

**Department of Medical Biophysics**  
**Medical Biophysics 4501A**

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.*

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 4	November 3–9	December 9	December 10	December 11–22

September 30, 2025: National Day for Truth and Reconciliation; non-instructional day

September 12, 2025: Last day to add or drop a Fall 12-week course

December 1, 2025: Last day to withdraw from a Fall 12-week course without academic penalty

**3. Contact Information**

Course Coordinator	Contact Information

Instructor(s) or Teaching Assistant(s)	Contact Information

#### 4. Course Description and Design

Lectures and seminars highlight topics in cardiovascular, circulatory, and respiratory sciences that medical biophysics cover while introducing important concepts and the multidisciplinary nature of research, professionals, and applications in the field. Key themes are mathematical modelling, experimental models, and technologies used in research and clinic.

**Antirequisite(s):** the former Medical Biophysics 3507G, the former Medical Biophysics 4535A/B.

**Prerequisite(s):** Medical Biophysics 3501A.

**Delivery Mode:** in-person

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**

<b>Component</b>	<b>Date(s)</b>	<b>Time</b>	<b>Location</b>
Section 001 Lecture		(2 hours)	
Section 002 Tutorial		(1 hour)	

- ☒ Attendance at sessions is required
- ☒ A recording will NOT be provided of tutorial or lecture sessions

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

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

- **Knowledge**

In this course we will draw upon skills you have already acquired in the disciplines of biology, mathematics and physics in order to guide you towards solving problems involving oxygen convection, diffusion and consumption, as well as blood flow, in a variety of novel biological situations. These will include problems such as the challenge of supplying oxygen to the cornea when you wear contact lenses, how far oxygen can diffuse from capillaries into the surrounding tissue, and how oxygen diffusion limits tumour growth. With this knowledge of how to apply fundamental biophysical principles to model and understand complex biological problems, *graduates of this course will be prepared to imagine and generate novel solutions to new unanswered questions in the future.*

- **Literacies and Interdisciplinarity**

By design, this is an interdisciplinary course that applies appropriate analytical and modelling techniques (mainly, solving linear differential equations and graphical analysis of solutions) to solve problems in biology. *Graduates of this course will be able to apply appropriate terminology from these diverse disciplines.*

- **Resilience and Life-long Learning**

*Graduates of this course will have a deep appreciation of how to apply problem-solving skills in a real world setting which will contribute to their life-long learning in both academic and non-academic settings.*

- **Critical Inquiry and Creative Thinking**

*Graduates of this course will know how to extract and define solvable problems from a mass of poorly structured information, and how to develop an organized strategy for exploring, planning and solving a problem while looking back to review whether the solution achieves the original goals.*

- **Communication**

*Graduates of the course will recognize the importance of effective communication and be able to communicate to others in an effective way the step-by-step processes they used in reaching a solution and demonstrate how they evaluate their solutions realistically in light of their practical knowledge of biology.*

- **Professionalism and Ethical Conduct**

- *Graduates of the course will be able to identify underlying assumptions and how those assumptions may impact the resulting solution to a problem. Through the team problem solving assignments, graduates will develop critical aspects of professionalism and ethical conduct of shared responsibility and respective group interactions.*

## 6. Course Content and Schedule

Week	Dates	Topic	Assignment	Quizzes
1		No lecture or tutorials, first lecture is on Sept 9th		
2		<b>Introduction:</b> Course Details, Problem Solving, Challenger Disaster, Introduction to Oxygen Diffusion in Biology		
3		<b>Introductory Oxygen Mass Balance:</b> Geometry, Basic Boundary Conditions, Interface Boundary Conditions		QUIZ 1:
4		<b>Advanced Oxygen Mass Balance:</b> Multi-layer Diffusion, Diffusion Distances in Different Geometries, Specialized Boundary Conditions	ASSN. 1	
5		<i>No lecture this week, on account of Truth and Reconciliation Day falling on a Tuesday</i>	PROJECT: Part A	QUIZ 2:
6		<b>Cornea-Contact Lens Model:</b> Development, Solution and Interpretation		
7		<b>Spheroid Tumor Model:</b> Development, Solution and Interpretation/ Mid-Term (P)Review	ASSN. 2,	
8		<b>Convective Transport of Oxygen:</b> Advection, Oxygen Carriers  <b>IN CLASS MIDTERM EXAM</b>	ASSN. 3	
9		<b>Krogh Tissue Cylinder Model:</b> Development, Solution and Interpretation		QUIZ 3:
10		<i>Reading Week, no assignments or quizzes</i>		
11		<b>Introduction to Blood Flow Physics:</b> Steady Flow in Large Vessels, Flow in Vascular Networks	ASSN. 4,	QUIZ 4:
12		<b>Microvascular Rheology:</b> Single Vessels, Murray's Law, Oxygen Transport in Arterioles, Branching Conservation Laws, Two-Phase Blood Flow	ASSN. 5,	QUIZ 5:
13		<b>Unsteady Oxygen Diffusion:</b> Analytical Solutions and Application to Measuring Diffusion Coefficients  <i>Project Presentations in Tutorial</i>	ASSN. 6,	
14		<b>Computational Modeling and Applications:</b> Unsteady Problems, Finite-Difference, Finite-Element, Network Models, Structural Models  <i>Project Presentations in Tutorial</i>	PROJECT: Part B “	
15		<b>Final Exam Review</b>	PROJECT: Part C	

## 7. Participation and Engagement

- ☒ Students are expected to **participate** and **engage** with content as much as possible
- ☒ Students are expected to participate by interacting in the forums with their peers and instructors
- ☒ Students are expected to participate during **tutorial sessions**

## 8. Assessment and Evaluation

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

Assessment	Format	Weight	Flexibility
Project	Three-part, group problem-solving project (Part A, B, and C).	20	N/A
Assignments	Six equally weighed assignments, posted online during Tutorial, and due the next Friday (see schedule)	25	Drop lowest 1
Quizzes	Total of 5 quizzes, approximately 30 minutes to complete. Given during first half of tutorial via Brightspace. Quizzes will be announced on OWL approximately one week in advance.	10	N/A
Midterm	In class on October, second half of lecture. (45min writing time, up to and including week 6). Multiple Choice, Short Problem, Problem Solving	15	N/A
Final Exam	In Person, cumulative but weighted to material after Reading Week. Date and time TBD by the Registrar (2hr writing time). Short Problem, Long Problem Solving	30	N/A

**Designated Assessment:** The following assessment has been designated as requiring supporting documentation]:

- Three-part, group problem-solving project (Part A, B, and C).

### Information about flexibility in assessment

- ☒ Flexibility in assessment has been applied to this course; therefore, academic consideration requests may be denied on the assessments where flexibility is included

### General information about assessments

- ☒ All assignments are due at 11:59 PM EST on Friday unless otherwise specified
  - ☒ All quizzes will have 30 minutes to complete during the day of your assigned tutorial
  - ☒ All quizzes will be submitted at the end of this period, regardless of whether you have answered all the questions
  - ☒ Students will have one (1) submission per quiz
  - ☒ Students are responsible for ensuring that the correct file version is uploaded for all assessments where applicable; incorrect submissions including corrupt files could be subject to late penalties (see below) or a 0
  - ☒ Written assignments may be submitted to Turnitin (statement in policies below) if instructor deems necessary. Students are encouraged to check for compliance before submission.
  - ☒ 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, it is advised for students to 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
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- ☒ 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 Department 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 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
- ☒ Quizzes CANNOT be made up, but with self-reported or documented absence their weight will be distributed to remaining quizzes
- ☒ Midterm cannot be made up, but with self-reported or documented absence the weight will be distributed to the final exam
- ☒ If the final exam is missed, arrangements must be made to make-up the exam. If the make-up final exam is missed, the student will receive an INC and complete the task the next time the course is offered
- ☒ An assessment cannot be submitted after it has been returned to the class; [an alternate assessment will be assigned] OR [the weight will be transferred to the final grade]
- ☒ Only one special examination (see below) will be offered in January

**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 or the student misses the makeup for the final exam for reasons approved by the Academic Advising Office, 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.

## 9. Communication

- ☒ Students should check the OWL Brightspace site every 24–48 hours
- ☒ Students should email their instructor and teaching assistant(s) using their UWO email address
- ☒ Students will receive email responses in 48-72 hours
- ☒ This course will use discussions on Brightspace
- ☒ Students should post all course-related queries on the discussion forum so that everyone can access the questions and responses

- ☒ Discussion forums on Brightspace will be monitored every 24-48 hours

## 10. Office Hours

- ☒ Office hours will be held in-person on Tuesdays. Additional hours may be arranged by appointment.
- ☒ Office appointments may be arranged via e-mail.

## 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. Connect with others. Try forming an online study group and try meeting on a weekly basis for study and peer support.
6. 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).
7. 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 [central academic consideration 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 Offences**

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.

## **E. 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.

**Policy:** [Undergraduate Course Credit](#)

**Procedures:** [Discovery Credits](#)

#### **F. Statement on the Use of Electronic Devices**

[Insert a clear statement of what electronic devices will or will not be allowed during tests and examinations.]

#### **G. Statement on the Use of Generative Artificial Intelligence (AI)**

In this course, the use of artificial intelligence tools (including but not limited to: ChatGPT, Copilot, Claude, Gemini, or any automated problem-solving or writing generator) is strictly prohibited for all course-related work unless the instructor explicitly authorizes a specific use in advance. This prohibition applies to all stages of work, including brainstorming, outlining, drafting, solving, explaining, or editing.

The central purpose of this course is to develop your own capacity to think, reason, and model biological systems mathematically. Any reliance on AI to perform intellectual or analytical tasks undermines that goal, produces an inaccurate representation of your abilities, and will be considered an academic integrity violation. Therefore, students must complete all problem-solving steps, derivations, modeling analyses, and written explanations entirely on their own. Any text, figures, or reasoning influenced by AI, even partially, must be clearly identified and attributed, and will be subject to grading penalties or rejection.

Bottom line: If you are unsure whether AI use is allowed for a particular task, assume it is not. The safest and most productive path in this course is to do all thinking, analysis, and writing yourself.

#### **H. Turnitin and other similarity review software**

All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. 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](https://www.turnitin.com).

Computer-marked multiple-choice tests and/or exams may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.

**Policy:** [Evaluation of Academic Performance](#)

### **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](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](mailto: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	<a href="#">Policy</a>
General Policy	Structure of the Academic Year	<a href="#">Policy</a>
Registration, Progression, Graduation	Course Numbering Policy, Essay Courses, and Hours of Instruction	<a href="#">Policy</a>
Registration, Progression, Graduation	Undergraduate Course Credit	<a href="#">Policy</a> • <a href="#">Procedures</a>
Examinations	Definitions of Types of Examinations	<a href="#">Policy</a>

Examinations	Evaluation of Academic Performance	<a href="#">Policy</a>
Examinations	Examination Conflicts	<a href="#">Policy</a>
Rights and Responsibilities	Academic Accommodation for Students with Disabilities	<a href="#">Policy</a>
Rights and Responsibilities	Accommodation for Religious Holidays	<a href="#">Policy</a>
Rights and Responsibilities	Policy on Academic Consideration – Undergraduate Students in First Entry Programs	<a href="#">Policy</a> • <a href="#">Procedures</a>
Rights and Responsibilities	Requests for Relief from Academic Decisions (Undergraduate)	<a href="#">Policy</a> • <a href="#">Procedures</a>
Rights and Responsibilities	Requests for Relief from Academic Decisions (Graduate)	<a href="#">Policy</a> • <a href="#">Procedures</a>
Rights and Responsibilities	Scholastic Offences (Undergraduate)	<a href="#">Policy</a> • <a href="#">Procedures</a>
Rights and Responsibilities	Senate Review Board Academic Appeals	<a href="#">Policy</a> • <a href="#">Procedures</a>