

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	Level	2-1
Type	Semestral	Semester	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

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