MEDICAL BIOPHYSICS
MEDBIO 3501A / BIOPHYS 9501

Circulatory and Respiratory Sciences 1

Course outline for Fall 2025

This course takes place at Western University, which is located on the traditional territories of the Anishinaabek, Haudenosaunee, Lūnaapéewak, and Chonnonton Nations, on lands connected with the London Township and Sombra Treaties of 1796 and the Dish with One Spoon Covenant Wampum.

1. Technical Requirements:

Stable internet connection

Laptop or computer

Working microphone

Working webcam

2. Course Overview and Important Dates:

Classes Begin	Classes End
Thursday September 4, 2025	Thursday December 9, 2025
September 12, 2025: Last day to add or drop a Fall 12-week course September 30, 2025 is National Day for Truth and Reconciliation. and a non-instructional day. December 1, 2025: Last day to withdraw from a Fall 12-week course without academic penalty.	

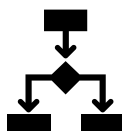| Reading Week	Study day(s)	Exam Period
November 3-9	December 10	December 11-22

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

Course summary

The study of 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, lung function, physics of air flow, breathing mechanics, 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. 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: https://westernu.brightspace.com/d2l/login. 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 Brightspace Help. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.
- Current versions of Safari, Chrome, Edge, and Firefox are supported with OWL Brightspace; what is most important is that you update your browser frequently to ensure it is current. All JavaScript and cookies should be enabled.

5. **Course Syllabus**

Teaching Rationale

This course uses primarily the flipped classroom approach to learning.

Online asynchronous lessons with pre-recorded videos introduce fundamental background for physiology and biophysics concepts related to the organization, structure, and function of selected components of the human cardiovascular and respiratory system. The course highlights with examples from medicine and scientific literature, various applications of biophysics and measurements of cardiovascular and respiratory functions, structures and behaviors. Organized into modules, the online lessons, which may be a review for some and new for other students, are necessary for establishing a common baseline to allow discussions later in the course.

The principal instructor facilitates discussion of course related topics during the In-person lecture periods. Students prepare themselves for class by reviewing the asynchronous lessons and materials posted on OWL and attending Tutorials. Students participate in class discussions and group work on material covered in lessons from prior and current week. The instructor assigns work for completion prior to class, group work in class, and individual, and group work to be followed-up in subsequent classes, or tutorials.

Teaching Assistants lead tutorials. Students are 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 opportunities for students to discuss the current Assignment with instructors and work on problem solving skills and writing as individuals or in groups. Instructors encourage students to ask questions about any course material covered in lectures throughout the term.

Students must 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	Module / Topics
1	*001 Introduction to the circulatory system*
2	*002 Biophysics Principles: a focus on transport of fluids*
3	*003 The heart, the vasculature, and the blood.*
4	*004 Cellular biophysics of cardiac cells*
5	*005 The heart as a pump*
6	*005 The heart as a pump*
7	*005 The heart as a pump*
8	*006 Midterm Review and Exam Week*
9	*007 Peripheral vascular system and vascular control; blood and the microcirculation*
10	*Fall Reading Week*
11	*007 Peripheral vascular system and vascular control; blood and the microcirculation*
12	*007 Peripheral vascular system and vascular control; blood and the microcirculation*
	008 Respiratory system and biophysics
13	*009 Lung function, blood flow, and ventilation-perfusion*
	010 Oxygen transport and diffusion
14	*011 Synthesis and application of biophysics to circulatory and respiratory systems in health and disease*
	012 Course Wrap up
15	*Last Class*
Dec 10	*University study day*
Dec 11 – 22	*Final Exam Cumulative; on campus; date and time and location to be determined* Set by Registrar
	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	Deadlines	Methods	Grade Weight (%)	Flexibility
Assignment #1	Week 3	Mixed. Primarily problem solving by making calculations.	10	72-hour no late penalty
Assignment #2	Week 6	Mixed. Primarily writing structured critical appraisal of article/topic area related to cardiovascular sciences.	25	72-hour no late penalty
Assignment #3	Week 12	Group Project. Written.	25	72-hour no late penalty
Midterm	Week 8	**In person on campus**. Mixed. Short answer and problem solving requiring calculations. Covers first half of course.	20	Not applicable
Final Exam	University Scheduled	**In person on campus**. Mixed. Short answers and problem solving requiring calculations. Cumulative. Covers all of course.	20	Not applicable

Designated Assessment: Instructors are permitted to designate one assessment per course per term as requiring supporting documentation to receive academic consideration. For 3501A, the following assessment is designated as requiring supporting documentation:

Midterm	Week 8	**In person on campus**. Mixed. Short answer and problem solving requiring calculations. Covers first half 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	10
Assignment 3	Week 12	Group project	12.5
Class Presentation	TBD	In person	40 (Designated assessment)
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.