

# Magnetic Resonance Imaging and Biomedical Nanotechnology

## Lecturers

Gilles BRUYLANTS (Coordinator) and Thierry METENS

## Course mnemonic

MEDI-H506

## ECTS credits

5 credits

## Language(s) of instruction

English

## Course period

Second term

Understanding the physical basis of image formation in MRI  
Being able to use MRI for human, animal or in vitro imaging  
Being able to further develop MRI sequences and methods  
Understanding biomedical nanotechnologies.

- > Mesurer les grandeurs physiques liées au vivant, tant morphologique que fonctionnel
- > Traiter et analyser des signaux de toute nature, 1D, image, vidéo, en particulier ceux issus des dispositifs médicaux
- > Se représenter les mécanismes biologiques fondamentaux depuis la biochimie de la cellule jusqu'au fonctionnement des principaux systèmes de la physiologie humaine
- > Traduire les contraintes du vivant dans le langage de l'ingénieur, anticiper l'impact d'un développement sur le vivant (choix des matériaux, des procédés, etc.)
- > Gérer, explorer et analyser les données médicales (dossier médical, imagerie, génomique, statistiques)

## Course content

### Magnetic resonance imaging

Basis of nuclear magnetic resonance and Bloch equations. MRI Image and contrast formation. Fourier MRI. Relationship between sampling in the Fourier space and features in the final image. Fourier sampling schemes Signal to noise ratio and artefacts in MRI. MRI of coherent and incoherent motions, angiography, diffusion, fonctionnal MRI, Echo train imaging. Parallel imaging Simultaneous multislice imaging. Practical demonstrations in Erasme Hospital

## Objectives (and/or specific learning outcomes)

[[table]]

## Teaching method and learning activities

### Contribution to the teaching profile

This teaching unit contributes to the following competences:

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## Evaluation method(s)

Oral examination

### Evaluation method(s) (additional information)

oral exam

Determination of the mark (including the weighting of partial marks)

geometry mean

## Programmes

Programmes proposing this course at the Brussels School of Engineering

MA-IRCB | Master of science in Biomedical Engineering | finalité Professional/unit 2 and MS-NATE | Specialized Master in Nanotechnology | unit U