

Academic Year: ( 2024 / 2025 )

Review date: 31-05-2024

Department assigned to the subject: Mechanical Engineering Department

Coordinating teacher: DIAZ ALVAREZ, JOSE

Type: Compulsory ECTS Credits : 6.0

Year : 1 Semester : 1

**REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)**

Students are expected to have passed:

- Production and Manufacturing Systems.
- Mechanical technology.

**OBJECTIVES**

- Students will develop skills and acquire the necessary knowledge for the correct definition and selection of the production systems and processes necessary to obtain especially critical components.
- Students will develop their communication skills to communicate the results and conclusions.
- They will increase their ability to analyze advanced problems related with new processes and production systems (analytically and numerically).
- They will improve their ability to lead, plan and supervise multidisciplinary teams.
- The student will receive the necessary knowledge to make optimal designs according to the process and the production system used for its manufacture.
- The student will have a global vision of the industrial transformation until the arrival of Industry 4.0.

**DESCRIPTION OF CONTENTS: PROGRAMME**

- 1.ADVANCED MANUFACTURING OF COMPOSITE MATERIALS.
  - 1.1.Processing of composite materials.
  - 1.2.Post-processing of composite materials.
    - 1.2.1.Machining of composite materials.
    - 1.2.2.Joint types.
  - 1.3.Specific tooling.
- 2.ADVANCED MACHINING OF SUPERALLOYS:
  - 2.1.Introduction to superalloys.
  - 2.2.Problems of machining superalloys.
  - 2.3.Current trends in the machining of superalloys.
  - 2.4.Damage associated with machining.
  - 2.5.Analytical study of the process.
  - 2.6.Numerical study of the process.
- 3.FABRICACIÓN ADITIVA.
  - 3.1.Materials.
  - 3.2.Manufacturing processes.
  - 3.3.Inspection and certification.
  - 3.4.Designs oriented to additive manufacturing.
  - 3.5.Numerical methods applied
- 4.ADVANCED MANUFACTURING TECHNIQUES.
  - 4.1.New issues and requirements.
  - 4.2.Non-traditional manufacturing methods.
- 5.INDUSTRIA 4.0
  - 5.1.Definition: Fourth industrial revolution?
  - 5.2.Orígin.
  - 5.3.Resource optimization.

- 5.4. Flexibility and customization of production.
- 5.5. New logistics tools.
- 5.6. Simulation tools.

## LEARNING ACTIVITIES AND METHODOLOGY

### TRAINING ACTIVITIES

- Theoretical classes
- Practical classes
- Computer assisted classes
- Laboratory practices
- Individual student work
- Group work

### TEACHING METHODOLOGIES

- Exposition in class of the teacher with support of computer and audiovisual means, in which the main concepts of the subject are developed and the bibliography is provided to complement the learning of the students.
- Solving case studies, problems, etc. raised by the teacher individually or in a group
- Preparation of work and reports individually or in groups

## ASSESSMENT SYSTEM

<b>% end-of-term-examination:</b>	60
<b>% of continuous assessment (assignments, laboratory, practicals...):</b>	40

- Final Exam = 60 % (about all the knowledge given by the profesor on theory of machining, Merchand and Molinari analytical models)
- Group homework = 40 %

It is required that the grade of the exam is superior to 4/10 in order to pass

## BASIC BIBLIOGRAPHY

- Amateau, M.F. Engineering Composite Materials, Engineering Mechanics, 2003
- Jamal Y. Sheikh-Ahmad. Machining of Polymer Composites, Springer, 2009
- Jones, R.M. Mechanics of Composite Materials, CRC Press, 1998
- Matthew J. Donachie. SUPERALLOYS: A Technical Guide, ASM International.
- Mazumdar, S.K. Composites Manufacturing: Materials, Product, and Process Engineering , CRC Press Book.
- Michael C.Y.Niu. Composite Airframe structures, Hong Kong Conmilit Press Ltd., 1992
- Steinar Westhrin Killi. Additive Manufacturing: Design, Methods, and Processes, CRC Press, 2017