

Design of Orthopaedic Medical Devices : biomechanics, design and regulation

Lecturer

Bernardo INNOCENTI (Coordinator)

Course mnemonic

MEDI-H504

ECTS credits

5 credits

Language(s) of instruction

English

Course period

First term

Course content

The course is subdivided in the following parts:

1. Biomaterials and Biocompatibility
2. Materials and Body Interaction: surface treatments, sterilization, allergy, corrorion and wear.
3. Fracture Fixation Devices: Fracture Repair,management and fixation, internal and external fixation devices, Mechanics of Intramedullary Rods, Bone Plates, External Fixators and bone screws.
4. Total Hip Replacements: Kinematics and Loads, Femoral Stems, Stresses in the bone, history and design of total hip replacement
5. Total Knee Replacements: Kinematics and Loads, Function, Structure and design of knee arthroplasty, prudction and surgery
6. Total Ankle Replacements: Kinematics and Loads, main components, history and design of total ankle replacement
7. Shoulder prosthesis:
8. External prosthesis and Orthosis;
9. Certification of Medical Devices: regulamentation of medical Devices, concept of Brand, Marketing;
10. Follow-Up analysis of medical design: clinical Follow-Up, defintion and planning of a clinical study, Gait Analysis, Fluoroscopy

Objectives (and/or specific learning outcomes)

The course is a continuation of the Orthopaedic Biomechanics course and addresses the analysis and design of Medical Devices, with a focus on orthopaedic and traumatologic implants that are used to treat the human body when it is damaged.

Moreover, the main aspect of regulation and certification of a medical devices will be also addressed in this course.

Teaching method and learning activities

36h lectures and 12h exercises in which the students will work on the development of a total hip prosthetic stem

Contribution to the teaching profile

This teaching unit contributes to the following competences:

- develop a realistic medical device. Starting from the anatomical, morphological and biomechanical constrain of the human being the student will be able to learn how to design and finalize a mechanical device aimed to treat the human body.
- understand all the aspect of the design, from the mechanical aspects to the sterilization, regulamentation and post-sales aspect (as clinical studies and patient follow-up)
- The students will be able to develop, working in small group, a real implant that could be used as a total hip prosthetic stem.

References, bibliography and recommended reading

Orthopaedic Biomechanics: Mechanics and Design in Musculoskeletal Systems. Bartel, Davy, Keaveny. Pearson Prentice Hall. 2007.

Other information

Contact(s)

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Evaluation method(s)

Other

Evaluation method(s) (additional information)

Oral examination, the oral will be divided in a geenral presentation of the project (one for each group) following an individual examination on the topic of the course.

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

During the course, the student will acquire all the necessary information needed to develop a medical device.

The students need to develop, working in small group, a real implant that could be used as a total hip prosthetic stem.

the students will also need to develop a technical report in which all the main aspects of the design need to be integrated.

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

