

Course Unit	Advanced Production Technologies	Field of study	Mechanical Constructions
Master in	Mechanical Engineering	School	School of Technology and Management
Academic Year	2023/2024	Year of study	1
Type	Semestral	Semester	1
Level	2-1	ECTS credits	6.0
Code	5071-793-1104-00-23		
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. Get an overview of the main manufacturing processes and their applications.
2. Acquire advanced knowledge of subtraction and addition manufacturing processes, both in conventional and non-conventional processes.
3. Know some conventional advanced machining processes such as micro-machining, high-speed machining, cryogenic machining and MQL machining.
4. In non-conventional processes, we intend to study different processes with special emphasis on EDM (penetration and wire) and laser cutting.
5. Know the main additive manufacturing processes.
6. Have basic computer-aided manufacturing skills.
7. Know and differentiate production technologies in the context of computer-integrated production.

Prerequisites

Before the course unit the learner is expected to be able to:
Basic knowledge of classic manufacturing processes.

Course contents

1. Introduction to manufacturing processes.
2. Machinability of metallic materials.
3. Machinability of composite materials.
4. Advanced conventional machining technologies.
5. Introduction to non-conventional machining technique.
6. EDM Machining.
7. Laser Machining.
8. Additive manufacturing.
9. Computer-assisted manufacturing.
10. Production engineering.

Course contents (extended version)

1. Introduction and manufacturing overview.
2. Machinability of metallic materials.
3. Machinability of composite materials.
4. Advanced conventional machining technologies:
 - high-speed machining,
 - cryogenic and MQL machining,
 - micro-machining.
5. Introduction to non-conventional machining techniques:
 - mechanical processes,
 - thermoelectric processes,
 - electrochemical and chemical processes.
6. EDM Machining: penetration and wire EDM.
7. Laser Machining.
8. Additive manufacturing:
 - additive manufacturing technologies,
 - classification of additive manufacturing processes.
9. Computer-assisted manufacturing:
 - CNC-ISO programming,
 - CAD/CAM systems,
 - simulation of manufacturing processes.
10. Production engineering:
 - basics,
 - automatic production support systems.

Recommended reading

1. Caristan, C.; Laser Cutting. Guide for Manufacturing., Society of Manufacturing Engineers, 2004.
2. Groover, M. P.; Fundamentals of modern manufacturing: materials, processes, and Systems. 7th Edition, John Wiley and Sons Ltd., 2019.
3. Alves, F.; Protoclick : prototipagem rápida, Protoclick, 2001.
4. Chang, T., Wysk, R., and Wang, H.; Computer Aided Manufacturing, Prentice Hall Inc, 1991.

Teaching and learning methods

Theoretical-practical classes are used with an expository component of theoretical subjects and a practical problem-solving component. The interrogative method is also used, systematically questioning students so that they can discover the points considered important. In the last few weeks, practical work will be proposed.

Assessment methods

1. Alternative 1 - (Regular, Student Worker) (Final)
 - Development Topics - 30%
 - Presentations - 15%
 - Practical Work - 45%

Assessment methods

- Intermediate Written Test - 10%
- 2. Alternative 2 - (Student Worker) (Supplementary, Special)
- Final Written Exam - 100%

Language of instruction

Portuguese, with additional English support for foreign students.

Electronic validation

João Eduardo Pinto Castro Ribeiro	João da Rocha e Silva	Paulo Alexandre Gonçalves Piloto	José Carlos Rufino Amaro
04-10-2023	04-10-2023	04-10-2023	20-10-2023