
<th>Office</th>
<th>Phone</th>
<th>Office Hours</th>
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<tbody>
<tr>
<td>Dr. James Lacefield</td>
<td><a href="mailto:jlacefie@uwo.ca">jlacefie@uwo.ca</a></td>
<td>CMLP 1333</td>
<td>84303</td>
<td>To be announced</td>
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Dr. James Lacefield (Course Coordinator)

The instructor will also be available for additional consultation by appointment or via e-mail.

3. Course Materials

No required textbook. Recommended references will be placed on reserve at Taylor Library or distributed electronically via OWL.

Course web site: [https://owl.uwo.ca/portal](https://owl.uwo.ca/portal) (OWL).
4. Evaluation:

<table>
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<th>Component</th>
<th>% of Final Mark</th>
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<tr>
<td>Assignments (Maximum 5 assignments)</td>
<td>50</td>
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<td>Final exam (Date TBA, limited open book, 3 hours)</td>
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To obtain a passing grade in the course an average mark of 50% or more must be achieved on the homework as well as a mark of 50% or more on the final examination. A homework average or final examination mark < 50% will result in a final course grade of 48% or less.

Homework assignments must be submitted electronically to the course OWL site.

5. Course Syllabus

LEARNING OBJECTIVES – Students will be able to:

(i) Explain the physiological and biophysical basis of biomedical systems models and analyze those models using concepts from systems analysis and control theory.

(ii) Demonstrate the use of biomedical systems models to inform the design of medical devices.

(iii) Employ software tools to understand the dynamic behaviour of mathematically complicated biomedical systems models.

(iv) Independently investigate and critique hypotheses and conclusions presented in primary source biomedical engineering and physiology literature.

(v) Identify ethical issues arising from development of medical technology and use of biomedical models to make decisions about public health or safety concerns.

TOPICS:

1. Cardiac electrophysiology and implantable cardioverter defibrillators
2. Cardiovascular mechanics and left ventricular assist devices
3. Respiratory mechanics and noninvasive mechanical ventilation
4. Respiratory regulation and diagnosis of unstable periodic breathing
5. Neuromuscular control and upper-limb neural prosthetics

6. Additional Information/Statements

Use of Electronic Devices
Students may use laptops only to access the course OWL site during lectures. Calculator use is permitted during examinations; students using programmable calculators must clear the device’s memory at the beginning of exams. No other electronic devices (e.g., cell phones, MP3 players) may be used during lectures or examinations.

Academic Offences
Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site: http://www.uwo.ca/univsec/handbook/appeals/scholoff.pdf

Students must write their essays and assignments in their own words. Whenever students take an idea, or a passage from another author, they must acknowledge their debt both by using quotation marks where
appropriate and by proper referencing such as footnotes or citations. Plagiarism is a major academic offence (see Scholastic Offence Policy in the Western Academic Calendar).

All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com http://www.turnitin.com

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.

Absence from course commitments

A. Absence for medical illness:
Students must familiarize themselves with the Policy on Accommodation for Medical Illness: https://studentservices.uwo.ca/secure/index.cfm

Statement from the Dean’s Office
If you are unable to meet a course requirement due to illness or other serious circumstances, you must provide valid medical or other supporting documentation to the Dean’s office as soon as possible and contact your instructor immediately. It is the student's responsibility to make alternative arrangements with their instructor once the accommodation has been approved and the instructor has been informed. In the event of a missed final exam, a “Recommendation of Special Examination” form must be obtained from the Dean's Office immediately. For further information please see: http://www.uwo.ca/univsec/handbook/appeals/medical.pdf

A student requiring academic accommodation due to illness should use the Student Medical Certificate when visiting an off-campus medical facility or request a Record's Release Form (located in the Dean’s Office) for visits to Student Health Services. The form can be found at: https://studentservices.uwo.ca/secure/medical_document.pdf

For medical illness affecting work worth less than 10% of the total course grade, evaluation may be re-weighted.

B. Absence for non-medical reasons:
Assignments may be submitted in class or at the ECE 4455 course locker in TEB. Marks for homework assignments submitted up to 24 hours late will be reduced by 10%. Marks for homework assignments submitted 24 to 48 hours late will be reduced by 25%. Assignments submitted more than 48 hours late will receive no credit unless alternate arrangements are agreed to in advance by the instructor.

Missed midterm tests will be given 0% unless accommodation is made through the Office of the Dean of Science.

C. 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.
A Special Examination must be written at the University or an Affiliated University College no later than 30 days after the end of the examination period involved. To accommodate unusual circumstances, a date later than this may be arranged at the time permission is first given by the Dean of the Faculty. The Dean will consult with the instructor and Department Chair and, if a later date is arranged, will communicate this to Registrarial Services. If a student fails to write a scheduled Special Examination, permission to write another Special Examination will be granted only with the permission of the Dean in exceptional circumstances and with appropriate supporting documents. In such a case, the date of this Special Examination normally will be the scheduled date for the final exam the next time the course is offered.

Support Services:
Registrarial Services: http://www3.registrar.uwo.ca/index.cfm

Academic Counselling (Science and Basic Medical Sciences):
http://www.uwo.ca/sci/counselling/index.html

Student Development Services: http://www.sds.uwo.ca

Student Health Services: http://www.shs.uwo.ca/

Please contact the course instructor if you require material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 519-661-2111 ext. 82147 for any specific question regarding an accommodation.

Students that are in emotional/mental distress should refer to Mental Health @ Western, http://www.uwo.ca/uwocom/mentalhealth/, for a complete list of options about how to obtain help.