2021

**BIOM 3710: Physiological Systems and Modeling (Syllabus)**

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BIOM 3710: Physiological Systems & Modeling Syllabus

Course Information

3 credit hours. Lecture format.

Class meeting: T, Th 9:40 - 11:05a

Course Description
This course will provide an introduction to fundamentals of control theory and mathematical modeling and analysis as applied to physiological systems. The course provides a framework for students to understand, investigate, and further develop complex models for physiological systems.

Course Goals
At the end of the course, students will be able to:
- Identify qualitative and quantitative features of complex physiological models
- Solve complex physiological problems using basic concepts and commonly used models in the form of differential equations
- Formulate mathematical models of two physiologic systems with terms of feedback and control

Prerequisites and Corequisites
- CIVL 2131, MATH 2120 or MATH 3402
- BIOL 3730 or BIOM 3110, BIOM 3010

Course Topics
The following are the topics that will be covered in this course:
- Introduction to Physiological Complexity and Modeling Process
- Review 1st order, 2nd order and System of Differential Equations
- MATLAB symbolic and numeric solutions and Livescript
- Static Modeling and Examples of Physiological Models
- Linear Modeling and Examples of Physiological Models
• Non-linear Modeling and Examples of Physiological Models
• MATLAB Simulink Modeling

Specific Course Requirements
Review of Differential Equations and Linear Algebra is necessary for writing and solving model equations so that course time is spent effectively on modeling aspects of physiological systems.

Important Announcements due to COVID

- **COVID-19 Health and Safety Policy - Masks and Social Distancing**
  All classes will be on-ground. All students, faculty and staff will wear masks with proper covering of nose and mouth in all public spaces, including our classroom per the COVID-19 policy. The first time a student enters a classroom without wearing a mask, the student will be given a mask to wear and if the student is non-compliant wearing mask, he/she will be asked to leave the class. Students who repeatedly or flagrantly violate these community expectations will be referred for discipline under the Student Code and, if appropriate, immediately removed from campus by the Dean of Students.

- **Student Health**
  Students who are experiencing symptoms such as sneezing, coughing or a higher than normal temperature should inform me by email so they can be excused from class and should stay home. Students should contact their health care provider or the Student Health Center at [https://www.memphis.edu/health/](https://www.memphis.edu/health/). During the entire course period (remote/face-to-face), students who have a positive COVID-19 test should contact the Dean of Students at deanofstudents@memphis.edu.

Textbooks, Supplementary Materials, Hardware and Software Requirements

Required Textbooks/Resources

  https://www.simiode.org/textbook

• MATLAB and Simulink Training:  
  https://matlabacademy.mathworks.com/

• Download Matlab & Simulink using UM credentials

• Use Matlab LiveScript (freely accessible via UM account) for writing codes and submitting the solutions.

Supplementary Materials


Hardware and Software Requirements
The minimum requirements can be found at:  
https://www.memphis.edu/uofmglobal/services/technology/requirements.php

Assessment and Grading
Testing Procedures
• Tests will be open book and open note.
• Quizzes involving solving differential equations by hand and uploading to e-courseware dropbox.
• Quizzes involving solving differential equations using Matlab LiveScript and submitting to Matlab Grader.
• Building models using Matlab Simulink.
• Communication between students during the exams is not allowed.

Projects
Students will be assigned an individual project and a team project to identify, formulate and solve complex physiological models. For individual project, a modeling scenario will be provided and students need to document problem statement, formulate model equations and solve them using Matlab/Simulink and submit a project report. For team projects, students will be assigned into teams with ~3 students per team. Teams will choose a project from a collection of modeling scenarios provided. Each team will give a 10-15 minutes presentation on their project and submit a report during the final week of class. Team members will also do a peer evaluation that will be factored into their project grade. All students will be responsible for attending other teams’ oral presentations, ask questions and fill out a student score sheet form that will be counted towards their project grade.

Grading Procedure
Homeworks, quizzes, exams and projects will be scored and published on ecourseware.

Grading Scale
91-100---A  
81-90---B  
71-80---C  
61-70---D

Final grade will be determined by dividing assignments into categories with the following weight toward the final grade.

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quizzes/Homeworks</td>
<td>20%</td>
</tr>
<tr>
<td>Participation</td>
<td>10%</td>
</tr>
<tr>
<td>Mid-term Exams</td>
<td>25%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>25%</td>
</tr>
<tr>
<td>Projects</td>
<td>20%</td>
</tr>
</tbody>
</table>
Class Participation
Students must participate in all interactive aspects of the course. Students must check the course content and updates on ecourseware frequently for announcements. Students must actively participate in threaded discussion events.

Punctuality
Students are expected to read announcements and communications from the professor in order to make progress through the course and turn in assignments in a timely manner.

Course Ground Rules
1. Students must use the assigned university e-mail address rather than a personal e-mail address.
2. Students are expected to learn how to navigate in D2L (ecourseware) and keep abreast of course announcements.
3. Students are responsible for all material, whether covered in class or as part of an assignment.
4. No late assignments (homework, reports) will be accepted. Late assignments will be assigned a score of zero, unless prior documentation and permission from the instructor has been approved.
5. Except when collaboration and teamwork is specifically encouraged or required, any work submitted for a grade must be your own original work. Working together on homework is certainly acceptable and encourage, but each person must work through the problem individually. Do not simply copy someone else’s solution. Do not electronically share your assignment files with classmates.
6. You are expected to participate actively in discussion.
7. Students are expected to communicate with other students on teams for laboratory assignments
8. Absences from exams require prior documentation and approval from the instructor. Student is responsible for scheduling makeup exams.
9. You are responsible for determining the availability of computing resources used in the class and for scheduling work accordingly.
10. Students must always observe course netiquette.
11. You must fully comply with all university guidelines and applicable laws regarding the use of computing facilities and software that may be provided for this course.
12. Students should address technical problems immediately.
14. Policies may be revised or augmented as required during the term.

Guidelines for Communication

Email
- Always include a subject line.
- Remember without facial expressions some comments may be taken the wrong way. Be careful in wording your emails. Use of emoticons might be helpful in some cases.
- Use standard fonts.
- Do not send large attachments without permission.
- Special formatting such as centering, audio messages, tables, html, etc. should be avoided unless necessary to complete an assignment or other communication.
- Respect the privacy of other class members

Discussion Groups
- Review the discussion threads thoroughly before entering the discussion.
- Try to maintain threads by using the "Reply" button rather starting a new topic.
- Do not make insulting or inflammatory statements to other members of the discussion group. Be respectful of others' ideas.
- Be patient and read the comments of other group members thoroughly before entering your remarks.
- Be cooperative with group leaders in completing assigned tasks.
- Be positive and constructive in group discussions.
- Respond in a thoughtful and timely manner.

Plagiarism and Integrity
Plagiarism, cheating, and other forms of academic dishonesty are prohibited. Students guilty of academic misconduct, either directly or indirectly, through participation or assistance, are immediately responsible to notify the instructor of the class in addition to other possible disciplinary sanctions which may be imposed through the regular institutional
disciplinary procedures. Expectations for academic integrity and student conduct are described in detail on the website of the Office of Student Accountability. Please read in particular, the section about "Academic Misconduct".

**Turnitin.com**

Your written work may be submitted to Turnitin.com, or a similar electronic detection method, for an evaluation of the originality of your ideas and proper use and attribution of sources. As part of this process, you may be required to submit electronic as well as hard copies of your written work or be given other instructions to follow. By taking this course, you agree that all assignments may undergo this review process and that the assignment may be included as a source document in Turnitin.com’s restricted access database solely for the purpose of detecting plagiarism in such documents. Any assignment not submitted according to the procedures given by the instructor may be penalized or may not be accepted at all.

**Library, Tutoring, and Other Resources**

- The myMemphis Portal system, eCampus Student tab provides access to University library.
- The tutoring link in the course navigation bar provides access to free online tutoring through UpSwing tutoring.

**Students with Disabilities**

Qualified students with disabilities will be provided reasonable and necessary academic accommodations if determined eligible by disability services staff at the University of Memphis. Prior to granting disability accommodations in this course, the instructor must receive written verification of a student’s eligibility for specific accommodations from the disability services staff. It is the student’s responsibility to initiate contact with Disability Resources for Students (DRS) and to follow the established procedures for having the accommodation notice sent to the instructor.

**Sexual Misconduct and Domestic Violence Policy**

This policy specifically addresses sexual misconduct which includes dating violence, domestic violence, sexual assault, and stalking. The policy establishes procedures for responding to Title IX-related allegations of
sexual misconduct. Complaints can be reported to the Office for Institutional Equity (OIE). You may contact OIE by phone at 901.678.2713 or by email at oie@memphis.edu. Complaints can be submitted online at File a Complaint. OIE’s office is located at 156 Administration Building.

Non-Discrimination and Anti-Harassment Policy
University policy prohibiting discrimination and harassment based on protected characteristics and classes. Complaints of discrimination and harassment can be reported to the Office for Institutional Equity (OIE). You may contact OIE by phone at 901.678.2713 or by email at oie@memphis.edu. The full text of the policy can be found at GE2030 - Non-Discrimination and Anti-harassment.

Technology Requirements
The following is a list of the minimum requirements to use our learning management system. Some courses will have more advanced requirements.

- Access to a reliable, high-speed Internet connection (DSL or Cable).
- Test your device to ensure it is compatible with our LMS (Learning Management System) using the System Check Wizard.
- Open PDF files using the free downloadable PDF software.
- Access Flash-based content with Adobe Flash Player (free).
- Use Microsoft Office for document creation (available for students via http://umapps.memphis.edu/)
- Play media content with Real Player (free), QuickTime (free), or Windows Media Player (free).

Syllabus Changes
The instructor reserves the right to make changes as necessary to this syllabus. If changes are necessitated during the term of the course, the instructor will immediately notify students of such changes both by individual email communication and posting both notification and nature of change(s) on e-courseware.

Technical Support
Call the Helpdesk: 901-678-8888
Online Helpdesk