

Medical Biophysics
Fundamentals of Digital Imaging, MEDBIO 3503G DRAFT

Course Syllabus for Winter 2023



Western University is committed to a **thriving campus**; therefore, your health and wellness matter to us! The following link provides information about the resources available on and off campus to support students: <https://www.uwo.ca/health/> Your course coordinator can also **guide you** to resources and/or services should you need them.

1. **Technical Requirements:**



Stable internet connection



Laptop or computer



Working microphone



Working webcam

2. **Important Dates:**



Classes Begin	Classes End	
Monday, January 9, 2023	Monday, April 10, 2023	
* March 7, 2023: Last day to drop a second-term half course without penalty		
Reading Week	Study day(s)	Exam Period
February 18–26	April 11-12	April 13-30

3. **Contact Information**



Course Coordinator	Contact Information
Prof. Corey Baron	corey.baron@uwo.ca
Instructors	Contact Information
Prof. Timothy Scholl	scholl@uwo.ca
Prof. Ali Khan	alik@robarts.ca
Prof. Jonathan Thiessen	jthiess5@uwo.ca
Teaching Assistants	
TBA	
TBA	

4. Course Description and Design

Delivery Mode: In-person

Basic concepts of images relevant to all imaging modalities. Image formation and capture including digital cameras and the eye, pixels, aliasing, resolution, contrast, sensitivity, specificity, ROC, window/level, dynamic range, RGB, spectroscopy. Image compression and quality, quantitative analysis based on imaging software and the implementation of digital image processing concepts.

Prerequisites:

One of: Calculus 1000A/B, Calculus 1500A/B, Numerical and Mathematical Methods 1412A/B or the former Applied Mathematics 1412A/B,

One of: Calculus 1301A/B, Calculus 1501A/B, Numerical and Mathematical Methods 1414A/B or the former Applied Mathematics 1414A/B, or the former Applied Mathematics 1413;

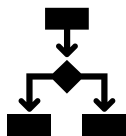
One of: Physics 1201A/B, Physics 1401A/B, Physics 1501A/B, the former Physics 1028A/B, the former Physics 1301A/B;

One of: Physics 1202A/B, Physics 1402A/B, Physics 1502A/B, the former Physics 1029A/B, the former Physics 1302A/B.

Integrated Science 1001X can be used as a prerequisite in place of Calculus 1301A/B and Physics 1202A/B.

Typically taken in third year, this course is also open to second-year students with an average of at least 70% in first year.

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



Timetabled Sessions

Component	Date(s)	Time
Lectures	T AND Th	10:30 am – 11:20 am
Tutorial	T OR W	11:30 am – 12:30 pm

- Asynchronous pre-work must be completed 1 day prior to sessions
- 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>. 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](#). Alternatively, they can contact the [Western Technology Services Helpdesk](#). 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](#).

5. Learning Outcomes



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

- Describe the basic concepts of images and what they represent.
- Assess image quality and information content in terms of dynamic range and resolution and determine how reliably images represent objects in terms of sensitivity and specificity.
- Understand how image sensors collect information to form digital images, including color images
- Use image processing packages to enhance and analyze images
- Characterize the eye as a digital camera, including biological image enhancement
- Examine information and evaluate content in medical images of different modalities

6. Course Content and Schedule



Week	Dates	Topic	Instructor
1	Jan 9–15	Intro to imaging science, image quality metrics	Prof. J. Thiessen
2	Jan 16-22	Evaluation of lesion detectability and diagnostic accuracy (Assignment 1)	Prof. J. Thiessen
3	Jan 23-29	Cost-benefit analysis of cancer screening using imaging	Prof. J. Thiessen
4	Jan 30–Feb 5	Image sensors, photon detection, saturation linearity, dynamic range	Prof. T. Scholl
5	Feb 6-12	Digital cameras and settings, windowing & leveling, colour models and colour temperature	Prof. T. Scholl
6	Feb 13–18	Analyzing images with digital tools (ImageJ), image compression (Assignment 2)	Prof. T. Scholl
7	Feb 19-26	Reading Week	N/A
8	Feb 27-Mar 5	Midterm Examination Introduction to Python	Prof. Thiessen/Scholl Prof. A. Khan
9	Mar 6-12	Displaying images, plots, histograms in Python (Assignment 3)	Prof. A. Khan
10	Mar 13–19	Image segmentation in Python, filtering, morphological operations in Python	Prof. A. Khan
11	Mar 20–26	Medical image data, spectral analysis, artifacts-aliasing (Assignment 4)	Prof. C. Baron
12	Mar 27–Apr 2	The eye, optics, resolution, sensitivity, perception	Prof. C. Baron
13	Apr 3-9	Image artefacts. Review.	Prof. C. Baron

7. Participation and Engagement



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

8. Evaluation



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

Assessment	Format	Weighting	Due Date
Assignment 1	OWL Submission	5%	TBD
Assignment 2	OWL Submission	5%	TBD
Assignment 3	OWL Submission	5%	TBD
Assignment 4	OWL Submission	5%	TBD
Midterm Exam	In person	40%	TBD
Final Exam	In person	40%	TBD

- All assignments are due at 11:55 pm EST unless otherwise specified
- Students are responsible for ensuring that the correct file version is uploaded; incorrect submissions including corrupt files could be subject to late penalties (see below) or a 0
- Written assignments will be submitted to Turnitin (statement in policies below)
- Students will have unlimited submissions to Turnitin
- Rubrics used to evaluate assessments 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
- Any grade appeals on assignments or midterms must be received within 3 weeks of the grade being posted.

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.

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

Information about late or missed evaluations:

- Late assessments without accommodation will be subject to a late penalty 25%/day
- Missed assessments worth less than 10% will receive a grade of 0. Up to one grade of 0 will be replaced by 0.75 multiplied by the mean grade received for the other assessments worth less than 10%. No other accommodations will be provided for assessments worth less than 10%.
- 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]
- One make-up midterm will be offered for those with an approved accommodation from Academic Counseling
- The midterm and final exam must be passed to pass the course. If both the original and make-up exams are missed due to approved accommodations from Academic Counseling (for either the midterm or final), the student will receive INC and complete the exam(s) the next time the course is offered.

INC (Incomplete Standing): If a student has been approved by the Academic Counselling Office (in consultation with the instructor/department) to complete term work at a later date, an INC will be assigned. 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 Counselling 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 Counselling 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 exam or the student misses the makeup exam for reasons approved by the Academic Counselling Office, the student will write the exam the next time the course is offered. Outstanding SPCs will reduce the course load for the term the exam is deferred as outlined in [Types of Examinations](#) policy.

9. Communication:



- Students should check the OWL site every 24–48 hours
- Students should contact their instructor(s) and teaching assistant(s) using email or OWL
- Emails will be monitored daily; students will receive a response in 24–48 hours
- This course will use OWL forum for discussions
- 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 or remotely using zoom
- Office hours will be by appointment

11. Resources



- All resources will be posted in OWL

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 (e.g., Must Knows Facebook group, Course Hero, Chegg, etc.)
- Recordings are not permitted (audio or video) without explicit permission
- Permitted recordings are not to be distributed

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 to ensure you have seen everything posted to help you succeed in this class.

3. Follow weekly checklists created on OWL 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 and Statements

Absence from Course Commitments

A. Absence for medical illness:

Students must familiarize themselves with the [Accommodation for Illness Policy](#).

A student seeking academic accommodation for any **work worth less than 10%** will follow the course specific instructions provided above in the "Evaluation" section. You are not required to disclose details about your situation to your instructor; documentation is not required in this situation, and you should not send any pictures to your instructor.

If you are unable to meet a course requirement for any **work worth 10% or greater** due to illness or other serious circumstances, you must provide valid medical or other supporting documentation to the Academic Counseling 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. Please note that the format of a make-up test, exam, or assignment is at the discretion of the course coordinator.

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: http://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf

B. Absence for non-medical reasons:

Student absences might also be approved for non-medical reasons such as religious holidays and compassionate situations. Please review the policy on [Accommodation for Religious Holidays](#). All non-medical requests must be processed by Academic Counselling. Not all absences will be approved; pay attention to the academic calendar and final exam period when booking any trips.

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. 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](#).

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](#)