

1. Course Information

**Medical Biophysics 3501F:
Biophysics of Transport Systems
Fall Term 2014**

This course describes the physiology and biophysics of the cardiovascular system (in health and disease), blood flow control and red blood cell distribution, and 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.

Antirequisite(s): Medical Biophysics 3302E.

Prerequisite(s): one of Calculus 1000A/B, 1100A/B, Mathematics 1225A/B, Applied Mathematics 1413 or the former Mathematics 030; 1.0 course from Physics 1020, 1024, 1028A/B and 1029A/B, or the former Physics 022 or 025. Typically taken in third or fourth year, this course is also open to second-year students with an overall average of at least 70% in first year.

Extra Information: 2 lecture hours, 1 tutorial hour, 0.5 course.

Lectures

Tuesday and Thursday: 1:30 -2:30 NCB 117

Tutorial

Tuesday Group: 12:30 - 1:30 pm UC 295

Wednesday Group: 11:30 am – 12:30 pm NS 7

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 **Senate regulation**

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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.

Please contact the course instructor if you require material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 661-2111 x 82147 for any specific question regarding an accommodation.

2. Instructor Information

Instructors	Email	Office	Phone	Office Hours
Dr. Dwayne N. Jackson, PhD (Course Coordinator)	dwayne.jackson@schulich.uwo.ca	M404	82815	During Tutorials
Dr. Graham Fraser, PhD	gmfraser@uwo.ca	M411	85867	During Tutorials

OWL (Formerly WebCT):

Students with Owl issues should contact the Computer Support Centre at 519 661-3800

3. Course Syllabus

This course replaces the first half of the former Medical Biophysics 3302E with tutorials and extra assignments instead of the laboratories. It is used together with Medical Biophysics 3503G and 3970Z (lab) to replace 302E in the Medical Biophysics modules. This course is also cross-listed with Biomedical Engineering 9501A and serves as the first half of Medical Biophysics 9500.

General information:

(from: http://www.uwo.ca/univsec/pdf/academic_policies/exam/courseoutlines.pdf)

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LEARNING OUTCOMES

By the end of the course students will be able to:

- (i) Use the concepts of vascular pressure, geometry and elasticity along with blood viscosity and velocity to assess energy storage and convective transport throughout the body. Use the concepts of partial pressure, diffusion, and microvascular geometry and blood flow to assess diffusive transport in tissues. Analyze series and parallel circuits to determine the effects of the control of vascular resistance on blood pressure and flow under normal and pathological conditions.
- (ii) Use problem solving to integrate concepts from each lecture in an effort to understand and describe the biophysics of the circulation in healthy and diseased states.
- (iii) Critically evaluate current research using biophysical concepts learned in class.

APPROACH

Lecture-discussion periods: Presentation of material supported by class discussion and demonstrations. Assignments are provided to apply and advance knowledge and to help students and lecturers assess progress.

Tutorials: Review of lecture material and discussion of assignments.

TERM WORK BASED ON LECTURES

TUTORIAL ATTENDANCE IS MANDATORY. Regular **ASSIGNMENTS** based on selected journal articles and class material will be given out approximately biweekly (during tutorial sessions) and will be due in tutorial the following week. Marks (5% per day) will be deducted for assignments submitted late and those handed in after the marked assignments have been returned will not be marked. Students are encouraged to work together, but the assignment *must be written up independently*.

ASSIGNMENTS ARE TO BE SUBMITTED (ON PAPER) IN TUTORIALS

TEACHING ASSISTANTS: TBA

VENUE:

Lectures

Tuesday and Thursday: 1:30 -2:30 NCB 117

Tutorial

Tuesday Group: 12:30 - 1:30 pm UC 295

Wednesday Group: 11:30 am – 12:30 pm NS 7

Medical Biophysics 3501F			
DATE 2013	Instructor	LECTURE TOPICS	ASSIGNMENTS & TUTORIALS
SEPTEMBER 4	DJ	-INTRO TO CLASS	
9 11	GF	-Cardiac function and biophysics of the cardiac cycle and systemic circulation	
16 18	GF	-Distribution of blood to tissues	ASSIGNMENT #1
23 25	GF	-Angiogenesis and microvascular geometry -Behavior of blood in the microcirculation	
30 OCTOBER 2	GF	-Blood Rheology: Viscosity and red blood cell distribution in the microcirculation	ASSIGNMENT #2
7 9	GF	-Veins and venous return - Introduction to the pulmonary circulation and lungs	
14 16	GF	-Gas exchange in the lungs -Surfactants	ASSIGNMENT #3

21 23	DJ	-Biophysical measurement techniques in microcirculatory research	
28 NOVEMBER 4 6 11	MIDTERM DJ	-In-class mid-term test ON OCTBER 28 -Resistance to flow in series and parallel circuits	ASSIGNMENT #4
13 18	GF	-Mathematical modeling in microcirculatory research	
20 25	DJ	-Disease and alterations in cardiovascular biophysics	ASSIGNMENT #5
27	DJ	-Cardiac pulse, pressure and blood velocity waves	
DECEMBER 2	DJ	EXAM REVIEW	
FINAL EXAM (time set by Registrar) - 2 hours (covers all topics)			

4. Course Materials

There is no formal text for the course. Instructional material will be provided electronically on OWL and students may be directed to on-line references.

5. Evaluation:

Component % of Final Mark

Midterm test 30

Assignments 25

Attendance/Class Participation 5

Final exam 40

6. Additional Information/Statements

Statement on Academic Offences

“Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following website:

http://www.uwo.ca/univsec/handbook/appeals/scholastic_discipline_undergrad.pdf.”

“Plagiarism: Students must write their essays and assignments in their own words. Whenever students take an idea, or a passage from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. Plagiarism is a major academic offence (see Scholastic Offence Policy in the Western Academic Calendar).”

THE USE OF ELECTRONIC DEVICES

All cellular telephones and recording devices must be turned off during class time. Using laptops and cellular telephones for personal enjoyment (e.g., Facebook, email, texting, twitter) during the class is unacceptable and will result in you being asked to leave the classroom and negatively affect your participation mark. Furthermore, usage of computers for purposes that are not related directly to class participation during class time (i.e. note taking) will result in restricting the use of computers in class. Finally, students are not permitted to record lectures using any electronic recording devices. Lectures are the intellectual property of the professor and unauthorized recording of lectures is considered an academic offence. Students who require assistance with note taking should consult the Student Development Centre.

Absence from course commitments

A. Absence for medical illness:

Students must familiarize themselves with the Policy on Accommodation for Medical Illness: <https://studentservices.uwo.ca/secure/index.cfm>

Statement from the Dean’s Office, Faculty of Science

If you are unable to meet a course requirement due to illness or other serious circumstances, you must provide valid medical or other supporting documentation to the Dean's office as soon as possible and contact your instructor immediately. It is the student's responsibility to make alternative arrangements with their instructor once the accommodation has been approved and the instructor has been informed. In the event of a missed final exam, a "Recommendation of Special Examination" form must be obtained from the Dean's Office immediately. For further information please see: <http://www.uwo.ca/univsec/handbook/appeals/medical.pdf>

A student requiring academic accommodation due to illness, should use the Student Medical Certificate when visiting an off-campus medical facility or request a Record's

Release Form (located in the Dean's Office) for visits to Student Health Services.
The form can be found at:
https://studentservices.uwo.ca/secure/medical_document.pdf

B. Absence for non-medical reasons:

A clear indication of how **non-medical absences** from midterms, tutorials, laboratory experiments, or late essays or assignments, will be dealt with must be provided. If documentation is required, such documentation must be submitted by the student directly to the appropriate Faculty Dean's Office and **not** to the instructor. It will subsequently be the Dean's Office that will determine if accommodation is warranted.

C. 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.

A Special Examination must be written at the University or an Affiliated University College no later than 30 days after the end of the examination period involved. To accommodate unusual circumstances, a date later than this may be arranged at the time permission is first given by the Dean of the Faculty. The Dean will consult with the instructor and Department Chair and, if a later date is arranged, will communicate this to Registrarial Services. If a student fails to write a scheduled Special Examination, permission to write another Special Examination will be granted only with the permission of the Dean in exceptional circumstances and with appropriate supporting documents. In such a case, the date of this Special Examination normally will be the scheduled date for the final exam the next time the course is offered.

Students that are in emotional/mental distress should refer to Mental Health@Western, <http://www.uwo.ca/uwocom/mentalhealth/>, for a complete list of options about how to obtain help.

Support Services:

Registrarial Services: <http://www3.registrar.uwo.ca/index.cfm>

Academic Counselling (Science and Basic Medical Sciences):
<http://www.uwo.ca/sci/counselling/index.html>

Student Development Services: <http://www.sds.uwo.ca>

Student Health Services: <http://www.shs.uwo.ca/>