 Although this academic year might be different, Western University is committed to a thriving campus. We encourage you to check out the Digital Student Experience website to manage your academics and well-being. Additionally, the following link provides available resources to support students on and off campus: https://www.uwo.ca/health/.

1. Technical Requirements:

- Stable internet connection
- Laptop or computer
- Working microphone
- Working webcam

2. Important Dates:

<table>
<thead>
<tr>
<th>Classes Begin</th>
<th>Classes End</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wednesday, September 8, 2021</td>
<td>Wednesday, December 8, 2021</td>
</tr>
</tbody>
</table>

* November 12, 2021: Last day to drop a first-term half course without academic penalty

<table>
<thead>
<tr>
<th>Reading Week</th>
<th>Study day(s)</th>
<th>Exam Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>November 1–7</td>
<td>December 9</td>
<td>December 10–21</td>
</tr>
</tbody>
</table>

3. Contact Information

<table>
<thead>
<tr>
<th>Course Coordinator &amp; Instructor</th>
<th>Contact Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Daniel Goldman</td>
<td><a href="mailto:dgoldma2@uwo.ca">dgoldma2@uwo.ca</a>, Office: HSA 21</td>
</tr>
</tbody>
</table>
4. Course Description and Design

**Delivery Mode:** [in-person]

Biophysics related to blood flow: Biomechanical properties of blood, arteries, and veins; pressure, flow, and Poiseuille’s law; optimality principles; fluid flow conservation laws and their mathematical description; pulsatile flow in rigid vessels; wave propagation in elastic vessels; structure and blood rheology of the microcirculation; oxygen delivery and flow regulation.

**Requisites:**
Prerequisite(s): Medical Biophysics 3501A, Medical Biophysics 3503G, Medical Biophysics 3505F and Medical Biophysics 3507G; or permission of the department.

**Senate regulation regarding the student's responsibility regarding requisites:**
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**

<table>
<thead>
<tr>
<th>Component</th>
<th>Date(s)</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture (incl. Quiz and Discussion)</td>
<td>W</td>
<td>4:30-6:30pm</td>
</tr>
</tbody>
</table>

☑ Attendance at sessions is required
☑ Missed work should be completed within 24 hours

All course material will be posted to OWL: [http://owl.uwo.ca](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](http://owl.uwo.ca). Alternatively, they can contact the [Western Technology Services Helpdesk](http://owl.uwo.ca). 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; update your browsers frequently. Students interested in evaluating their internet speed, please click here.

**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. Learning Outcomes

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

- Demonstrate an understanding of the basic biomechanical properties of the blood, arteries and veins.
- Demonstrate an understanding of the principles of blood flow in arteries, including mass conservation, force balance, pressure, viscosity, shear stress, inertia, and vessel elasticity, and how these are involved in pulsatile flow and wave propagation.
- Demonstrate an understanding of the principles of blood flow in the microcirculation, including the role of discrete red blood cells in producing the Fahraeus effect, the Fahraeus-Lindqvist effect, and plasma skimming at diverging bifurcations.
- Demonstrate an understanding of oxygen transport by diffusion and convection, the implications for flow regulation, and some of the ways this regulation is accomplished.
- Apply the above blood flow and mass transport principles, and their mathematical descriptions, to quantitative analysis of problems in vascular physiology and pathophysiology.

6. Course Content and Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Dates</th>
<th>Topic</th>
<th>Assignments/Quizzes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sept 8</td>
<td>Intro/The circulatory system: Blood, heart, arteries and veins</td>
<td>HONOUR PLEDGE</td>
</tr>
<tr>
<td>2</td>
<td>Sept 15</td>
<td>Basic flow dynamics: Pressure, flow, resistance, and Poiseuille’s Law</td>
<td>Quiz #1, Asst. #1 (Assignment 1 due Sept. 22nd)</td>
</tr>
<tr>
<td>3</td>
<td>Sept 22</td>
<td>Applications of Poiseuille’s Law: Electrical analogues and optimality</td>
<td>Asst. #2 (Due Sept. 29th)</td>
</tr>
<tr>
<td>4</td>
<td>Sept 29</td>
<td>Equations of fluid flow: Continuity, Bernoulli, Navier-Stokes</td>
<td>Asst. #3 (Due Oct. 6th)</td>
</tr>
<tr>
<td>5</td>
<td>Oct 6</td>
<td>Womersley flow: Pulsatile flow in rigid vessels</td>
<td>Quiz #2</td>
</tr>
<tr>
<td>6</td>
<td>Oct 13</td>
<td>Wave propagation: Pulsatile flow in elastic vessels</td>
<td>Quiz #3</td>
</tr>
<tr>
<td>7</td>
<td>Oct 20</td>
<td>In-Class Test</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Oct 27</td>
<td>Pulsatile flow</td>
<td>Asst. #4 (Due Nov. 10th)</td>
</tr>
<tr>
<td>9</td>
<td>Nov 3</td>
<td>Reading Week</td>
<td>N/A</td>
</tr>
<tr>
<td>10</td>
<td>Nov 10</td>
<td>Structure of the microcirculation</td>
<td>Quiz #4</td>
</tr>
<tr>
<td>11</td>
<td>Nov 17</td>
<td>Microvascular blood rheology</td>
<td>Asst. #5 (Due Nov. 24th)</td>
</tr>
<tr>
<td>12</td>
<td>Nov 24</td>
<td>Microvascular oxygen delivery</td>
<td>Asst. #6 (Due Dec. 1st)</td>
</tr>
<tr>
<td>13</td>
<td>Dec 1</td>
<td>Microvascular blood flow regulation: basic mechanisms and modeling</td>
<td>Quiz #5</td>
</tr>
<tr>
<td>14</td>
<td>Dec 8</td>
<td>Review</td>
<td></td>
</tr>
</tbody>
</table>
7. Participation and Engagement

☑ Students are expected to participate and engage with content as much as possible
☑ Students can participate during lecture sessions or post online forum
☑ Students can also participate by interacting in the forum with their peers and instructor

8. Evaluation

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

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Format</th>
<th>Weighting %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>There will be a total of 6 assignments, each worth 6%. They will be posted online on the date noted, and will be due in one week. If you work on an assignment as a group (&lt;=4 students), you should hand in a single assignment with the names and student numbers of all contributing students indicated.</td>
<td>36</td>
</tr>
<tr>
<td>Quizzes</td>
<td>There will be a total of 5 quizzes, each worth 3%. They will take 10 minutes to complete and be given via OWL Tests and Quizzes at the beginning of Lecture (4:30-4:45pm) on the date noted.</td>
<td>15</td>
</tr>
<tr>
<td>Participation</td>
<td>This mark will be based on attendance/participation at weekly in-person lectures and discussions, and participation in the online forum.</td>
<td>5</td>
</tr>
<tr>
<td>In-Class Test</td>
<td>Closed book, 1 hour in class on the date noted, covering material through Womersley flow in rigid vessels</td>
<td>16</td>
</tr>
<tr>
<td>Final Exam</td>
<td>Closed book, 2 hours in person during the final exam period (date TBD), cumulative but weighted to material after Womersley flow in rigid vessels</td>
<td>28</td>
</tr>
</tbody>
</table>

☑ All assignments are due at 4:00 PM EST unless otherwise specified
☑ Students will have two (2) submissions per assignment
☑ All quizzes will have 10 minutes or until 04:45 PM EST whichever is shorter to complete this assessment
☑ All quizzes will be submitted at that time, regardless of whether you have answered all the questions
☑ Students will have one (1) submission per quiz
☑ No virtual proctoring will be used

Click [here](#) for a detailed and comprehensive set of policies and regulations concerning examinations and grading. The table below outlines the University-wide grade descriptors.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Score Range</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>90-100</td>
<td>One could scarcely expect better from a student at this level</td>
</tr>
<tr>
<td>A</td>
<td>80-89</td>
<td>Superior work which is clearly above average</td>
</tr>
<tr>
<td>B</td>
<td>70-79</td>
<td>Good work, meeting all requirements, and eminently satisfactory</td>
</tr>
<tr>
<td>C</td>
<td>60-69</td>
<td>Competent work, meeting requirements</td>
</tr>
<tr>
<td>D</td>
<td>50-59</td>
<td>Fair work, minimally acceptable</td>
</tr>
<tr>
<td>F</td>
<td>below 50</td>
<td>Fail</td>
</tr>
</tbody>
</table>
Information about late or missed evaluations:

- Late assignments without self-reported or documented absence will NOT be accepted.
- Late assignments with self-reported absence should be submitted within 48 hours of the original due date; with documented absence an accommodation should be discussed with the instructor.
- Missed quizzes cannot be made up, but with self-reported or documented absence their weight will be distributed to the quizzes taken.
- A missed In-Class Test cannot be made up and its weight will be transferred to Final Exam; a missed Final Exam must be made up.
- If a make-up assessment is missed, the student will receive an INC and complete the task the next time the course is offered.

9. Communication:

- Students should check the OWL site every 24 – 48 hours.
- Students should email their instructor using his UWO email address.
- This course will have discussions in-person and using an OWL forum.
- Students should post all course-related questions and answers on the discussion forum so that everyone can access.
- The discussion forums will be monitored every 24 – 48 hours by the instructor.

10. Office Hours:

- Office hours will be held using Zoom every Monday 3:00 pm – 4:00 pm or by appointment.
- Students will be able to sign up for an appointment using Email.
- Office hours will NOT be recorded.

11. Resources

- Lecture Slides will be posted in OWL.
- Suggested References are below or as given/posted during the course.

  **Main Textbook**

  **Supplementary Textbooks**
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.
- 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.

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 time at the start of each week to get organized and manage your time.
2. Make it a daily habit to log onto OWL to ensure you have seen everything posted to help you succeed in this class.
3. Take notes as you go through the material. Treat this course as you would a face-to-face course. Keeping handwritten notes or even notes on a regular Word document will help you learn more effectively than just reading or watching the videos.
4. Connect with others. Try forming an online study group and try meeting on a weekly basis for study and peer support.
5. Do not be afraid to ask questions. If you are struggling with a topic, check the online discussion board or contact your instructor.

14. Western Academic Policies and Statements

Absence from Course Commitments

Policy on Academic Consideration for Student Absences

If you are unable to meet a course requirement due to illness or other serious circumstances, you must seek approval for the absence as soon as possible. Approval can be granted either through a self-reported absence or via the Academic Counselling unit. Students have two self-reports to use throughout the academic year; absence from course commitments including tests, quizzes, presentations, labs, and assignments that are worth 30% or less can be self-reported. Self-reported absences cover a student for 48 hours (yesterday + today or today + tomorrow). Your instructor will receive notification of your consideration; however, you should contact your instructor immediately regarding your absence. Students are expected to submit missed work within 24 hours of the end of the 48-hour period. Please review details of the university’s policy on academic consideration for student absences.

If you have used both their self-reported absences or will miss more than 48 hours of course requirements, a Student Medical Certificate (SMC) should be signed by a licensed medical or mental health practitioner and you should contact academic counselling. Academic Counselling will be operating virtually this year and can be contacted at scibmsac@uwo.ca.
Accommodation for Religious Holidays

The policy on Accommodation for Religious Holidays can be viewed here.

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. These dates as well as other important information about examinations and academic standing can be found here.

Academic Offenses

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

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 or review The policy on Accommodation for Students with Disabilities.

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. You can read about the privacy and security of the UWO email accounts here.

Discovery Credit Statement

Students are permitted to designate up to 1.0 Discovery Credit course (or equivalent) for pass/fail grading that can be counted toward the overall course credits required for their degree program. The details of this policy and the deadlines can be found here.

Essay Course Guidelines

The guidelines for the minimum written assignments refer to the cumulative amount of written work in a course but excludes written work in examinations. You can read about essay course guidelines here.

An essay course must normally involve total written assignments (essays or other appropriate prose composition, excluding examinations) as follows:

- Full course (1000 to 1999): at least 3000 words
- Half course (1000 to 1999): at least 1500 words
- Full course (2000 and above): at least 5000 words
- Half course (2000 and above): at least 2500 words

The structure of the essay course must be such that in order to pass the course, the student must exhibit some minimal level of competence in essay writing and the appropriate level of knowledge of the content of the course.
Turnitin and other similarity review software

All assignments will be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. Students will be able to view their results before the final submission. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between Western University and Turnitin.com.

15. BMSUE Academic Policies and Statements

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, i.e., cell phones, tablets, cameras, 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. Non-programmable calculators are only allowed when indicated by the instructor. The program is not responsible for stolen/lost or broken devices.

Copyright and Audio/Video Recording Statement

Course material produced by faculty is 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.

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 on this course, irrespective of the number of decimal places used in marking individual assignments and tests, will be calculated to one decimal place and rounded to the nearest integer, e.g., 74.4 becomes 74, and 74.5 becomes 75. Marks WILL NOT be bumped to the next grade or GPA, e.g. a 79 will NOT be bumped up to an 80, an 84 WILL NOT be bumped up to an 85, etc. The mark attained is the mark you achieved, and the mark assigned; requests for mark “bumping” will be denied.

16. Support Services

The following links provide information about support services at Western University.

- Academic Counselling (Science and Basic Medical Sciences)
- Appeal Procedures
- Registrarial Services
- Student Development Services
- Student Health Services