

# Biomedical robotics

## Lecturers

Emanuele GARONE (Coordinator) and Bernardo INNOCENTI

## Course mnemonic

MATH-H509

## ECTS credits

5 credits

## Language(s) of instruction

English

## Course period

Second term

## Campus

Solbosch

## Course content

The course is structured in the following parts:

- › Robotic structure
- › Robot Kinematics and Dynamics: Planar and Spatial Kinematics, Differential Kinematics; dynamics;
- › Robot Control: Motion control and Force control
- › Robotics for Biomedical Applications: Examples of robotics in biomedical applications, Teleoperation, Specific control/design aspects for biomedical robotics,
- › Robot for minimally invasive surgery, design of robotic tools, human-machine interface

## Objectives (and/or specific learning outcomes)

*The goal of this course is to present the most important techniques for the design of robots used in the medical field.*

## Teaching method and learning activities

**Lectures:** Ex cathedra lectures

**Labs :** The students will develop a robot control project in small groups (2-3 people) following realistic robotics scenario

## Contribution to the teaching profile

This teaching unit contributes to the following competences:

- › understand the main aspect of kinematics dynamic and control of surgical robot;
- › develop a prototype of a realistic robot that could be used in a surgical theater for a realistic surgical treatment;

- › understand and design a surgical robot, able to deal with all the constraint coming from the patient, the surgeon, the surgical theater and the regulation in the field;

## References, bibliography and recommended reading

L. Sciacivco, B. Siciliano, *Modelling and Control of Robot Manipulators, 2nd Edition*, Springer-Verlag Advanced Textbooks in Control and Signal Processing Series [<http://www.springeronline.com/sgw/cda/frontpage/0,10735,5-40109-22-2093898-0,00.html>], London, UK, 2000; 1st Edition, McGraw-Hill, New York, NY, 1996. Also in Italian as *Robotica Industriale – Modellistica e Controllo di Manipolatori* [<http://www.prisma.unina.it/images/cover.pdf>], McGraw-Hill Libri Italia, Milano, I, 2nd Edition, 2000; 1st Edition, 1995.

## Other information

### Place(s) of teaching

Solbosch

### Contact(s)

Prof. Emanuele Garone: [egarone@ulb.ac.be](mailto:egarone@ulb.ac.be)

Prof. Bernardo Innocenti: [Bernardo.Innocenti@ulb.be](mailto:Bernardo.Innocenti@ulb.be)

## Evaluation method(s)

Other

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

Project Report, Project Results Presentation, a brief Oral Exam

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

50% Laboratory

50% Theory

### Main language(s) of evaluation

English

## Programmes

### Programmes proposing this course at the Brussels School of Engineering

MA-IRCB | Master of science in Biomedical Engineering | finalité Professional/unit 2

