

Department of Physiology and Pharmacology
Cardiovascular Physiology-Physiology 4610A

Course Outline for Fall 2026

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.

Students who are in emotional and/or mental distress should refer to <https://www.uwo.ca/health/> for a complete list of options about how to obtain help.

1. Technical Requirements:



Stable internet connection



Laptop or computer

2. Important Dates:

Classes Begin	Reading Week	Classes End	Study day(s)	Exam Period
September 9	October 10-18	December 9	December 10	December 11–22

September 30, 2026: National Day for Truth and Reconciliation; non-instructional day

September 17, 2026: Last day to add or drop a Fall 12-week course

November 30, 2026: Last day to withdraw from a Fall 12-week course without academic penalty

3. Contact Information

Course Coordinator	Contact Information
Dr. Donald Welsh	dwelsh24@uwo.ca

Instructor(s) or Teaching Assistant(s)	Contact Information
Dr. Galina Mironova	gmironova@uwo.ca
Vicky Yanwen Li (TA)	Yli4953@uwo.ca

4. Course Description and Design

Delivery Mode: in-person

A study of the regulation of the circulation including factors involved in the regulation of cardiac output, reflex control of the circulation and long-term control of arterial pressure.

Prerequisite(s): Physiology 3120.

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.

Timetabled Sessions

Component	Date(s)	Time
Lecture	Friday	9:30-11:30

- ☒ Asynchronous pre-work must be completed 72 hours prior to sessions
- ☒ Attendance at sessions is required
- ☒ Missed work should be completed within 72 hours

All course material will be posted to OWL Brightspace: <https://westernu.brightspace.com/d2l/login>. Any changes will be indicated on the OWL Brightspace 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 all popular browsers (e.g., Safari, Chrome, Edge, 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. Learning Outcomes

After completing this course the student will understand the fundamentals of cardiovascular physiology and pathobiology, from the cell-to-the-whole organism. They will additionally garner rudimentary knowledge of tissue metabolism, and disease management. The latter will expose students to basic pharmacology, interventional cardiology and the use of implantable engineered devices. Students will further develop critical thinking and presentation skills through discussion of the current literature.

Specific Course Objectives: After completing this course, students will understand, at an appropriate level, the essentials of oxygen/substrate delivery, blood pressure regulation, lung function and gas exchange, cardiac/vascular electrophysiology and contractility, hemodynamics and blood flow regulation. They will also garner an understanding of key pathobiologic states and their treatment. Those states include but aren't limited to: pulmonary & systemic hypertension, angina, heart failure, peripheral vascular disease, diabetes, stroke and myocardial infarction, and arteriosclerosis.

6. Course Content and Schedule

Week	Dates	Topic	Instructor
1	Sept 9–13	1: Course Outline and Assessment 2: Overview of Cardiovascular system 3: Blood, Erythrocytes and Buffers 4: Group Project and Dates	DW
2	Sept 14–20	1: Lung, Anatomy and Physiology 2: Lung Mechanics and Ventilation 3: Lung Pathobiology 4: Mock Paper Presentation and Discussion	DW
3	Sept 21–27	1: Heart, Structure and Function 2: Modulation of Cardiac Output 3: Pathobiology 20 min Break 1: Echocardiography 2: Basics and Principles 3: Pathobiology	DW
4	Sept 28–Oct 4	1: Cardiac Myocyte, Structure and Function 2: Excitation-Contraction Coupling 3: Heart Pathobiology 4: Paper Presentation (40 mins)	DW
5	Oct 5–11	1: Cardiac Action Potential 2: Electrical Conduction 3: Pathobiology 4: Paper Presentation/Discussion (40 min)	DW
6	Oct 12–18	Reading Week (starts October 10 th 12:01 AM)	
7	Oct 19–25	1: Cardiac EKG 2: Cardiac Arrhythmia 3: Paper Presentation/Discussion (40 min)	DW
8	Oct 26–Nov 1	Midterm Exam 30%: Make up exam, November 9	
9	Nov 2–8	1: Smooth Muscle Contraction 2: Electrophysiology and Ca ²⁺ Dynamics 3: Smooth Muscle Pathobiology 4: Paper Presentation/Discussion (40 min)	DW
10	Nov 9–15	1: Endothelial Dependent Relaxation/ Conduction 2: Endothelial Permeability 3: Pathobiology 4: Paper Presentation/Discussion (40 min)	DW
11	Nov 16–22	1: Cerebral Circulation 2: Neurovascular Coupling 3: Pathobiology 4: Paper Presentation/Discussion (40 min)	GM
12	Nov 23–29	1: Peripheral Vasculature & Microcirculation 2: Blood Flow Regulation 3: Pathobiology 4: Paper Presentation/Discussion (40 min)	GM
13	Nov 30–Dec 6	1: Arterial Remodeling 2: Microvascular Remodeling 3: Pathobiology 4: Paper Presentation/Discussion (40 min)	DW
14	Dec 7–9	End	

7. Participation and Engagement

- ☒ Students are expected to participate and engage with content as much as possible. This includes questions and comments related to the material presented. It can also include discussion prior to and following class.

8. Assessment and Evaluation

Below is the evaluation breakdown for the course. Any deviations will be communicated.

Assessment	Format	Weighting	Due Date	Flexibility
Group Presentation /Discussion	Oral/In class	30%	As scheduled	Not applicable
Class Participation	Throughout	10%	Throughout	Not applicable:
Midterm Test (Weeks 1-7)	Written/In Person	30%	Oct 30-In class	Not applicable: designated assessment
Final Exam (3 hrs) (Weeks 9-13)	Written/In Person	30%	December Exam Period	Not applicable

Designated Assessment: Instructors are permitted to designate one assessment per course per term as requiring supporting documentation to receive academic consideration. See below for information on academic consideration policy and missed course work.

For this course, the **Midterm Exam** is designated as requiring supporting documentation.

There will be a group paper presentation (30%), a participation mark (10%: case study participation and paper discussion/participation) and a midterm (30%) and final exam (30%).

The research paper presentation entails 1 group per week (5-6 students) critiquing an up-to-date research paper. Total presentation time will be 40 minutes, with 20 minutes dedicated to a powerpoint presentation: 1) Background; 2) Objective/Hypothesis; 3) Methods; 4) Results/Discussion; 5) Strength/Weakness and 6) Future Direction. An additional 20 minutes is allocated for critical questions, which can be asked throughout, by students/instructors alike. In greater detail, each group will identify 3-5 recent research papers two weeks prior to presentation, from which the instructor will pick one. Those articles will be chosen from: 1) American Journal of Physiology; 2) Journal of Applied Physiology; 3) Journal of Physiology; and 4) ATVB, Circulation or Circulation Research.

Note student participation is expected throughout the course and will be graded at 10% (case study participation at 5% and paper discussion/participation at 5%). This mark is based on an aggregate contribution (questions, commentary) over a 13 week period. Participation is strongly encouraged to create a more dynamic learning environment.

The midterm and final exam are worth 30% and 30%, respectively. The final exam will cover material from the midterm forward. Questions will be short answer and will ask student to draw diagrams, recite/extrapolate from lecture material and to design/critique experiments based on lecture notes/paper presentations.

General information about assessments

- ☒ Rubrics will be used to evaluate assessments and will be posted with the instructions
- ☒ A student might not receive the same grade as their group members if it is determined that the distribution of work was not equal
- ☒ After an assessment is returned, students should wait 24 hours to digest feedback before contacting their evaluator; to ensure a timely response, reach out within 7 days
- ☒ Assessment re-grading could result in the mark, increasing, decreasing, or remaining the same. Marking will be done by an independent referee within the Dept. of Physiology
- ☒ Prior to the filing of a written request for relief, students must attempt to resolve the concern regarding a mark or grade through informal consultation with the instructor. If the student is dissatisfied with the decision of the instructor or does not receive a decision from the instructor, a written request for relief must be submitted to the Undergraduate Chair within three (3) weeks from the date that the mark was issued.

The table below outlines the University-wide grade descriptors.

A+	90-100	One could scarcely expect better from a student at this level
A	80-89	Superior work which is clearly above average
B	70-79	Good work, meeting all requirements, and eminently satisfactory
C	60-69	Competent work, meeting requirements
D	50-59	Fair work, minimally acceptable
F	below 50	Fail

Information about late or missed assessments:

- ☒ Late assessments without approved academic consideration will be subject to a late penalty of **10 %/day**
- ☒ One make-up test will be offered within 5 days of the original test and the weight of a missed test will be transferred to the final examination
- ☒ Make-up assessments/exam may be a different format than the original assessment. This could include an essay based exam, in contrast to a standard short answer format.
- ☒ Students who miss an exam without approved academic consideration will receive a grade of zero for that assessment
- ☒ All course components (e.g., final exam, laboratories, major essay, etc.) must be completed to pass the course. Special accommodation is at the discretion of the course supervisor.
- ☒ Only one special examination (see below) will be offered in January

All students are required to be present and participatory in their class presentations. If a group member is absent, they will be required to meet privately with the course supervisor and defend the groups entire presentation in full. They will be given a mark distinct from the group whose own mark will be adjust for their absence.

INC (Incomplete Standing): If a student has been approved by the Academic Advising Office (in consultation with the instructor/department) to complete term work at a later date, an INC will be assigned, which could impact program progression. Students with INC will have their course load in subsequent terms reduced to allow them to complete outstanding course work. Students may request permission from Academic Advising to carry a full course load for the term the incomplete course work is scheduled.

SPC (Special examination): If a student has been approved by the Academic Advising Office to write a Special Examination and the final exam is the only outstanding course component, an SPC will be assigned. If the class has a makeup exam, the student is expected to write the makeup exam. If the class doesn't have a makeup for the final exam, the student will write the exam the next time the course is

offered, which could impact program progression. Outstanding SPCs will reduce the course load for the term the exam is deferred as outlined in [Definitions of Types of Examinations](#) policy. If a student misses an SPC exam and is approved for academic consideration, they will be withdrawn from the course without academic penalty. If a student misses an SPC exam and is not approved for academic consideration, they will receive a grade of zero on the exam.

9. Communication

- ☒ Students should check the OWL Brightspace site every 24–48 hours
- ☒ Students should email their instructor(s) and teaching assistant(s) using email
- ☒ Emails will be monitored daily; students will receive a response in 24–48 hours
- ☒ This course will use Brightspace
- ☒ Students should post all course-related queries on the discussion forum so that everyone can access the questions and responses

10. Office Hours

- ☒ Office hours will be held in-person
- ☒ Office hours will be held Friday 12-2 pm
- ☒ Office hours will be booked or drop in
- ☒ Office hours will be individual or group

11. Course Materials

- ☒ All resources will be posted on OWL Brightspace

12. Professionalism & Privacy

Western students are expected to follow the [Student Code of Conduct](#). Additionally, the following expectations and professional conduct apply to this course:

- ☒ All course materials created by the instructor(s) are copyrighted and cannot be sold/shared/upload (e.g., Must Knows Facebook group, Course Hero, Chegg, ChatGPT, etc.)
- ☒ Recordings are not permitted (audio or video) without explicit permission
- ☒ Permitted recordings are not to be distributed
- ☒ Students will be expected to take an academic integrity pledge before some assessments

Western is committed to providing a learning and working environment that is free of harassment and discrimination. All **students**, staff, and faculty have a role in this commitment and have a responsibility to ensure and promote a safe and respectful learning and working environment. Relevant policies include Western's [Non-Discrimination/Harassment Policy](#) (M.A.P.P. 1.35) and [Non-Discrimination/Harassment Policy – Administrative Procedures](#) (M.A.P.P. 1.35). Any **student**, staff, or faculty member who experiences or witnesses' behaviour that may be harassment or discrimination **must report the behaviour** to the Western's [Human Rights Office](#). Harassment and discrimination can be human rights-based, which is also known as EDI-based, (sexism, racism, transphobia, homophobia, islamophobia, xenophobia, antisemitism, and ableism) or non-human rights-based (personal harassment or workplace harassment).

13. How to Be Successful in this Class

Students enrolled in this class should understand the level of autonomy and self-discipline required to be successful.

1. Invest in a planner or application to keep track of your courses. Populate all your deadlines at the start of the term and schedule your time throughout the course.
2. Make it a daily habit to log onto OWL Brightspace to ensure you have seen everything posted to help you succeed in this class.
3. Follow checklists created on OWL Brightspace or create your own to help you stay on track.
4. Take notes as you go through the lesson material. Keeping handwritten notes or even notes on a regular Word document will help you learn more effectively than just reading or watching the videos.
5. Actively participate in class. It makes the learning experience more entertaining and engaging. I active encourage everyone to participate.
6. Connect with others. Try forming an online study group and try meeting on a weekly basis for study and peer support.
7. Do not be afraid to ask questions. If you are struggling with a topic, check the online discussion boards or contact your instructor(s) and or teaching assistant(s).
8. Reward yourself for successes. It seems easier to motivate ourselves knowing that there is something waiting for us at the end of the task.

14. Western Academic Policies/Procedures and Statements

A. Absence from Course Commitments

Medical, Compassionate, or Extenuating Circumstances

Students missing course work for medical, compassionate, or extenuating circumstances can request academic consideration by completing a request at the [Student Absence Portal](#). Students are permitted one academic consideration request per course per term **without** supporting documentation. Note that supporting documentation is **always** required for academic consideration requests for examinations scheduled by the office of the registrar (e.g., December and April exams) and for practical laboratory and performance tests (typically scheduled during the last week of the term).

Students should also note that the instructor may **designate** one assessment per course per term that requires supporting documentation. This designated assessment is described elsewhere in this document. Academic consideration requests may be denied when flexibility in assessment has already been included. Examples of flexibility in assessment include when there are assessments not required for calculation of the final grade (e.g. 8 out of 10 quizzes) or there is flexibility in the submission timeframe (e.g. 72 hour no late penalty period).

Please note that any academic considerations granted in this course will be determined by the instructor of this course, in consultation with the academic advisors in your Faculty of Registration, in accordance with information presented in this course syllabus. Supporting documentation for academic considerations for absences due to illness should use the Student Medical Certificate or, where that is not possible, equivalent documentation by a health care practitioner.

Policy: [Academic Consideration – Undergraduate Students in First Entry Programs](#)

Procedures: [Student Medical Certificate](#)

Religious Holidays

Students should review the policy for Accommodation for Religious Holidays (Appendix 1). Where a student will be unable to write examinations and term tests due to a conflicting religious holiday, they should inform their instructors as soon as possible but not later than two weeks prior to writing the

examination/term test. In the case of conflict with a midterm test, students should inform their instructor as soon as possible but not later than one week prior to the midterm.

Policy: [Accommodation for Religious Holidays](#)

Special Examinations

A Special Examination is any examination other than the regular examination, and it may be offered only with the permission of the Dean of the Faculty in which the student is registered, in consultation with the instructor and Department Chair. Permission to write a Special Examination may be given on the basis of compassionate or medical grounds with appropriate supporting documents. To provide an opportunity for students to recover from the circumstances resulting in a Special Examination, the University has implemented Special Examinations dates.

Policy: [Definitions of Types of Examinations](#)

B. Academic Appeals and Scholastic Offenses

Students can file a **request for relief from academic decisions** if the request is based on one or more grounds listed in the policy. Requests for relief generally fall into three categories, which are also listed in the policy. All requests for relief must be supported by evidence. A request for relief from academic decisions process was formally referred to as an appeal. Refer to the policy and procedures about further details and timelines.

Policy: [Requests for Relief from Academic Decisions](#)

Procedures: [Undergraduate Student Academic Requests for Relief](#)

Scholastic offences are taken seriously, and students are directed to read the appropriate policy, specifically, the definition of what constitutes a scholastic offence.

Policy: [Scholastic Offences](#)

Procedures: [Undergraduate Scholastic Offences](#)

Students may **appeal** some academic and scholastic disciplinary decisions by a Dean or their designate, to the Senate Review Board Academic (SRBA).

Policy: [Senate Review Board Academic Appeals](#)

Procedures: [Senate Review Board Academic Appeals](#)

C. 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 Accessible Education (AE) at 661-2111 x 82147 for any specific question regarding an accommodation.

Policy: [Academic Accommodation for Students with Disabilities](#)

D. Correspondence Statement

The centrally administered **e-mail account** provided to students will be considered the individual's official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at his/her official university address is attended to in a timely manner.

Policy: [Course Numbering Policy, Essay Courses, and Hours of Instruction](#)

E. Statement on the Use of Generative Artificial Intelligence (AI)

Within this course, students are permitted to use AI tools exclusively for information gathering and preliminary research purposes. These tools are intended to enhance the learning experience by providing access to diverse information sources. However, it is essential that students critically evaluate the obtained information, exercise independent thinking, and engage in original research to synthesize and develop their own ideas, arguments, and perspectives. The use of AI tools can serve as a starting point for exploration, with students expected to uphold academic integrity by appropriately attributing all sources and avoiding plagiarism. Assignments should reflect the students' own thoughts and independent written work. By adhering to these guidelines, students contribute to a responsible and ethical learning environment that promotes critical thinking, independent inquiry and allows them to produce original written contributions.

15. BMSUE Academic Policies and Statements

A. Cell Phone and Electronic Device Policy (for in-person tests and exams)

The Schulich School of Medicine & Dentistry is committed to ensuring that testing and evaluation are undertaken fairly across all our departments and programs. For all tests and exams, it is the policy of the School that any electronic devices, e.g., cell phones, tablets, cameras, smart glasses, smart watch or iPod are strictly prohibited. These devices **MUST** be left either at home or with the student's bag/jacket at the front of the room and **MUST NOT** be at the test/exam desk or in the individual's pocket. Any student found with one of these prohibited devices will receive a grade of zero on the test or exam and this will be documented as a Scholastic Offence. Non-programmable calculators are only allowed when indicated by the instructor. The program is not responsible for stolen/lost or broken devices.

B. Copyright and Audio/Video Recording Statement

Course materials produced by faculty are copyrighted and to reproduce this material for any purposes other than your own educational use contravenes Canadian Copyright Laws. You must always ask permission to record another individual and you should never share or distribute recordings.

C. Rounding of Marks Statement

Across the Basic Medical Sciences Undergraduate Education programs, we strive to maintain high standards that reflect the effort that both students and faculty put into the teaching and learning experience during this course. All students will be treated equally and evaluated based only on their actual achievement. **Final grades** in this course are rounded to the nearest whole number based on the first decimal place. For example, a grade of 74.49 or lower will be rounded to 74, whereas 74.50 or higher will be rounded to 75.

Marks **WILL NOT** be arbitrarily increased to the next grade or GPA, e.g., a 79 will **NOT** be increased to an 80, and 84 **WILL NOT** be increased to an 85, etc. The mark attained is the mark you achieved, and the mark assigned; requests for arbitrary mark increasing will be denied. Marks will be assigned based on assessments in the syllabus and no extra work or tasks will be assigned to increase a mark.

Course grade rounding provisions, as described above, differ from cumulative and term averages. Cumulative and term averages will be calculated to two decimal places and rounded to the nearest whole number with .45 rounded up, for the purposes of admission to and progression in modules, scholarship retention, and Dean's Honour List.

Policy: [Marks/Grades; Definitions of Grades; Grading Scale for Undergraduate Students](#)

16. Support Services

Students who are in emotional/mental distress should refer to Mental Health @Western <https://www.uwo.ca/health/> for a complete list of options about how to obtain help.

Statement on Gender-Based and Sexual Violence

Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced sexual or gender-based violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts at the following website:

https://www.uwo.ca/health/student_support/survivor_support/get-help.html

To connect with a case manager or set up an appointment, please contact support@uwo.ca.

Other important links:

- [Academic Advising \(Science and Basic Medical Sciences\)](#)
- [Learning Development and Success](#)
- [Office of the Registrar](#)
- [Wellness & Wellbeing](#)
- [Western USC Services](#)

Appendix 1: Western University Academic Policies and Procedures

The policies and procedures listed in this syllabus are outlined in the table below. In some cases, a policy does not include an accompanied procedures document.

Academic Policy	Name of Policy/Procedure	Links
General Policy	Marks/Grades; Definitions of Grades; Grading Scale for Undergraduate Students	Policy
General Policy	Structure of the Academic Year	Policy
Registration, Progression, Graduation	Course Numbering Policy, Essay Courses, and Hours of Instruction	Policy
Registration, Progression, Graduation	Undergraduate Course Credit	Policy • Procedures
Examinations	Definitions of Types of Examinations	Policy
Examinations	Evaluation of Academic Performance	Policy
Examinations	Examination Conflicts	Policy
Rights and Responsibilities	Academic Accommodation for Students with Disabilities	Policy
Rights and Responsibilities	Accommodation for Religious Holidays	Policy
Rights and Responsibilities	Policy on Academic Consideration – Undergraduate Students in First Entry Programs	Policy • Procedures
Rights and Responsibilities	Requests for Relief from Academic Decisions (Undergraduate)	Policy • Procedures
Rights and Responsibilities	Requests for Relief from Academic Decisions (Graduate)	Policy • Procedures
Rights and Responsibilities	Scholastic Offences (Undergraduate)	Policy • Procedures
Rights and Responsibilities	Senate Review Board Academic Appeals	Policy • Procedures