



## Course guide

### 220225 - 220225 - Surface Engineering

Last modified: 02/04/2024

**Unit in charge:** Terrassa School of Industrial, Aerospace and Audiovisual Engineering  
**Teaching unit:** 702 - CEM - Department of Materials Science and Engineering.

**Degree:** MASTER'S DEGREE IN INDUSTRIAL ENGINEERING (Syllabus 2013). (Optional subject).  
MASTER'S DEGREE IN AERONAUTICAL ENGINEERING (Syllabus 2014). (Optional subject).  
MASTER'S DEGREE IN SPACE AND AERONAUTICAL ENGINEERING (Syllabus 2016). (Optional subject).

**Academic year:** 2024    **ECTS Credits:** 3.0    **Languages:** English

#### LECTURER

**Coordinating lecturer:** M. Núria Salán

**Others:** Carles Colominas  
Juan Muñoz, Jaime  
Illescas Fernández, Silvia

#### TEACHING METHODOLOGY

The course is divided into parts:

Theory classes

Practical classes

Self-study for doing exercises and activities.

In the theory classes, teachers will introduce the theoretical basis of the concepts, methods and results and illustrate them with examples appropriate to facilitate their understanding.

In the practical classes (in the classroom), teachers guide students in applying theoretical concepts to solve problems, always using critical reasoning. We propose that students solve exercises in and outside the classroom, to promote contact and use the basic tools needed to solve problems.

Students, independently, need to work on the materials provided by teachers and the outcomes of the sessions of exercises/problems, in order to fix and assimilate the concepts.

The teachers provide the syllabus and monitoring of activities (by ATENEA).

#### LEARNING OBJECTIVES OF THE SUBJECT

Knowing about heat treatments, coatings, thermomechanical treatments or other techniques that can introduce some changes in surface components in order to suit them to service requirements.

Introduction of main surface analysis and characterization techniques in order to determine quality and effectiveness of modified surfaces mostly applied to metal alloys. Learn about the latest advances in coatings and different utilities of each.

#### STUDY LOAD

Type	Hours	Percentage
Hours large group	27,0	36.00
Self study	48,0	64.00

**Total learning time:** 75 h



## CONTENTS

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### Module 1: Surface heat treatments

**Description:**

Surface heat treatments in metal alloys

- Flame quenching, induction quenching, laser quenching, electron beam quenching
- Characteristics and requirements
- Applications

**Related activities:**

Individual questionnaire

Team work

**Full-or-part-time:** 25h

Theory classes: 9h

Self study : 16h

### Module 2: Thermochemical treatments

**Description:**

Surface thermomechanic treatments for metallic alloys

- Shot peening
- Laser peening

**Related activities:**

Individual questionnaire

Team work

**Full-or-part-time:** 25h

Theory classes: 9h

Self study : 16h

### Module 3: Surface Engineering-Coatings

**Description:**

- PVD, CVD
- TBC (Thermal Barrier Coatings)
- DLC (Diamond Like Coatings)

**Related activities:**

Individual questionnaire

Team work

**Full-or-part-time:** 25h

Theory classes: 9h

Self study : 16h

## GRADING SYSTEM

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Deliverables modules 1-2-3: 40%

Teamwork: 40%

Subjective qualification: 20 %



## BIBLIOGRAPHY

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### Basic:

- Dieter, G. E.; Schmidt, L. C. Engineering design. 6th ed. New York: McGraw-Hill, 2021. ISBN 9781260575279.
- Ashby, M. F.; Shercliff, Hugh; Cebon, David. Materials : engineering, science, processing and design. 3rd ed. Oxford, Amsterdam [etc.]: Butterworth-Heinemann, Elsevier, 2014. ISBN 9780080977737.