



Course guide

220047 - SMT - Sustainable Manufacturing Technologies

Last modified: 19/04/2023

Unit in charge: Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 712 - EM - Department of Mechanical Engineering.

Degree: BACHELOR'S DEGREE IN AEROSPACE TECHNOLOGY ENGINEERING (Syllabus 2010). (Optional subject).
BACHELOR'S DEGREE IN AEROSPACE VEHICLE ENGINEERING (Syllabus 2010). (Optional subject).
BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Optional subject).

Academic year: 2023 **ECTS Credits:** 3.0 **Languages:** English

LECTURER

Coordinating lecturer: Jasmina Casals

Others: José A. Ortiz, Xavier Salueña

PRIOR SKILLS

Students should have basic technical drawing capabilities and knowledge about technology materials.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

1. An understanding of manufacturing processes
2. Applied knowledge of manufacturing systems and processes, metrology and quality control

TEACHING METHODOLOGY

The teaching methodology is divided in three parts:

- Theoretical contents sessions.
- Visits to metrology and mechanical lab sessions or Probleme solving sessions.
- Autonomous work and homeworks.

In the theoretical sessions the professor will present the theoretical concepts

In the lab sessions, students will practice the knowledge acquired setting practical experiments or solving problems under the supervision of the professor.

In each module a selfstudy time is required in order to assimilate the concepts and resolve the proposed exercises .

LEARNING OBJECTIVES OF THE SUBJECT

- To Provide basic knowledge, theoretical, practical, sustainable manufacturing processes most commonly those areas aerospace, automotive and renewable energy, among others.
- To Introduce students to the techniques of quality control in the manufacturing sector, with considerations of design, safety and sustainability.



STUDY LOAD

Type	Hours	Percentage
Hours large group	30,0	40.00
Self study	45,0	60.00

Total learning time: 75 h

CONTENTS

Module 1: MANUFACTURING PROCESSES and QUALITY CONTROL

Description:

- 1.1. Introduction to Manufacturing Technologies
- 1.2. Sustainability and ecomanufacturing
- 1.3. Quality control (metrology, tolerances)

Related activities:

Activity 1 - Activity 2 - Activity 3 - Activity 4 - Activity 5

Full-or-part-time: 20h

Theory classes: 8h

Self study : 12h

Module 2: WELDING PROCESSES

Description:

- 2.1. Introduction to welding processes
- 2.2. Welding heterogeneous / homogeneous
- 2.3. Quality control. Standards. Safety

Related activities:

Activity 1 - Activity 3 - Activity 4 - Activity 5

Full-or-part-time: 8h

Theory classes: 3h

Self study : 5h

Module 3: MACHINING PROCESSES

Description:

- 3.1. Introduction to machining processes
- 3.2. Features Machine Tools
- 3.3. Features Cutting Tools and Tooling
- 3.4. Quality Control. Safety
- 3.5. Sustainability processes

Related activities:

Activity 1 - Activity 2 - Activity 3 - Activity 4 - Activity 5

Full-or-part-time: 28h

Theory classes: 10h

Self study : 18h

Module 4: OTHERS MANUFACTURING TECHNOLOGIES

Description:

- 4.1. Hot forming
- 4.2. Cold forming
- 4.3. Rapid Prototyping
- 4.4. Micromanufacturing

Related activities:

Activity 1 - Activity 2 - Activity 3 - Activity 4

Full-or-part-time: 19h

Theory classes: 9h

Self study : 10h

ACTIVITIES

ACTIVITY 1: THEORY SESSIONS

Description:

Description in class of the theoretical contents of the subject

Specific objectives:

After these classes, the student should have consolidated and adquired all the knowledges enumerated in the general learning goals of subject.

Material:

Basic and specific bibliography
ATENEA Handouts

Delivery:

This activity is graded through one written final exam (activity 4)

Full-or-part-time: 22h

Theory classes: 14h

Self study: 8h

ACTIVITY 2: PRACTICAL PROJECT SESSIONS

Description:

Students organized by project groups. Teachers provide general criteria contained in project "Design and manufacturing of a sustainable prototype." Also, it will provide the content specific to each project group.

Specific objectives:

- Ability to find technical information autonomously.
- Ability to resolve production problems, go to a design (on paper or digital), the making a physical prototype or real.
- Understand and apply different methods to raise production.
- The student aware of the concept of standardization and the concept of 3R's (Reduce, Reuse and Recycling), designed and manufactured components.
- Development of Sustainability and Social generic competence.

Material:

Bibliography and Project guide

Delivery:

Report on the activity performed in groups. Must be delivered in digital format (ATENEA) and make an oral presentation at the end of course (3-5 min. per group).

It is part of continuous evaluation systems.

Full-or-part-time: 22h

Theory classes: 6h

Self study: 16h

ACTIVITY 3: LAB SESSIONS

Description:

In this activity the student will set up practical experiments related to the subject contents

Specific objectives:

Improve and use concepts related to metrology and manufacturing technologies.+
Contents related to module 1, 2, 3 and 4

Material:

Bibliography and Lab Guide

Delivery:

Lab report prepared for groups.

It is part of continuous evaluation systems.

Full-or-part-time: 18h

Theory classes: 8h

Self study: 10h



ACTIVITY 4: FINAL EXAM

Description:

Individual test related to the required contents.

Specific objectives:

Contents related to module 1,2, 3 and 4

Material:

Exam and handouts provided

Delivery:

Solved exam is handed to the professor

It is part of continuous evaluation systems

Full-or-part-time: 9h

Theory classes: 2h

Self study: 7h

ACTIVITY 5: HOMEWORKS

Description:

Solve problems posted in ATENEA in order to fix the contents developed in the theoretical and practical sessions

Specific objectives:

Contents related to module 2 and 3

Material:

Problem posted in ATENEA

Delivery:

Handout the solution through ATENEA

Full-or-part-time: 4h

Self study: 4h

GRADING SYSTEM

Activity 2 (Project sessions), weight: 25%

Activity 3 (Lab sessions), weight: 20%

Activity 4 (Final exam), weight: 45%

Activity 5 (Homeworks), weight: 10%

EXAMINATION RULES.

All the activities are compulsory.

Activities 2 and 3 are held in groups and writing. The third activity will also have a 3-5 minute oral presentation.

Activities 4 and 5 will be individually written.

BIBLIOGRAPHY

Basic:

- Kalpakjian, S.; Schmid, S.R. Manufacturing processes for engineering materials. 5th ed. Upper Saddle River: Prentice Hall, 2008. ISBN 9789810679538.

Complementary:



- Reithmaier, L. (ed.). Standard aircraft handbook for mechanics and technicians. 6th ed. New York: McGraw-Hill, 1999. ISBN 9780071348362.
- Ehmann, K.F. [et al.]. Micromanufacturing: international research and development. Dordrecht: Springer, 2007. ISBN 9781402059483.
- Castellanos, Rafael [et al.]. Diccionari del taller mecànic. Barcelona: La Llar del Llibre, 1991. ISBN 8472794563.

RESOURCES

Other resources:

Notes of teachers.

Research articles and / or technical information.