

# Course Package

## Imaging & Diagnostics 2A

Name module	Imaging & Dagnostics
Educational programme	MSc Biomedical Engineering
Period	First quartile of the second semester (Quarter 2A)
Study load	15 ECTS

Imaging & Dagnostics			
Quarter 1A	Quarter 1B	Quarter 2A	Quarter 2B
		Image processing and Computer Vision (5 EC)	
		Medical Acoustics (5 EC)	
		Magnetic Methods for (Neuro)imaging (5 EC)	

Required preliminary knowledge: Basic knowledge of Vector and Matrix Algebra, Calculus, Fluid Mechanics and Electricity and magnetism. Basic skills in programming, e.g. some Matlab skills.

### 191210910 Image processing and Computer Vision

The course familiarizes students with digital image processing and computer vision techniques. It provides the fundamentals for 2-D signal processing applied to digital images. It also discusses techniques for the extraction of 2D, 3D, or 4D information that is represented by a digital image (or image sequence). Examples of computer vision tasks are:

- a) the detection, e.g. checking the presence of an object or event.
- b) The recognition or identification of an object or person.
- c) The measurement of the parameters of an object, e.g. position, size, shape.
- d) Motion analysis of objects.

The topics of the course include image formation and acquisition, 2D Fourier transforms, image operations, image segmentation, regional description, recognition and parameter estimation. The course involves practical work in which the students design a vision system for a simple application. As such, the student acquires programming skills using Matlab and its image processing toolbox.

*The modules are tentative and subject to change. Please check [the website](#) regularly.*

Examples of design tasks that students can select are:

- a) Virtual advertising: inserting virtual advertising images into recorded movies of sports events
- b) Motion analysis: tracking an object in a cluttered movie.
- c) 3D face reconstruction from 3 images
- d) 3D tracking of facial point features.

#### 193542070 **Medical Acoustics**

This course will focus in-depth into various diagnostic methods used in medical ultrasound for cardiac and radiology applications. These include color flow Doppler, intravascular ultrasound, high-frequency ultrasound and contrast imaging. Several experts in the field of medical ultrasound will provide interesting cases. There is ample room for hands-on demonstrations in the practical sessions.

#### 193530050 **Magnetic Methods for (Neuro)imaging**

After a short review of the laws of physics that describe electricity and magnetism an introduction is given to the electromagnetic properties of, and the electromagnetic signals that are generated by, the human body. A review is presented of the magnetic methods that are used in medical imaging. The emphasis is on the methods and technology that is used for the diagnosis of the various components of the neural system.