1. Course Information

Imaging has become an integral part of clinical diagnosis, prognosis and research. One of the main challenges of medical imaging is providing quantitative measurements of biology and the pathology of disease. Using positron emission tomography (PET) as a platform, this course focuses on the fundamentals of how non-invasive images of specific biological functions can be obtained.

Prerequisite(s): Medical Biophysics 3505F and equivalent

Lectures: 2 lecture hours (including case studies), 0.5 credit course

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

<table>
<thead>
<tr>
<th>Instructors</th>
<th>Email</th>
<th>Office</th>
<th>Phone</th>
<th>Office Hours</th>
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</thead>
<tbody>
<tr>
<td>Dr. Keith St Lawrence (Course Coordinator)</td>
<td><a href="mailto:kstlaw@lawsonimaging.ca">kstlaw@lawsonimaging.ca</a></td>
<td>LHRI</td>
<td>65737</td>
<td>Email for appointment</td>
</tr>
<tr>
<td>Dr. Udunna Anazodo</td>
<td><a href="mailto:uanazodo@lawsonimaging.ca">uanazodo@lawsonimaging.ca</a></td>
<td>LHRI</td>
<td>65864</td>
<td>Email for appointment</td>
</tr>
<tr>
<td>Dr. Justin Hicks</td>
<td><a href="mailto:jhicks@lawsonimaging.ca">jhicks@lawsonimaging.ca</a></td>
<td>LHRI</td>
<td>61087</td>
<td>Email for appointment</td>
</tr>
<tr>
<td>Dr. Jonathan Thiessen</td>
<td><a href="mailto:jthiessen@lawsonimaging.ca">jthiessen@lawsonimaging.ca</a></td>
<td>LHRI</td>
<td>64181</td>
<td>Email for appointment</td>
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3. Course Syllabus

The course will provide a foundation in the main components of PET imaging, which include:
1) Nuclear Physics/Medicine
2) Radiopharmaceuticals
3) PET instrumentation
4) PET image reconstruction and analysis
5) Pharmacokinetics

In addition to these topics, the course will involve cases studies to provide students with the opportunity to put into practise the principles taught in the lectures. These case studies will focus on brain function, neuroreceptor imaging and oncology, and each will include a review of a published study. Students will be expected to have read the paper prior to class and to participate in the discussion.

The course will consist of 25 lectures, 4 problem assignments, and a 2-hour final exam.

We understand that students work together, but you are responsible for the work you submit. Note on 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).

4. Learning Outcomes

The learning outcomes are centred on providing students with the basic tools to understand how the multiple components of PET imaging, which encompass biochemistry, physics and mathematics, are combined to extract information of human physiology. The value of this multidisciplinary approach will be reinforced by presenting case studies.

Knowledge
Students will develop an understanding of
- The synthesis of radiolabelled ligands used for PET imaging and how each ligand is evaluated for target specificity and clinical utility
- PET instrumentation and the generation of tomographic images of the distribution of radioactivity in the body
- The mathematical models developed to characterize the uptake of a PET probe in a targeted organ and how to derive solutions to these models using Laplace transforms.
- Imaging processing methods used to analyze PET images and extract physiological measurements.

Literacies and Interdisciplinarity
- Students will become comfortable with terminology utilized in PET and medical imaging.
- Students will develop the mathematical skills needed to solve kinetic models relevant to PET imaging
- Student will become familiar with software tools commonly used to analyze PET images.
- Students will further develop written problem-solving skills with special attention to solution organization and communication
Communication

- Students will further develop their writing communication skills especially those pertaining to communication of mathematical ideas in problem solving. This will occur through assignments and in-class discussions, particularly involving reviewing scientific articles.

Critical Inquiring and Creative Thinking

- Students will have the opportunity to apply creative thinking in solving problems, especially those in which there are multiple pathways to solutions.

5. Course Materials

There is no single text for this course; however, electronic notes for each lecture will be provided through OWL, along with additional information and reading material.

There is one computer software package that you may wish to purchase: MATLAB student version. This software will be available on the student computers in the class lab and MATLAB can be used online http://myvlab.uwo.ca/.

We wish to encourage you to come and discuss any problems arising from the course, whether general or specific. We are always pleased to help.

6. Evaluation

Marks will be obtained from four problem assignments, class participation related to journal reviews, and a final examination. The mark breakdown is as follows:

Assignments = 50%
Class participation = 10%
Exam = 40%

The exam will be hand written. Questions will include problems to be solved and may also include short answer questions as well as short “essay” questions. The only electronic devices permitted during the tests are standard calculators (programmable calculators not allowed).

Assignments that are submitted late will receive a penalty of 2% per day for the first two days following the submission deadline and 5%/day for each day thereafter. For example, an assignment which is 3 days late will receive a penalty of 2×2% + 5% = 9%. An extension for assignment submission will be granted by the instructor for submission of a single assignment which is delayed due to medical reasons. Students are advised to inform the instructor as soon as possible regarding such delays. Non-medical reasons will be considered if the instructor is notified prior to the due date. However, if the submission of more than one assignment from a given student is delayed (for medical or non-medical reasons) the student will be required to contact the Academic Counselling office of their home Faculty as described below.

Assignment Schedule

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Handed out</th>
<th>Completed</th>
<th>Submission Date</th>
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<tbody>
<tr>
<td>Assignment 1</td>
<td>January 17</td>
<td>January 31</td>
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<tr>
<td>Assignment 2</td>
<td>February 7</td>
<td>February 26</td>
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<tr>
<td>Assignment 3</td>
<td>March 7</td>
<td>March 21</td>
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7. Additional Information/Statements

Statement on Use of Electronic Devices:
Please see section 5.

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.”

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 Policy link at https://studentservices.uwo.ca/secure/index.cfm

Statement from the Academic Counselling Office, Faculty of Science (for Science and BMSc students)
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 Academic Counselling 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 by the Academic Counselling Office 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 Academic Counselling Office immediately.

Students seeking academic accommodation on medical grounds for any missed tests, or exams must apply to the Academic Counselling office of their home Faculty and provide documentation. Regulations regarding accommodations for late assignments are described in section 5.

For further information please see:
http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_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/index.cfm

B. Absence for non-medical reasons:
Students seeking academic accommodation on non-medical grounds for any missed tests, or exams must apply to the Academic Counselling office of their home Faculty and provide documentation. Regulations regarding accommodations for late assignments are described in section 5.
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.

C. Special Examinations
A Special Examination is any examination other than the regular final examination, and it may be offered only with the permission of the Dean/Academic Counselling Office 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/Academic Counselling Office of the Faculty. The Dean/Academic Counselling Office will consult with the instructor and Department Chair and, if a later date is arranged, will communicate this to the Office of the Registrar. 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/Academic Counselling Office 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. When a grade of Special (SPC) or Incomplete (INC) appears on a student's record, the notations will be removed and replaced by a substantive grade as soon as the grade is available.

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 Services: 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.