

## Medical Imaging (E010371)

**Course size** *(nominal values; actual values may depend on programme)*

**Credits 6.0**

**Study time 180 h**

**Course offerings and teaching methods in academic year 2025-2026**

A (semester 1)	English	Gent	lecture seminar
B (semester 1)	Dutch	Gent	

**Lecturers in academic year 2025-2026**

Vandenbergh, Stefaan	TW06	lecturer-in-charge
Vandemeulebroucke, Jef	VUB	co-lecturer

**Offered in the following programmes in 2025-2026**

	crdts	offering
Master of Science in Electrical Engineering (main subject Communication and Information Technology )	6	A
Master of Science in Electromechanical Engineering(main subject Control Engineering and Automation)	6	A
Master of Science in Electromechanical Engineering(main subject Electrical Power Engineering)	6	A
Master of Science in Electrical Engineering (main subject Electronic Circuits and Systems)	6	A
Master of Science in Electromechanical Engineering(main subject Maritime Engineering)	6	A
Master of Science in Electromechanical Engineering(main subject Mechanical Construction)	6	A
Master of Science in Electromechanical Engineering(main subject Mechanical Energy Engineering)	6	A
Master of Science in Biomedical Engineering	6	B
Master of Science in Biomedical Engineering	6	A
Master of Science in Chemical Engineering	6	A
Master of Science in Chemical Engineering	6	A
Master of Science in Computer Science Engineering	6	A
Master of Science in Photonics Engineering	6	A

**Teaching languages**

English, Dutch

**Keywords**

MRI, CT, SPECT, PET, Ultrasound, image processing

**Position of the course**

The goal of this course is to make the students familiar with medical imaging and image processing techniques. An overview will be given of the working mechanisms of the most important medical imaging techniques, their advantages and disadvantages , their applications and recent technical developments. In addition, an introduction is given to the most commonly used techniques in medical image processing and analysis.

**Contents**

- 1 Introduction to images and image processing: sampling, filters convolution theorem
- 2 X-rays radiography and principle of computed tomography and analytical reconstruction
- 3 SPECT imaging: collimation, detection and image degrading effects
- 4 PET imaging: principle, image degrading effects and iterative reconstruction
- 5 Ultrasonic imaging
- 6 MRI: basic principles of magnetic resonance and image formation

7 Image enhancement and filtering: histogram-based methods, linear and nonlinear filters for noise reduction, edge enhancement and detection.

8 Image registration and visualization

9 Segmentation: thresholding, region growing, level sets, classification, mathematical morphology

#### **Initial competences**

Basic knowledge of physics and signal processing

#### **Final competences**

1 Understand physical principles of different medical imaging techniques

2 Be capable of defining components of medical imaging systems

3 Have insight in advantages and disadvantages of existing image reconstruction techniques

4 Be able to judge the advantages and disadvantages of different medical imaging techniques.

5 Be able to explain the basic principles of the most important techniques in image enhancement, image segmentation and image registration.

6 Understand relationship between different image processing techniques

#### **Conditions for credit contract**

Access to this course unit via a credit contract is determined after successful competences assessment

#### **Conditions for exam contract**

This course unit cannot be taken via an exam contract

#### **Teaching methods**

Seminar, Lecture

#### **Study material**

None

#### **References**

#### **Course content-related study coaching**

#### **Assessment moments**

end-of-term and continuous assessment

#### **Examination methods in case of periodic assessment during the first examination period**

Oral assessment

#### **Examination methods in case of periodic assessment during the second examination period**

Oral assessment

#### **Examination methods in case of permanent assessment**

Assignment

#### **Possibilities of retake in case of permanent assessment**

not applicable

#### **Calculation of the examination mark**

Periodical evaluation (75%) + non-periodical evaluation (25%)

Second exam: only periodical evaluation