1. Course Information (Draft 20140825)

Medical Biophysics 3970Z:
General Biophysics Laboratory
Full Year half course 2014-2015

Intended primarily for students in Honors Specialization and Major modules in Medical Biophysics. Laboratories include topics from biomechanics (mechanical properties of arteries and bone), imaging (quantitative stereology, optical CT), biophysical analysis (diffusion and washout models), and transport systems (cardiovascular fluid dynamics). Includes an individual 6-week project in a research laboratory.

Extra Information: 3 laboratory hours (3 laboratory hours every other week and up to 3 tutorial hours, at the instructor's discretion, in alternate weeks).
0.5 course spanning both the Fall and Winter terms.

Laboratory/Tutorial:
Tuesday/Wednesday 2:30-5:30 MSB-113

Although 3 hours are available for data collection and interaction with the instructors, it is expected that some labs and most tutorials and demonstrations will be completed in less time.

Antirequisite(s): The former Medical Biophysics 3302E.

Pre-or Corequisite(s): Medical Biophysics 3330F/G; Medical Biophysics 3501F; Medical Biophysics 3505F.

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.

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 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
Ian MacDonald (Course Coordinator)	(via OWL)/ imacd@uwo.ca	M136	86543	Tues, Wed 11:30 – 12:30
Hanif Ladak (MatLab)	(via OWL)	M415	85867	TBA
Jacob Matthews	(via OWL)			TBA

OWL:
Students with OWL issues should see: https://owl.uwo.ca/portal/site/owldocs

3. Course Syllabus

This course replaces the laboratory component of the former Medical Biophysics 3302E

COURSE OBJECTIVES -

(i) To complement the lecture material presented in MBP 3501F (Transport Systems), MBP 3505F (Mathematical Transforms) and MBP3330F (Biomechanics)
(ii) To provide hands on experience using a biophysics approach to research.
(iii) To prepare students for the Medical Biophysics major 4th year research project (MBP 4970)

APPROACH

Set laboratory exercises: Approximately 5 set exercises will be performed by small groups of students where raw data is collected for further analysis. Some labs will require the full 3 hours while others may be completed in less time. Preliminary analysis will be discussed in a group session a week or two following the lab and reports (common data, individual analysis and discussion) are submitted the following week.

Research Lab Tours: Students are given the opportunity to visit research labs in small groups. This provides an opportunity for students to obtain an overview of research in medical biophysics, make contacts and plan for their six-week project.

Demonstrations: Specialized equipment such as portable ultrasound and benchtop optical CT scanners will be used to demonstrate principles of medical imaging.

Six-Week Projects: During the latter part of the year, students work in biophysics research labs on individual projects. This provides them with an opportunity to experience the research environment, contribute to ongoing projects and plan for their 4th year project.

(Examples of previous projects are available in the undergraduate section of the department website)

Expected Outcomes - Upon completion of the course, students should be able to:

1. Analyse digital images using programs such as ImageJ or MATLAB to adjust contrast and brightness, to use segmentation to isolate objects and to obtain stereological measurements such as object size, shape, orientation and numerical density.

2. Measure the elastic properties of hard and soft biological materials by measuring the non-linear strain response to stress (uniaxial, biaxial or torsional) and relate these to the function and failure of biological structures.

3. Use mathematical and physical models to analyse blood flow through organs or tumors and to predict changes in oxygen supply to tissues due to changes in microvascular blood flow.

4. Use basic statistical analysis to test for significance in differences found in lab results.

5. Work in a research environment by interacting with research colleagues and providing individual input to the overall project.

6. Report the results of scientific studies using both written and oral presentations.

Medical Biophysics 3970Z LABORATORY		
DATE 2014	**Instructor**	**Fall Term** - MSB113, Tues-Wed 2:30 - 5:30 pm
Sep 10 12	ICM	**Lab Introduction.**
19 20	HL/ ICM	**Tutorial:** Matlab (assignment)
26 27	ICM	**Lab 1.** Modelling Diffusion in Tissues – Computer models
30 Oct 1	TA	**Workshop:** Scientific Writing Skills
7 8	TA	Research lab tours (optional)
14 15	ICM	**Lab 2.** Biological Variability, Image Analysis and Basic Statistics – Size of Red Blood Cells
21 22	ICM	**Workshop:** Scientific Communications – Review lab 2 and Develop a PPT presentation
28 29	ICM	**PPT Presentation** for Lab 2 (assignment)
Nov 4 5	TA	Research lab tours (optional)
11 12	ICM	**Lab 3.** Modelling Washout in Tissues – Physical models and computer analysis
18 19	TA	consulting
25 26	ICM/AS	**Lab 4.** Elasticity of Arteries – Biomechanics of composite materials. Pressure-volume and stress-strain in blood vessels.
Dec 2 3	TA	consulting
Research lab tours are a good opportunity to develop ideas for 6-week projects		

Medical Biophysics 3970Z LABORATORY		
DATE 2015	**Instructor**	**Winter Term** MSB113, Tues or Wed 2:30 - 5:30 pm
Jan 6 7	ICM/JL	**Tutorial:** Ultrasound Imaging – (assignment)
13 14	ICM/AS	**Lab 5.** Torsional Stress in Bone – Characteristics of stress, strain and fracture in hard tissues (typical skiing injury)
20 21	TA	Consulting - Project Approval
27 28	ICM/JJB	**Tutorial:** Optical CT– Computed Tomography based on the absorption of light. Image capture, reconstruction and display. (assignment)
Feb 3 4	Supervisors	**Projects** - Week 1
10 11	Supervisors	**Projects** - Week 2
Feb 16 - 20 Reading Week		
24 25	Supervisors	**Projects** - Week 3 Progress report – one page summary
Mar 3 4	Supervisors	**Projects** - Week 4
10 11	Supervisors	**Projects** - Week 5
17 18	Supervisors	**Projects** - Week 6
24 25	ICM / Supervisors	Six Week Project **Presentations**
31 April 1	ICM / Supervisors	Six Week Project **Write-up** Due one week after presentation
7 8		No lab
**Supervisors for six-week projects should be approached by the beginning of the winter term. In many cases, graduate students are the direct supervisors.		

4. Course Materials:

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

Textbook:	None required
Supplemental Information:	Provided via OWL
Laboratory Manual:	Provided via OWL
Laboratory Materials:	Provided
Safety Materials:	As required for specific labs
Electronic Devices:	Laptops or equivalent are useful for calculations and records

5. Evaluation:

Component	**Approximate % of Final Mark**
Set Labs (5)	40
Assignments (4)	10
Project Presentation	15
Project Report	20
Project Supervisor Evaluation	15

There are no exams for the course

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/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf .

Offenses include

Plagiarism, which may be defined as "The act or an instance of copying or stealing another's words or ideas and attributing them as one's own." Excerpted from Black's Law Dictionary, West Group, 1999, 7th ed., p. 1170. This concept applies with equal force to all assignments, including laboratory reports, diagrams, and computer projects. Students wishing more detailed information should consult their instructor, Department Chair, or Dean's Office. In addition, they may seek guidance from a variety of current style manuals available in the University's libraries. Information about these resources can be found atwww.lib.uwo.ca/services/styleguides.html **.**

In this course, there are a number of written reports required for evaluation. We feel strongly that students should work together, sharing raw data and ideas. Reports submitted for marking, however, must be written independently. *After working together, take the data, go away, do the analysis and write it up without looking at anyone else's work*. In a course as small as this, it's easy for us to spot material with a common source.

Absence from course commitments

A. Absence for medical illness:

Students must familiarize themselves with the Policy on Accommodation for Medical Illness for Undergraduate Students, located at:
http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_medical.pdf
The policy is also accessible from the Medical Accommodation

B. Absence for non-medical reasons:

Material submitted for evaluation (assignments, lab reports) after the due date will be subjected to a late penalty of 10%/day but will not be accepted after marked material has been returned to the class. Missed material will be given 0% unless accommodation is made through the Office of the Dean of Science.

C. Special Examinations

There is no final exam for this course, but students are expected to present their projects as a PowerPoint presentation at a scheduled time. Under exceptional circumstances, students may seek permission to make alternate arrangements.

Support Services:

Registrarial Services: http://www.registrar.uwo.ca

Academic Counselling (Science and Basic Medical Sciences):
http://www.uwo.ca/sci/undergrad/academic_counselling/index.html

USC Student Support Services: http://westernusc.ca/services/

Student Development Centre: http://www.sdc.uwo.ca

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

Students who 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.