

MEDICAL BIOPHYSICS
MEDBIO 3501A / BIOPHYS 9501

Course outline



Western University is committed to a **thriving campus**; therefore, your health and wellness matter to us! The following link provides available resources to support students on and off campus: <https://www.uwo.ca/health/>. We encourage you to check out the [Digital Student Experience](#) website to manage your academics and well-being.

1. Technical Requirements:



Stable internet connection



Laptop or computer



Working microphone



Working webcam

Please Note: For contingency plans for in-person classes pivoting to 100% online learning, students must have a reliable internet connection and computer that are compatible with online learning and testing system requirements.

Computer requirements include:

- Operating system: MAC: OSX Yosemite 10.10.5 or higher, PC: Windows 7, 8, or higher
- Processor/Ram: MAC: Intel / AMD Processor, 2 GB RAM, PC: Dual-core 2.4 Ghz CPU, 2 GB RAM or better
- Web Browsers: Mozilla Firefox v20.0 or Higher Google Chrome v25.0 or higher
- Plug-ins: Javascript Enabled & Third Party Cookies Enabled
- Camera resolution: 800 x 600 resolution or better
- Internet connection: Cable Modem, DSL or better (300 kbps download, 250 kbps upload)

2. Course Overview and Important Dates:



Classes Begin	Classes End	
Thursday September 7 2023	Thursday December 8, 2023	
* November 30, 2023: Last day to drop a first-term half credit course without academic penalty		
Reading Week	Study day(s)	Exam Period
Oct 30- November 5	December 9	December 10 - 22

3. Contact Information



This information is limited to persons having Western University credentials with permission to access Western University's academic service portals.

4. Course Description and Design

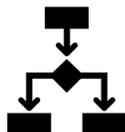
Delivery Mode: in-person on campus

Course summary

The biophysics and physiology of the cardiovascular and respiratory systems in health and disease, including cellular biophysics, cardiac function, physics of blood flow, vascular mechanics in the microcirculation and large vessels, surface energy and interactions at biological interfaces such as the lung, diffusive and convective transport and exchange.

Prerequisites

One of [Calculus 1000A/B](#), [Calculus 1500A/B](#), [Mathematics 1225A/B](#), [Numerical and Mathematical Methods 1412A/B](#), the former Applied Mathematics 1412A/B, the former Applied Mathematics 1413; one of [Physics 1201A/B](#), [Physics 1401A/B](#), [Physics 1501A/B](#), the former Physics 1028A/B, the former Physics 1301A/B; and one of [Physics 1202A/B](#), [Physics 1402A/B](#), [Physics 1502A/B](#), the former Physics 1029A/B, the former Physics 1302A/B. [Integrated Science 1001X](#) can be used as a prerequisite in place of [Physics 1202A/B](#). Typically taken in third year, this course is also open to second-year students with an overall average of at least 70% in first year.



Prerequisite checking – the student's responsibility

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.

Course Weight: 0.5

Breadth: Category C

Subject code: MEDBIO

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 Student Accessibility Services at 519-661-2147 for any specific question regarding an accommodation.

Timetabled Sessions

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2 h classroom lessons per week; 1 h Tutorial per week

- Asynchronous pre-work lessons must be completed prior to in-person sessions.
- Attendance at in-person sessions is required.
- Students have access to all course materials, assignments, exams, and tutorials through OWL: <http://owl.uwo.ca>. 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 Help page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.
- Google Chrome or Mozilla Firefox are the preferred browsers to optimally use OWL.

NOTE: In the event of a COVID-19 resurgence during the course that necessitates moving away from face-to-face interaction, all remaining course content will be delivered entirely online, either synchronously (i.e., at times indicates in the timetable) or asynchronously (e.g., posted on OWL for students to view at their convenience). The grading scheme will not change. Any remaining assessments will also be conducted online at the discretion of the instructor.

5. Course Syllabus

Teaching Rationale

This course uses primarily the flipped classroom approach to learning.

Online asynchronous lessons introduce fundamental background for physiology and biophysics concepts. The organization, structure, and function of selected components of human cardiovascular circulatory and respiratory systems are considered in the context of their function as biological transport systems. The first half of each series of lessons is weighted heavily on introducing foundational concepts, which may be a review for some and new for other students. This is necessary for establishing a common baseline that allows for discussions later in the course. The application of biophysics and quantifying cardiovascular, and respiratory functions, structures and behaviors is highlighted using examples from medicine.



In-person lecture periods are led by the principal instructor. Students prepare themselves for class by reviewing the asynchronous lessons posted on OWL. Students will participate in class discussions and group work on material covered in lessons from prior and current week. The instructor will assign work to be completed prior to class, assigned as group work in class, and individual, and group work to be followed up in subsequent class, tutorials.

Tutorials are led by the Teaching Assistants. Students will be expected to complete work prior to class and or in Tutorials. Some of this work may be followed up in subsequent Lecture and Tutorial periods. Tutorials are an opportunity for students to discuss the current Assignment with instructors and work on problem solving skills and writing as individuals or in groups. Students are encouraged to ask questions to learn about any course material covered in lectures throughout the term.

Students are expected to become familiar with all required course readings and course materials posted on OWL, review all lessons, attend all tutorials, complete all assignments, and examinations. Students are encouraged to become familiar with recommended reading lists.

Course Learning Outcomes

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

- Explain the functions and structures of organs, tissues, and cells found in the human cardiovascular and respiratory systems.
- Predict and calculate biophysics concepts and formulas, including those related to blood flow, blood pressure, cardiac function, diffusion, partial pressures.
- Critically appraise the literature.
- Generate hypotheses to test solutions for problems encountered in the cardiovascular and respiratory systems.
- Express evidence-based opinions in disciplinary discussions and reports.

6. Course Content and Schedule



Week	Topic
1	<i>Introduction to the circulatory system: a biological transport system</i>
2	<i>Biophysics Principles: a focus on transport of fluids</i>
3	<i>The heart, the vasculature, and the blood.</i>
4	<i>Cellular biophysics of cardiac cells</i>
5	<i>The heart as a pump</i>
6	<i>The heart as a pump</i>
7	<i>Peripheral vascular system and vascular control; blood and the microcirculation</i>
8	<i>Peripheral vascular system and vascular control; blood and the microcirculation</i>
9	Fall Reading Week
10	<i>Peripheral vascular system and vascular control; blood and the microcirculation</i>
11	<i>Respiratory system and biophysics</i>
12	<i>Oxygen transport and diffusion</i>
13	<i>Synthesis and application of biophysics to circulatory and respiratory systems in health and disease</i>
14	<i>Synthesis and application of biophysics to circulatory and respiratory systems health and disease</i>
	University study day
15	<i>Final Exam</i> <i>Cumulative; on campus; date and time and location to be determined</i>
The themes and dates reflect the expected timelines to cover these topics. We may spend longer or shorter time on topics as the semester unfolds.	

7. Evaluation

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Assessment	Dates	Methods	Grade Weight (%)
Assignment #1	Week 3	Mixed. Primarily problem solving by making calculations.	10
Assignment #2	Week 6	Mixed. Primarily writing structured critical appraisal of article/topic area related to cardiovascular sciences.	25
Assignment #3	Week 12	Mixed; Primarily writing structured critical appraisal of article/topic area related to any cardiovascular and or respiratory sciences.	25
Midterm	Week 8	In person on campus. Mixed. Short answer and problem solving requiring calculations. Covers first half of course.	20
Final Exam	University Scheduled	In person on campus. Mixed. Short answers and problem solving requiring calculations. Cumulative. Covers all of course.	20

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Assessment	Due Date	Format	Grade Weight (%)
Assignment 1	Week 3	Mixed	5
Assignment 2	Week 6	Mixed	12.5
Midterm	Week 8	In person	0*
Assignment 3	Week 12	Mixed	12.5
Class Lessons	TBD	In person	50
Final Exam	University Scheduled	In person	20

Access to the full copy of the official Course syllabus is limited to persons having Western University credentials with permission to access Western University's academic service portals.