

**Modeling Physiological Systems and Laboratory**  
**Fischell Department of Bioengineering**  
**University of Maryland**  
**College Park, MD**

**Syllabus**

- Course:** Modeling Physiological Systems and Laboratory (BIOE 340 0101 and BIOE 340 0102)
- Course Hours:** Tuesdays and Thursdays, 3:30 - 4:45 pm (Lecture)  
Thursdays, 5:00 pm - 6:30 pm (Laboratory)  
Tuesdays, 8:00 – 8:50 am (Discussion, BIOE 340 0101)  
Thursdays, 8:00 – 8:50 am (Discussion, BIOE 340 0102)
- Course Location:** Room 1110, Jeong H. Kim Engineering Building (Lecture)  
Room 2107 & 2111, Jeong H. Kim Engineering Building (Laboratory)  
Room 1104, Glenn L. Martin Hall (Discussion)
- Course Description:** An introduction to the quantitative description and modeling of major physiological systems within the human body. The course will begin with an introduction to human physiology as well as basic concepts of applied math, and then discuss physiological systems, followed by their description using applied math concepts. Major topics include membrane physiology, the heart, circulation, the kidney, metabolism, and respiration. Modeling mechanisms and functions inherent in each system is intended to help in the future design of artificial systems by bioengineering students. Please note that credit will be granted for only one of the following: BIOE 340 or BSCI 440/441.
- Modeling Physiological Systems and Lab (BIOE 340) is a required course within the Fischell Department of Bioengineering Undergraduate Program, and is typically completed in the first semester of the third year, within the four year undergraduate program.
- Course Website:** Follow links from Canvas.
- Instructor:** Dr. John P. Fisher  
Office: Room 3238, Jeong H. Kim Engineering Building  
Phone: 301 405 7475  
Email: jpfisher@umd.edu  
Office Hours: 9:00 am – 10:00 am, Tuesdays, 3238 KEB
- Teaching Assistants:** Laurie Bracaglia  
Office: Room 3240, Jeong H. Kim Engineering Building  
Email: laura.bracaglia@gmail.com  
Office Hours: 8:00 am – 9:00 am, Wednesdays, 3240 KEB
- Adam Brown  
Office: Room 6128, Plant Sciences Building  
Email: adam1234@umd.edu  
Office Hours: 11:00 am – 12:00 noon, Thursdays, 6128 PLS
- Required Textbook:** Textbook of Medical Physiology, 12th Edition  
Author: Arthur C. Guyton, John E. Hall  
Publisher: Elsevier Saunders Publishing  
ISBN: 1416045740

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**Suggested Textbook:** Numerical Methods in Biomedical Engineering  
Author: Stanley M. Dunn, Alkis Constantinides, Prabhas V. Moghe  
Publisher: Academic Press  
ISBN: 0121860310

**Honor Code:** Please see <http://www.shc.umd.edu/>

**Disabled Students:** In accordance with University of Maryland policies, the instructor requests that students with disabilities inform the instructor of their needs at the beginning of the semester.

**Lecture Policy** Course lectures will mostly follow the text, with additions from other relevant sources. Lectures will be both written on the board and presented with powerpoint slides. PDF files containing powerpoint slides will be posted on the course website. The only electronic devices allowed in class are laptops and tablets to facilitate note-taking. No other electronic devices, including phone and recording devices, or software are allowed in class.

**Course Assignments & Examinations:** The lecture portion of the course will contain 6 homeworks, 3 exams, and 1 cumulative final exam. The laboratory portion of the course will contain 4 lab reports. All assignments must be turned in at the start of class (3:30 pm) on their due date. Please note that some lab reports will require the electronic submission of MATLAB code, and that this submission must also occur on time. No late submissions will be accepted.

All in-class examinations will be closed book, closed notes, and without the use of any type of calculating or electronic device. Arrangements for a missed exam, due to a reasonable and documented absence, will be made on a case-by-case basis.

<b>Course Grading:</b>	6 Homework Assignments	240 pts (40 pts each)
	4 Laboratory Assignments	260 pts (65 pts each)
	Midterm Exam 1	90 pts
	Midterm Exam 2	90 pts
	Midterm Exam 3	120 pts
	Cumulative Final Exam	200 pts
	<b>Total</b>	<b>1000 pts</b>

All requests for re-grades must be made in writing to Dr. Fisher within 24 hr after the graded material has been returned. Do not contact the TAs about a re-grade. Dr. Fisher will re-grade the specific question of interest as well as the entire work.

Final grade assignment will be based upon the percentage of total points possible achieved throughout the semester. The assignment of the final letter grade for the course is the following: > 85% A, 84% - 75% B, 74% - 65% C, 64% - 55% D, and < 55% F.

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<b>Lecture Schedule</b>			
<b>Date</b>	<b>Lecture Topic</b>	<b>Chapters</b>	<b>Assignment</b>
<b>Tuesday, September 3</b>	L1: Introduction to Physiology: The Human Body	1 – 3	
<b>Thursday, September 5</b>	L2: Biological Transport Phenomena		
<b>Tuesday, September 10</b>	L3: Biological Kinetics		
<b>Thursday, September 12</b>	L4: Membranes: Transport, Potentials, & Muscles	4 - 8	
<b>Tuesday, September 17</b>	L4: Membranes: Transport, Potentials, & Muscles	4 - 8	
<b>Thursday, September 19</b>	L4: Membranes: Transport, Potentials, & Muscles	4 - 8	
<b>Tuesday, September 24</b>	L4: Membranes: Transport, Potentials, & Muscles	4 - 8	HW1 Due
<b>Thursday, September 26</b>	<b>Midterm Exam 1</b>		
<b>Tuesday, October 1</b>	L5: Heart: Cardiac Function & ECGs	9 - 13	Lab 1 Due
<b>Thursday, October 3</b>	L5: Heart: Cardiac Function & ECGs	9 - 13	
<b>Tuesday, October 8</b>	L5: Heart: Cardiac Function & ECGs	9 - 13	
<b>Thursday, October 10</b>	L5: Heart: Cardiac Function & ECGs	9 - 13	
<b>Tuesday, October 15</b>	L6: Circulation: Blood Vessels, Flow, & Regulation	14 - 19	HW2 Due
<b>Thursday, October 17</b>	L6: Circulation: Blood Vessels, Flow, & Regulation	14 - 19	
<b>Tuesday, October 22</b>	L6: Circulation: Blood Vessels, Flow, & Regulation	14 - 19	HW3 Due
<b>Thursday, October 24</b>	<b>Midterm Exam 2</b>		
<b>Tuesday, October 29</b>	L7: Kidney: Body Fluids & Renal Function	25 - 27	Lab 2 Due
<b>Thursday, October 31</b>	L7: Kidney: Body Fluids & Renal Function	25 - 27	
<b>Tuesday, November 5</b>	L7: Kidney: Body Fluids & Renal Function	25 - 27	
<b>Thursday, November 7</b>	L7: Kidney: Body Fluids & Renal Function	25 - 27	
<b>Tuesday, November 12</b>	<b>No Class</b>		HW4 Due
<b>Thursday, November 14</b>	L8: Liver: Metabolism & Energetics	67 - 72	Lab 3 Due
<b>Tuesday, November 19</b>	L8: Liver: Metabolism & Energetics	67 - 72	
<b>Thursday, November 21</b>	L8: Liver: Metabolism & Energetics	67 - 72	
<b>Tuesday, November 26</b>	L9: Respiration: Ventilation, Circulation, & Transport	37 - 40	HW5 Due
<b>Thursday, November 28</b>	<b>Thanksgiving Holiday Break</b>		
<b>Tuesday, December 3</b>	L9: Respiration: Ventilation, Circulation, & Transport	37 - 40	
<b>Thursday, December 5</b>	L9: Respiration: Ventilation, Circulation, & Transport	37 - 40	Lab 4 Due
<b>Tuesday, December 10</b>	L9: Respiration: Ventilation, Circulation, & Transport	37 - 40	HW6 Due
<b>Thursday, December 12</b>	<b>Midterm Exam 3</b>		
<b>Saturday, December 21</b>	<b>Cumulative Final Exam (10:30 am – 12:30 pm)</b>		

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**Lab Schedule**

<b>Date</b>	<b>Laboratory Topic</b>
Thursday, September 5	Lab 1: Modeling Biosystems
Thursday, September 12	Lab 1: Modeling Biosystems
Thursday, September 19	Lab 1: Modeling Biosystems
Thursday, September 26	<b>No Class</b>
Thursday, October 3	Lab 2: Dynamic Systems: Grps A & B / Diffusion: Grps C
Thursday, October 10	Lab 2: Dynamic Systems: Grps A & C / Diffusion: Grps B
Thursday, October 17	Lab 2: Dynamic Systems: Grps B & C / Diffusion: Grps A
Thursday, October 24	Lab 3: Sampling Physiological Data: Grps A & B / EKG: Grps C
Thursday, October 31	Lab 3: Sampling Physiological Data: Grps A & C / EKG: Grps B
Thursday, November 7	Lab 3: Sampling Physiological Data: Grps B & C / EKG: Grps A
Thursday, November 14	Lab 4: Physiological Model
Thursday, November 21	Lab 4: Physiological Model
Thursday, November 28	Lab 4: Physiological Model
Thursday, December 5	<b>No Class</b>
Thursday, December 12	<b>No Class</b>

**Discussion Schedule**

<b>Date</b>	<b>Discussion Topic</b>
Tu & Th, September 3 & 5	<b>No Class</b>
Tu & Th, September 10 & 12	Membrane Problem Solving
Tu & Th, September 17 & 19	Membrane Problem Solving
Tu & Th, September 24 & 26	Problem Solving Review
Tu & Th, October 1 & 3	Heart Problem Solving
Tu & Th, October 8 & 10	Heart Problem Solving
Tu & Th, October 15 & 17	Circulation Problem Solving
Tu & Th, October 22 & 24	Problem Solving Review
Tu & Th, October 29 & 31	Kidney Problem Solving
Tu & Th, November 5 & 7	Kidney Problem Solving
Tu & Th, November 12 & 14	Liver Problem Solving
Tu & Th, November 19 & 21	Liver Problem Solving
Tu & Th, November 26 & 28	Respiration Problem Solving
Tu & Th, December 3 & 5	Respiration Problem Solving
Tu & Th, December 10 & 12	Problem Solving Review