BME809 Biomedical System Modeling

**Prequisites**
BLG 600 or BLG 601, BLG 700 or BLG 701, BME 229, and BME 639

**Compulsory Text**

**Reference Texts**

*Cardiac Electrophysiology Methods and Models*, Daniel C. Sigg, Paul A. Laizzo, Yong-Fu Xiao and Bin He (Editors), Springer, 2010

**Calendar Description**
Mathematical modeling of biomedical systems. Lumped and distributed models of electrical, mechanical, and chemical processes applied to cells, tissues, and organ systems

**Learning Objectives**
Throughout this course, the students should become familiar with and develop an understanding of the following topics:

1- Applying Mathematical tools to formulate biophysical processes into mathematical models and using numerical or analytical methods to solve them (1b, 2b)

2- Using Signal Processing techniques on various types of biophysical data (1c)

3- Using data to perform system identification and data fitting (3c)
Note: Numbers in parentheses refer to Canadian Engineering Accreditation Board attributes for Learning Objectives. For more info please check: 
http://www.ryerson.ca/content/dam/feas/facultystaff/learningobjectives.pdf

Course Organization

- 3 hours of Lecture per week for 13 weeks
- 2 hour of lab per week for 8 weeks
- 2 hour of Tutorial per week for 4 weeks
- 1 Teaching Assistant

Course Evaluation

- Final: 40 %
- Midterm: 25% (closed book, 2 hours)
- Lab :20%
- Assignments :5%
- Quiz 10%
- Total 100%

To be awarded a passing mark, a student must pass both Theory and Lab components of the course

Examinations

- Quizzes, Week 4 and Week10, 1 hour, open book
- Midterm exam in Week 7, two hours, closed book (covers Weeks 1-6)
- Final exam, during exam period, three hours, closed book (covers Weeks 1-13)

Course Content

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<th>Hours/Weeks</th>
<th>Topic, description</th>
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<td>2.2,2.3, 3.3, 4.1, 4.2,4.3, 4.4, 6 (All)</td>
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<td>Basic concept of modeling/Signals &amp; Systems Review/Wavelet</td>
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<td>1&amp;14</td>
<td>1.2, 14(All)</td>
<td>3/3</td>
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<td>10</td>
<td>10(All)</td>
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<td>Lab1 : Wavelet transform application on EEG</td>
<td>ENG 409</td>
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<td>Tutorial on Simulink</td>
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<td>Tutorial on Metabolism /Problem Solving</td>
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**Prelabs should be done before attending the lab.**

**Important Notes**

1. All of the required course-specific written reports will be assessed not only on their technical/academic merit, but also on the communication skills exhibited through these reports.

2. For Students who miss a quiz with proper documentation, the mark will be distributed over other course assessments proportionally.

3. Should a student miss a mid-term test or equivalent (e.g. studio or presentation), with appropriate documentation, a make-up will be scheduled as soon as possible in the same semester. Make-ups should cover the same material as the original assessment but need not be of an identical format. Only if it is not possible to schedule such a make-up may the weight of the missed work be placed on the final exam, or another single assessment. This may not cause that exam or assessment to be worth more than 70% of the student’s final grade. If a student misses a
scheduled make-up test or exam, the grade may be distributed over other course assessments even if that makes the grade on the final exam worth more than 70% of the final grade in the course.

4. Students who miss a final exam for a verifiable reason and who cannot be given a make-up exam prior to the submission of final course grades, must be given a grade of INC (as outlined in the Grading Promotion and Academic Standing Policy) and a make-up exam (normally within 2 weeks of the beginning of the next semester) that carries the same weight and measures the same knowledge must be scheduled.

5. Medical or compassionate documents for the missing of an exam must be submitted within 3 working days of the exam. Students are responsible for notifying the instructor that they will be missing an exam as soon as possible.

6. Request for accommodation of specific religious or spiritual observance must be presented to the instructor no later than two weeks prior to the conflict in question (in the case of final examinations within two weeks of the release of examination schedule). In extenuating circumstances this deadline may be extended. If the dates are not known well in advance because they are linked to other conditions, requests should be submitted as soon as possible in advance of the required observance. Given that timely requests will prevent difficulties with arranging constructive accommodations, students are strongly encouraged to notify the instructor of an observance accommodation issue within the first two weeks of classes.

7. The results of the first test of midterm test will be returned to students before the deadline to drop an undergraduate course in good Academic Standing.

8. Students are required to adhere to all relevant university policies including the Student Code of Academic Conduct (http://www.ryerson.ca/senate/policies/pol60.pdf) and Non-Academic Conduct (http://www.ryerson.ca/senate/policies/pol61.pdf)

9. Students are required to obtain and maintain a Ryerson email account for timely communications between the instructor and the students.

10. Any changes in the course outline, test dates, marking or evaluation will be discussed in class prior to being implemented.