INSTITUTO POLITÉCNICO DE BRAGANÇA

Course Unit	Medical Devices Design			Field of study	Orthopedics and Rehabilitation		
Master in	Biomedical Technology - Biomechanics and Rehabilitation			School	School of Technology and Management		
Academic Year	2019/2020	Year of study	1	Level	2-1	ECTS credits	6.0
Type	Semestral	Semester	2	Code	5025-421-1204-00-19		

Workload (hours)	162	Contact hours	T	TP	PL	TC	S	E	OT	O
			-	-	60	-	-	-	-	-

T - Lectures; TP - Lectures and problem-solving; PL - Problem-solving, project or laboratory; TC - Fieldwork; S - Seminar; E - Placement; OT - Tuturial; O - Other

Name(s) of lecturer(s): Paulo Alexandre Gonçalves Piloto

Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:
1. Understand design problems and use of medical devices.
2. Analyse and design the functionality of orthopaedic medical devices;
3. Acknowledge and understanding security and safety issues of medical devices
4. Optimizing previous or developed medical devices;
5. Design of implants, Orthopaedic devices and technical aids for persons with disabilities .

Prerequisites

Before the course unit the learner is expected to be able to:
1. Understand musculoskeletal functionality for orthopaedic and rehabilitation.
2. Understand static and dynamic behaviour of deformable and rigid bodies.
3. Apply solid stress and fluid flow analysis principles in simple systems.
4. Select biomaterials for biomedical applications.

Course contents

Introduction to design. Device Design Principles. Medical devices regulation and standards. Case studies in orthopaedic engineering.

Course contents (extended version)

1. Introduction to design
   - Introduction to medical devices.
   - Medical devices definition.
   - Introduction to design.
   - Tissue engineering.
   - Biomaterials for devices.
   - Materials wear and corrosion.
   - Medical devices regulatory issues.
2. Device Design Principles.
   - Concept of collapse or failure.
   - Concept of device safety.
3. Medical devices regulation and standards.
4. Case studies in orthopaedic engineering.
   - Internal bone fracture-fixation plates.
   - Human spinal vertebral body.
   - Intervertebral disc as optimally design human body structure.

Recommended reading

1. Dhanjoo N. Ghista, "APPLIED BIOMEDICAL ENGINEERING MECHANICS", CRC Press, USA, 2008.
2. Richard Fries; "Reliable Design of Medical Devices"; CRC Taylor and Francis, 2006.
3. Richard C. Fries; "Handbook of medical device design", Marcel and Dekker, 2001.
4. D. G. Shurr, J. W. Michael; “Prosthetics and Orthotics”, 2nd edition. Prentice Hall, 2001.
5. A. Bennett, Jr. Wilson; “A Primer on Limb Prosthetics”, Charles C. Thomas Pub Ltd, 1998.

Teaching and learning methods

Theoretical and practical exposition of the fundamental concepts should be presented at classes, complemented with practical exercises. The remaining period should be used to solve working projects. Out of classes, students are invited to solve problems and prepare poster sessions.

Assessment methods

1. FINAL - (Regular, Student Worker) (Final)
   - Practical Work - 100%
2. FINAL - (Student Worker) (Final)
   - Final Written Exam - 100% (Labor students with special statute may require Exam during final season)
3. APPEAL AND SPECIAL SEASON - (Regular, Student Worker) (Supplementary, Special)
   - Final Written Exam - 100%

Language of instruction

Portuguese, with additional English support for foreign students.

Electronic validation

Paulo Alexandre Gonçalves Piloto	Luís Manuel Ribeiro Mesquita	Fernando Jorge Coutinho Monteiro	Paulo Alexandre Vara Alves
07-03-2020	09-03-2020	10-03-2020	11-03-2020