Course guide
295766 - 295EM126 - Material Joining Technology

Last modified: 04/06/2026

Unit in charge: Barcelona East School of Engineering
Teaching unit: 702 - CEM - Department of Materials Science and Engineering.

Degree: ERASMUS MUNDUS MASTER'S DEGREE IN ADVANCED MATERIALS SCIENCE AND ENGINEERING (Syllabus 2014). (Optional subject).
MASTER'S DEGREE IN MATERIALS SCIENCE AND ADVANCED MATERIALS ENGINEERING (Syllabus 2019). (Optional subject).
ERASMUS MUNDUS MASTER'S DEGREE IN ADVANCED MATERIALS SCIENCE AND ENGINEERING (Syllabus 2021). (Optional subject).

Academic year: 2026 **ECTS Credits:** 6.0 **Languages:** Spanish

LECTURER

Coordinating lecturer: ANTONIO MANUEL MATEO GARCIA

Others: Segon quadrimestre:
TOBIAS MARTIN ABT - Grup: T1
ANNA GIRONES MOLERA - Grup: T1
ANTONIO MANUEL MATEO GARCIA - Grup: T1
JAUME PUJANTE AGUDO - Grup: T1
ORLANDO ONOFRE SANTANA PEREZ - Grup: T1

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CEMCEAM-03. (ENG) Realizar estudios de caracterización y evaluación de materiales según sus aplicaciones
CEMCEAM-04. (ENG) Realizar estudios de caracterización y evaluación de materiales según sus aplicaciones

Transversal:
05 TEQ. TEAMWORK. Being able to work as a team player, either as a member or as a leader. Contributing to projects pragmatically and responsibly, by reaching commitments in accordance to the resources that are available.

TEACHING METHODOLOGY

In the classes of theory, the basic concepts of the subject will be exposed, starting from textbooks as a general reference. The subject will be complemented with other materials, like outlines or summaries of the theoretical concepts and fundamental laws, tests to appraise the assimilation of the theoretical concepts, collections of problems, hyphens of practices, etc...
In the classes, the proposed test questions, which the students will have worked previously at home, attempting to favour a discussion of the concepts on the part of the students will be solved. Besides the blackboard different didactic resources will be used like transparencies and presentations with computer. Real pieces of material, representative varying ones of the different processes of union with faults and failures will be presented to the classes.

The practices of laboratory will be carried out by small groups and will consist of the realization of the practice in the laboratory and the writing of a report with the results and the discussion. They will allow that the student familiarizes himself with determinate instruments, that develop his critical observation and that approaches to the scientific method and becomes familiar to analyzing and presenting experimental results. The sessions of practices have duration of two hours. Together with the examination of theory, there will be an examination with questions about the sessions of laboratory practices.

LEARNING OBJECTIVES OF THE SUBJECT

The processes of materials joining are the fundamental topic.

Specific objectives:
- To know of the main technologies of metals welding
- To understand the metallurgical changes in the welded material and their influence in the mechanical properties
- To understand the basic aspects of the adhesion, evaluation of the adhesion and the essential aspects about the effectiveness of the adhesive joints

As general objectives in the formation of the students:
- To promote the capacity to work in team.
- Promoting the development of critical analysis and scientific method
- To collaborate in the capacity to transmit knowledge in an oral way as well as written.
- Familiarize them with the use of the bibliography and of technical material in order to favour their self-learning capacity.

STUDY LOAD

Type	Hours	Percentage
Hours large group	28,0	53.85
Hours small group	14,0	26.92
Self study	10,0	19.23

Total learning time: 52 h

CONTENTS

title english

Description:
1. FUNDAMENTS OF WELDING Definitions. Importance of welding.
Types of welding. Physics of welding.

2. WELDING PROCESSES
Arc welding
Resistance welding
Gas welding
Solid state welding.
Filler metals. Fluxes.
Positions of the pieces in the welding. Preparation of the pieces to weld.
Cost of the welding.
Automatic welding.

3. DEFECTS OF WELDING
Deformations and internal tensions in the welding.
Defects of welding.

4. ADHESIVE JOINTS
General aspects about adhesion
Contact among the phases
Pretreatment of the surfaces

5. MECHANICAL PROPERTIES OF THE ADHESIVE UNIONS
Tests to evaluate the resistance to the separation of adhesive unions
Non destructive tests

6. TYPES OF ADHESIVES
Components on the formulations

Related competencies :
CEMCEAM-03. (ENG) Realizar estudios de caracterización y evaluación de materiales según sus aplicaciones
CEMCEAM-04. (ENG) Realizar estudios de caracterización y evaluación de materiales según sus aplicaciones
05 TEQ. TEAMWORK. Being able to work as a team player, either as a member or as a leader. Contributing to projects pragmatically and responsibly, by reaching commitments in accordance to the resources that are available.

Full-or-part-time: 150h
Theory classes: 28h
Laboratory classes: 14h
Guided activities: 6h
Self study : 102h

GRADING SYSTEM

Any academic fraud, plagiarism or use or possession of unauthorised means in an assessment activity leads to a mark of zero (0) for the affected test or assignment. Furthermore, in accordance with the University's regulations, if disciplinary proceedings are initiated the subject is recorded as "Pending Assessment" until a decision is reached. These incidents are managed in accordance with the **Action Framework for Academic Integrity in Assessment at the UPC**.

There will be two partial exams, being at least 25% of the final qualification.
Reports and problems have a minimum value of 20% of the final qualification.
There will be a final exam but not retake exam.

BIBLIOGRAPHY

Basic:
- Messler, Robert W. Principles of welding : processes, physics, chemistry, and metallurgy. New York: Wiley-VCH, cop. 2004. ISBN 0471253766.
- Ruiz Rubio, Alfonso. Inspección radiográfica de las uniones soldadas. Bilbao: Urmo, 1971. ISBN 8431401664.
- Kinloch, A. J. Adhesion and adhesives : sciences and technology. London [etc.]: Chapman and Hall, 1987. ISBN 041227440X.