


Medical Biophysics
Fundamentals of Digital Imaging, MEDBIO 3503

Course Syllabus for Winter 2025



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

2. Important Dates:



Classes Begin	Reading Week	Classes End	Study day(s)	Exam Period
January 6	February 15–23	April 4	April 5–6	April 7–30

March 31, 2025: Last day to withdraw from second-term half course without academic penalty

3. Contact Information

Course Coordinator	Contact Information

Instructors	Contact Information

4. Course Description and Design

Delivery Mode: in-person

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 principles of quantitative stereology.

Prerequisite(s): One of Calculus 1000A/B, Calculus 1500A/B, Numerical and Mathematical Methods 1412A/B or the former Applied Mathematics 1412A/B, plus one of Applied Mathematics 1201A/B, Calculus 1301A/B, Calculus 1501A/B, Mathematics 1600A/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. Integrated Science 1001X can be used as a prerequisite in place of Calculus 1301A/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

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

Component	Date(s)	Time
Lectures		
Tutorial		

- 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: <https://westernu.brightspace.com/d2l/login>. 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 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:

- 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 6–12	Unit 1: Intro to imaging science, image quality metrics	
2	Jan 13–19	Unit 1: Evaluation of lesion detectability and diagnostic accuracy	
3	Jan 20–26	Unit 1: Cost-benefit analysis of cancer screening using imaging	
4	Jan 27–Feb 2	Unit 2: Image sensors, photon detection, saturation linearity, dynamic range	
5	Feb 3–9	Midterm: Unit 1 (in-class) Unit 2: Digital cameras and settings, windowing & leveling, colour models and colour temperature	
6	Feb 10–16	Unit 2: Analyzing images with digital tools (ImageJ)	
7	Feb 17–23	Reading Week (starts February 15 th)	
8	Feb 24–Mar 2	Unit 2: image compression Unit 3: Introduction to Python	
9	Mar 3–9	Unit 3: Displaying images, plots, histograms in Python Midterm: Unit 2 (in-class)	
10	Mar 10–16	Unit 3: Image segmentation in Python, filtering	
11	Mar 17–23	Unit 3: Morphological operations in Python Unit 4: Medical image data, spectral analysis, artifacts-aliasing	
12	Mar 24–30	Unit 4: The eye, optics, resolution, sensitivity, perception	
13	Mar 31–Apr 4	Unit 4: Image artefacts.	

7. Participation and Engagement

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

8. Assessment and Evaluation

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

Assessment	Format	Weighting	Due Date	Flexibility
Assignments	Mixed format	4*5% = 20%	TBD: posted on OWL	Missed assignments have weight transferred to final exam.
Midterm, Unit 1	Mixed format	20%	Feb 4	Not applicable
Midterm, Unit 2	Mixed format	20%	Mar 8	Not applicable
Final Exam, Units 3 and 4 only	Mixed format	40%	TBD	Not applicable

Designated Assessment: Instructors are permitted to designate one assessment per course per term as requiring supporting documentation to receive academic consideration. See below for information on academic consideration policy and missed course work. For this course no assessment has been designated as requiring supporting documentation.

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
- This course is separated into 4 units, and there is one assignment per unit, an in-class midterm for each of Units 1 and 2, and a final exam that covers Units 3 and 4. Assignments turned in late will lose 10% per day late. Assignments that are not turned in or turned in more than 2 days late will have their weight transferred to the relevant midterm or final exam for that Unit. No academic consideration is required to have the weight transferred. Assignments turned in more than 2 days late will still be marked as a studying aid, but the assignment grade will not be used in the calculation of the final grade.

General information about assessments

- All assignments are due at 11:59 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 will be used to evaluate assessments and 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, quizzes, or midterms must be received within 3 weeks of the grade being posted.
- 15% of your course grade will be evaluated and returned 3 days prior to the drop deadline (statement in policies below).

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.

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 assessments without academic consideration will be subject to a late penalty 10%/day
- An assessment cannot be submitted after it has been returned to the class; the weight will be transferred to an exam
- One make-up test will be offered per midterm or final exam (time/location to be posted on OWL)
- Each 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, 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 Advising 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 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 exam or the student misses the makeup exam for reasons approved by the Academic Advising 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 Brightspace site every 24–48 hours
- Students should email their instructor(s) and teaching assistant(s) using email
- Emails will be monitored daily; students will receive a response in 24–48 hours
- This course will use OWL announcements to distribute information
- 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 by appointment, either in-person or remotely using Zoom

11. Resources

- All resources will be posted in 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 (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 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 and Statements

A. Absence from Course Commitments

Students must familiarize themselves with the Policy on [Academic Consideration – Undergraduate Students in First Entry Programs](#)

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.

Accommodation for Religious Holidays

Students should review the policy for [Accommodation for Religious Holidays](#). 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.

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](#).

B. 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.

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.

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 or review [The policy on 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. You can read about the privacy and security of the UWO email accounts [here](#).

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. The details of this policy and the deadlines can be found [here](#).

F. 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.

G. 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.

H. 15% Rule

According to the [Evaluation of Academic Performance](#) policy, at least three days prior to the deadline for withdrawal from a 1000- or 2000-level course without academic penalty, students will receive assessment of work accounting for at least 15% of their final grade. Generally, students can expect some form of feedback on their performance in a course before the drop date. In rare instances, at the Dean's discretion, an exemption can be issued, which also must be noted in the course syllabus. Deans should review exemptions on a course-by-course basis each time an exempted course is offered.

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, 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. 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., 74.45 becomes 74, and 74.50 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.

Statement on the use of Generative Artificial Intelligence (AI) Platforms

Within this course, students are permitted to use AI tools exclusively for information gathering and preliminary research purposes. These tools are intended to enhance the learning experience by providing access to diverse information sources. However, it is essential that students critically evaluate the obtained information, exercise independent thinking, and engage in original research to synthesize and develop their own ideas, arguments, and perspectives. The use of AI tools can serve as a starting point for exploration, with students expected to uphold academic integrity by appropriately attributing all sources and avoiding plagiarism. Assignments and/or lab reports should reflect the students' own thoughts and independent written work. By adhering to these guidelines, students contribute to a responsible and ethical learning environment that promotes critical thinking, independent inquiry and allows them to produce original written contributions.

16. Support Services

- Students who are in emotional/mental distress should refer to Mental Health @Western Health <https://www.uwo.ca/health/> for a complete list of options about how to obtain help.
- To connect with a case manager or set up an appointment, please contact support@uwo.ca.
- Other important links:
 - [Academic Advising \(Science and Basic Medical Sciences\)](#)
 - [Appeal Procedures](#)
 - [Registrarial Services](#)
 - [Student Development Services](#)
 - [Student Health Services](#)

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:

https://www.uwo.ca/health/student_support/survivor_support/get-help.html.