

Course Unit	Materials Processing		Field of study	Biomaterials and Biomechanics	
Bachelor in	Biomedical Technology		School	School of Technology and Management	
Academic Year	2022/2023	Year of study	3	Level	1-3
Type	Semestral	Semester	1	ECTS credits	6.0
Code	9600-752-3102-00-22				
Workload (hours)	162	Contact hours	T 30	TP 30	PL -
			TC -	S -	E -
			OT -	O -	

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

Name(s) of lecturer(s) Luís Miguel Cavaleiro Queijo

#### Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:

1. Know the supportive technologies to product development.
2. Identify and know the manufacturing processes used in machines and parts production of hospital support activity equipment's or bio-medical devices.
3. Identify and know how to apply the manufacturing techniques to process Biomaterials in order to obtain prototypes or usable devices able to apply in Biomedical field.
4. Know to define manufacturing processes by choosing operations, equipments, tools and operative parameters (setting up) that allow to manufacture a given part.

#### Prerequisites

Before the course unit the learner is expected to be able to:  
Non applicable.

#### Course contents

Machining; Rapid prototyping; Foundry; Plastic forming.

#### Course contents (extended version)

1. Cutting. Machining.
  - Conventional machine-tools.
  - Cut geometry.
  - Cutting tools: geometric characteristics; materials; cutting tools wearing and predictable life.
  - Non-conventional machining.
  - Surface finishing.
  - Machining sequences.
2. Additive manufacturing.
  - Additive manufacturing techniques and materials.
  - Functional and semi-functional model manufacturing.
  - Biomodelling.
3. Foundry technology.
  - Metal and alloys solidification mechanisms. Heat transfer ways.
  - Techniques: Sand Molding, Investment casting, Shell molding, Die casting, Centrifugal casting.
4. Forming technologies.
  - Drawing forces. Material plasticity and springback effect.
  - Forming techniques: Metal stamping, Metal lamination, Forging, Extrusion and Wire drawing.
5. Welding technology.

#### Recommended reading

1. Shaw, M. C. - Metal cutting principles, Oxford series, 2005.
2. Webster, P. - Fundamentals of Foundry Technology, Portcullis Press, Redhill, 1980.
3. Schey, T. A. - Introduction to manufacturing processes, McGraw-Hill Book Company, 1989.
4. Alves, F.; Braga, F. - Prototipagem rápida, Protoclick, Porto 2001.
5. Dieter, George E. - Mechanical metallurgy, McGraw-Hill International Editions, 1986.

#### Teaching and learning methods

Theoretical-practical classes are used with an expositive part about the concepts and theoretical principles concerning the technologies covered and with a practical part in which are solved problems and practical cases study. In non-presencial environment it is proposed solving problems and works execution.

#### Assessment methods

1. Alternative 1 - (Regular, Student Worker) (Final, Supplementary, Special)
  - Intermediate Written Test - 40%
  - Intermediate Written Test - 40%
  - Development Topics - 20%
2. Alternative 2 - (Regular, Student Worker) (Supplementary, Special)
  - Final Written Exam - 100%

#### Language of instruction

Portuguese

#### Electronic validation

Luís Miguel Cavaleiro Queijo	João Eduardo Pinto Castro Ribeiro	Joana Andrea Soares Amaral	Paulo Alexandre Vara Alves
18-10-2022	18-10-2022	31-10-2022	01-11-2022