INSTITUTO POLITÉCNICO DE BRAGANÇA

Course Unit	Mechanical Technology I			Field of study	Mechanical Constructions		
Bachelor in	Mechanical Engineering			School	School of Technology and Management		
Academic Year	2022/2023	Year of study	2	Level	1-2	ECTS credits	6.0
Type	Semestral	Semester	2	Code	9123-759-2204-00-22		

Workload (hours)	162	Contact hours	T -	TP 60	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): João Eduardo Pinto Castro Ribeiro

Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:
1. Know the limitations of the support technologies to the development of the product and the production.
2. Acquire sensibility for the freedom design with casting technologies.
3. Design and planning capacity to obtain of a piece by casting technology.
4. Identify and to interpret the more frequent casting defects.
5. Present, to characterize and to compare the several technologies, conventional and you non-conventional, that could constitute the casting.
6. Describe, characterize and analyze the mechanical technologies of plastic deformation.
7. Know the most relevant variables and define the typical parameters of each operation.
8. Know the conventional conformation and the no-conventional ones, as well as the physical and mathematical models available for the understanding and control of the processes.

Prerequisites

Before the course unit the learner is expected to be able to:
1. Basic knowledge of materials science.
2. Basic knowledge of metalography.
3. Knowledge of the main mechanical properties of mechanical construction materials.
4. Knowledge of English.

Course contents

Processes of casting manufacturing. Processes of metal plastic deformation manufacturing.

Course contents (extended version)

1. Brief reference to production of casting technologies. Ovens and other equipments.
2. Casting techniques in sand and in permanent moulds, non-conventional casting technologies.
3. Way of obtaining casting pieces.
   - Dimensional differences between the casting pieces and the patterns.
4. Melted and solidification of metallic alloys.
   - Contraction determination during the cooling and solidification.
   - Chills design.
5. Gating system and stuffing of moulds. Alloys used in foundry and their typical applications.
6. Basic rules for design of casting pieces.
7. Introduction to the plastic deformation technology.
8. Techniques of analysis:
   - Method of uniform energy.
   - Method of elementary slice.
   - Method of the slipping lines.
   - Method of the superior limit.
   - Method of finite elements.
9. Technological processes of plastic deformation:
   - Forging.
   - Extrusion.
   - Stretching.
   - Roll forming.
10. Sheet metal forming technology
   - Presses
   - Bending processes of bottoming.
   - Roll bending
   - Tube bending and Roll forming
   - Stamping

Recommended reading

1. Ribeiro, J. , Tecnologia Mecânica I, Apontamentos IPB-ESTIG, 2007.
2. Santos, A. Dias dos; Tecnologia da embutidura, ISBN: 972-8826-03-06.
3. Jorge Rodrigues, Paulo Martins; Tecnologia Mecânica – Tecnologia da deformação plástica, Escolar Editora, 2005 (Vol. I e Vol. II).
4. Alves, Fernando Jorge Lino 070; Protoclick, N. ISBN: 972-95376-1-5.
5. Beeley, Peter; Foundry Technology, N. ISBN: 0-7506-4567-9.

Teaching and learning methods

Theoretical-practices classes are used with an expository component of the theoretical subjects and a practical component of problems resolution and practical cases analysis. It is also used the interrogative method, questioning the students systematically about the most important elements of the course. In non-presence environment is proposed the resolution of problems and accomplishment works.

Assessment methods

1. Alternative 1 - (Regular, Student Worker) (Final)
   - Practical Work - 40%
   - Intermediate Written Test - 40% (Minimum grade for passing the UC: 30% of the grades in the mid-term exams.)

Assessment methods

- Presentations - 20%

2. Alternative 2 - (Regular, Student Worker) (Supplementary, Special)
- Final Written Exam - 100%

Language of instruction

Portuguese, with additional English support for foreign students.

Electronic validation

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16-02-2023	16-02-2023	04-03-2023