# General Course Information

## MDPH 406
## Medical Imaging

0.125 EFTS
Second Semester 14 Jul 2025 - 9 Nov 2025

**Course Coordinator**
Dr Konstantin Pavlov

**Lecturers:**
Dr Konstantin Pavlov (konstantin.pavlov@canterbury.ac.nz) (JvH726)
Office hours: W1-W6 & W10-W12 : Wednesdays 11:30 – 12:30; Thursdays 11-12.

Dr Darin O'Keeffe (darin.okeeffe@canterbury.ac.nz)
Office appointments by arrangement

**Lectures:**
Check the timetable for any room/time changes.

**Description**
An introduction to radiographic practice and terminology, image perception, x-ray, fluoroscopy, CT, MRI, ultrasound, digital radiographic image measurement, patient dosimetry, occupational radiation dose factors, quality assurance.

**Assessment**

| | |
|---|---|
| Assignment 1 | 10% |
| Assignment 2 | 10% |
| Assignment 3 | 10% |
| Mid-course test | 15% (12-1 pm on Tuesday 19th August 2025) |
| Final exam☝ | 55% |

☝Note that a 50% pass in the final exam is required to pass the course, unless there are exceptional circumstances.

Candidates may view their marked mid-course test scripts at the course coordinator office (Room 726, Julius von Haast Building).

The following shall apply for ***all assessments*** *in this course*, except where a lecturer has specifically stated otherwise ***in written instructions*** *for an assessment*.

**Use Prohibited for Specified Reasons: Generative AI tools must not be used within this assessment due to specific considerations, which will be clearly communicated to students.**

**Generative AI Tools Cannot Be Used for This Assessment**
In this assessment, you are strictly prohibited from using generative artificial intelligence (AI) to generate any materials or content related to the assessment. This is because *students are expected to solve problems and demonstrate knowledge and understanding without the assistance of AI*. The use of AI-generated content is not permitted and may be considered a breach of academic integrity. Please ensure that all work submitted is the result of your own human knowledge, skills, and efforts.

**Pre-requisites**
Subject to approval of the director of the programme

**Recommended Textbooks**
Diagnostic Radiology Physics – A Handbook for Teachers and Students, D.R. Dance et al. IAEA 2014. A free PDF copy is available here (http://www-pub.iaea.org/books/IAEABooks/8841/Diagnostic-Radiology-Physics-A-Handbook-for-Teachers-and-Students).

The Essential Physics of Medical Imaging, Fourth Edition. J.T. Bushberg et al. Lippincott Williams and Wilkins 2021. Mostly Sections I and II. (available electronically via the Library website).

MRI from Picture to Proton, D.W. McRobbie. Cambridge University Press, 3rd edition, 2017. (available electronically via the Library website and via a link from the MDPH 406 Learn page)

Other useful reading is listed below.

**Goal of the Course**
This course will provide a background to the physical principles and practical aspects of medical imaging. The main imaging modalities considered are x-ray (including radiography, mammography, fluoroscopy, digital subtraction angiography and computed tomography), ultrasound, and magnetic resonance imaging.

**Summary of Course Content**
The general topics covered by this course are:

- Image science and image perception – an introduction
- PACS and an introduction to the DICOM standard
- Introduction to image processing
- Radiography – screen-film and digital radiography
- Fluoroscopy
- Digital subtraction angiography
- Mammography
- Computed tomography
- Magnetic resonance imaging
- Ultrasound imaging

**Learning Outcomes**
On completing this course you should be able to

- Describe basic principles underlying imaging methods
- Discuss principles of operation of medical imaging equipment
- Recognise safety aspects of imaging with ionising and non-ionising radiation
- Understand basic quality control of medical imaging equipment
- Recognise potential sources of artefacts or inaccuracy
- Discuss a range of clinical applications of imaging modalities
- Discuss radiation doses associated with medical imaging methods
- Discuss image processing used in medical imaging
- Discuss perception in relation to image display methods

**Other Useful and Reference Texts**

- Medical imaging physics, Fourth Edition. W.R. Hendee, E.R. Ritenour. Wiley 2002. (available electronically via the Library website)
- Magnetic resonance imaging: physical principles and sequence design. 2nd edition, Robert W. Brown, et al., 2014. (available electronically via the Library website)
- Modern diagnostic X-ray sources: technology, manufacturing, reliability. R. Behling. 2016. (available electronically via the Library website)
- Computed Tomography: Fundamentals, System Technology, Image Quality, Applications. Willi A. Kalender. 2011 (available electronically via the Library website)

Hendee's book provides alternative explanations to the main reference texts and some interesting anecdotes, but is generally more qualitative. The MRI section of Bushberg is

somewhat lacking for medical physics education (this is not the target audience), mainly because it avoids any mathematical formalism relating to Fourier transforms. McRobbie's book on MRI is aimed at a more suitable level, with many practical examples with only the minimum required mathematics. However, if you want some more in-depth theory on MRI imaging, you can't go past the book by Brown et al. The book by Behling is very recent and contains some useful material if you want to learn more about x-ray tubes. For this course, it is the go-to book for x-ray sources.

**Learn**
All important course information can be accessed through the UC *Learn* system available at http://learn.canterbury.ac.nz/. You need to login with your UC login and password and then select the course code on the left hand side. Make sure you check the *Learn* page regularly for relevant information and course updates. Note that all course related emails will be sent to your UC email address. It is your responsibility to check your UC email regularly or forward it to your usual email address.

**General Physics and Astronomy Information**
Please consult the document General Information for Physics and Astronomy Students on the Physics and Astronomy Web Page:
https://apps.canterbury.ac.nz/1/science/phys-chem/PHYS%20-%20Course%20Outlines/General.PDF

Below is an extract from the above-mentioned document:

**"Dishonest Practice (**online information Academic Integrity :
https://www.canterbury.ac.nz/about-uc/what-we-do/teaching/academic-integrity )
Plagiarism, collusion, copying and ghost writing are unacceptable and dishonest practices.

- Plagiarism is the presentation of any material (text, data, figures or drawings, on any medium including computer files) from any other source (including other students) without clear and adequate acknowledgement of the source. Note that the use of **AI generative tools such as ChatGPT** for assessment work is *strictly forbidden*, except where the lecturer concerned has specifically granted approval.
- Collusion is the presentation of work performed in conjunction with another person or persons, but submitted as if it has been completed only by the named author(s).
- Copying is the use of material (in any medium, including computer files) produced by another person(s) with or without their knowledge and approval.
- Ghost writing is the use of another person(s) (with or without payment) to prepare all or part of an item submitted for assessment.

Do not engage in dishonest practices. The School reserves the right to refer the University Proctor and where appropriate to **not mark the work or award a mark of zero**."

**Late work**
Late work will be accepted. However, to be fair on the efforts of other students, unless the course coordinator considers the reason for the late submission valid the work will be penalised through the deduction of marks, usually at 20% per day or part thereof.