

Physics of Medical Imaging**Lectures:** 10:00-11:30 am Tuesday and Thursday

Lecturers: Tong Xu E-mail: txu@physics.carleton.ca
 Telephone: 520-2600 Ext. 8794
 Office: Herzberg 3318
 Office Hours: By appointment

B. Jarosz E-mail: Jarosz@physics.carleton.ca

I. Cameron E-mail: ICameron@Ottawahospital.on.ca
 Office: MRI Unit, Dept. of Diagnostic Imaging
 Ottawa Hospital - General Campus

R.A. deKemp E-mail: radekemp@ottawaheart.ca
 Office: Cardiac PET Centre
 University of Ottawa Heart Institute

G. Wells Email: gwells@ottawaheart.ca
 Office: University of Ottawa Heart Institute

Prerequisites: PHYS 4203/5313 Physical Applications of Fourier Analysis, or equivalent,
 and
 PHYS 5203 Medical Radiation Physics, or equivalent.

References:**Most useful:**

- IAEA , Diagnostic Radiology Physics: a handbook for teachers and students, (Free ebook).

Other references:

- Handouts given in lectures
- J. Beutel, H.L. Kundel, & R.L. Van Metter, editors, Handbook of Medical Imaging, vol.1: Physics and Psychophysics, SPIE Press, 2000 (ISBN: 0-8194-3621-6). Available on-line from books.google.com.
- J.L. Prince and J.M. Links, Medical Imaging Signals and Systems, Pearson Prentice Hall, 2006 ISBN 0-13-065353-5 H.E. Johns & J.R. Cunningham, The Physics of Radiology, 4th edition, 1983.
- R.N. Bracewell, The Fourier Transform and its Applications, 2nd edition (revised), McGraw-Hill, 1986.
- S. Webb (editor), The Physics of Medical Imaging, Institute of Physics, 1988.
- S.Cherry, J. Sorenson, & M. Phelps, Physics in Nuclear Medicine, 3rd edition, Saunders, 2003.
- M.J. Bronskill & P. Sprawls, 1992 Proceedings from the AAPM Summer School on MRI, AAPM, 1992.

- M. Haacke, R. Brown, M. Thompson, & R. Venkatesan, Magnetic Resonance Imaging: Physical Principles and Sequence Design, Wiley, 1999 (ISBN: 0-471-35128-8)
- Z.-P. Liang & P. C. Lauterbur, Principles of Magnetic Resonance Imaging: A Signal Processing Perspective, SPIE Press, 2000. (ISBN: 0-8194-3516-3)
- W.K. Pratt, Digital Image Processing, 2nd edition, Wiley, 1991.

Course Content: Conventional planar X-ray imaging – formation and systems
 Imaging system evaluation and linear system theory
 Digital x-ray imaging
 Computed Tomography
 Nuclear Medicine
 Positron Emission Tomography
 Ultrasound Imaging
 Magnetic Resonance Imaging

Assignments & Project: about 6 problem sets. Late assignments only be accepted in exceptional case.
 Grading will in part be on clarity, rigour, and organization of solutions.
 In addition, there will be one project on a specific area of imaging, requiring a written report and presentation (see attachment).

Exam: There will be a 3 hour open-book final exam.

Grading Scheme:

Assignments	=	60%
Project	=	20%
Final Exam	=	20%

ACADEMIC ACCOMMODATIONS

Requests for Academic Accommodation

You may need special arrangements to meet your academic obligations during the term. For an accommodation request, the processes are as follows:

Pregnancy obligation

Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website: carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf

Religious obligation

Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website: carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf

Academic Accommodations for Students with Disabilities

If you have a documented disability requiring academic accommodations in this course, please contact the Paul Menton Centre for Students with Disabilities (PMC) at 613-520-6608 or pmc@carleton.ca for a formal evaluation or contact your PMC coordinator to send your instructor your Letter of Accommodation at the beginning of the term. You must also contact the PMC no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with your instructor as soon as possible to ensure accommodation arrangements are made.
carleton.ca/pmc

Survivors of Sexual Violence

As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and its survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit: carleton.ca/sexual-violence-support

Accommodation for Student Activities

Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation must be provided to students who compete or perform at the national or international level. Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. <https://carleton.ca/senate/wp-content/uploads/Accommodation-for-Student-Activities-1.pdf>

For more information on academic accommodation, please contact the departmental administrator or visit: students.carleton.ca/course-outline