1. BASIC INFORMATION

Course	Construction II: Materials
Degree program	Bachelor's degree in Fundamentals of Architecture
School	School of Architecture, Engineering, Science and Computing
Year	Second Year
ECTS	6 ECTS (150 hours)
Credit type	Basic
Language(s)	English and Spanish
Delivery mode	Campus-based
Semester	S2
Academic year	2025-2026
Coordinating professor	Luis Alvarez Alfaro

2. PRESENTATION

The subject is taught in the second year of the degree, during the second term. Introduces the student to:

- Knowledge of the chemical characteristics of the materials used in construction, their manufacturing processes, the methodology of the tests for determining their characteristics, their geological origin, environmental impact, recycling and waste management.
- Ability to use the knowledge acquired in subsequent subjects, especially in construction, quality control and environmental management.
- Ability to adapt construction materials to the type and use of the building, manage and direct the reception and quality control of materials, their implementation, execution control and the performance of final tests and trials.
- Knowledge of the specific procedures for controlling the material execution of the building work.

3. COMPETENCIES AND LEARNING OUTCOMES

Core competencies: 1, 2, 3, 4, 5

- CB1: That students have demonstrated knowledge and understanding in a field of study that is based on general secondary education, at a level which, although supported by advanced textbooks, imply some knowledge of the vanguard of their field of study.
- CB2: That students can apply their knowledge to their work or vocation in a professional way and have competences that can be displayed by means of elaborating and sustaining arguments and solving problems in their field of study.
- CB3: That students have the ability to gather and interpret relevant data (usually within their field of study) to make judgements that include reflection on relevant social, scientific or ethical issues.
- CB4: That students can communicate information, ideas, problems and solutions to both the specialist and non-specialist.

- CB5: That students have developed the necessary learning skills to undertake further studies with a high level of autonomy.

Cross-curricular competencies: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

- CT1: Responsibility: aptitude or capacity to face responsibility that the profession of architect has in society, particularly when elaborating projects that take into consideration social and environmental factors.
- CT2: Self-confidence.
- CT3: Awareness of ethical values: ethical commitment, which includes the understanding and knowledge of the rights and duties of individuals and professional people, fostering respect for human rights, the protection of the most vulnerable members of society and respect for the environment.
- CT4: Communication skills in the native language (both oral and written) and in the English language, in accordance with the principles the Universidad Europea de Madrid, any concept or specification for the development of the regulated profession of architect. This includes learning the specific vocabulary of the degree as well as the ability to manage information.
- CT5: Interpersonal skills.
- CT6: Flexibility.
- CT7: Teamwork: Ability to work in teams of architects, or in interdisciplinary teams (with shared responsibility in many cases), managing and planning work groups that are necessary in the scheme of competences and tasks that are defined for projects of a certain scale, in which several disciplines come together. This ability includes skills for interpersonal relations and team leadership.
- CT8: Initiative and the spirit of an entrepreneur, both in the area of architecture as well as in business.
- CT9: Planning and time management: Ability to plan work in order to comply with delivery times and to respect the limits imposed by budgets and building codes.
- CT10: Innovation and creativity: Creativity, imagination and aesthetic sensitivity applied to the design in order to satisfy the both the aesthetic and technical demands. This competence includes critical reasoning and historical culture.

Specific competencies: 24, 26

- CE24: Adequate knowledge of solid, continuum and soil mechanics, as well as plastic and elastic qualities and strength of materials in heavy construction.
- CE26: Adequate knowledge of the physical and chemical characteristics, production procedures, pathology and use of building materials.

Learning outcomes:

- RA1: Understand the chemical characteristics of materials used in construction, their manufacturing process, the testing methods to determine their characteristics, their geological origin, the environmental impact, recycling and waste management.
- RA2: Use the knowledge acquired to study subsequent subjects, especially construction, quality control and environmental management.
- RA3: Adapt construction materials to the typology and use of the building, manage and direct the reception and quality control of the materials, their installation, implementation of work units, testing and final trials.

- RA4: Gain knowledge of the specific control procedures for the material implementation of construction.

The following table shows the relationship between the competencies developed during the course and the learning outcomes pursued:

Competencies	Learning outcomes
CB1, CB4, CG4, CT1, CT3, CT9, CE24	RA1: Understand the chemical characteristics of materials used in construction, their manufacturing process, the testing methods to determine their characteristics, their geological origin, the environmental impact, recycling and waste management.
CB2, CB5, CT2, CT8, CT10	RA2: Use the knowledge acquired to study subsequent subjects, especially construction, quality control and environmental management.
CB3, CG5, CT4, CT5, CT6, CT7, CE26	RA3: Adapt construction materials to the typology and use of the building, manage and direct the reception and quality control of the materials, their installation, implementation of work units, testing and final trials.
CG6,	RA4: Gain knowledge of the specific control procedures for the material implementation of construction.

4. CONTENT

The subject is organized into three learning units, which, in turn, are divided into lessons or sections:

LU1: Theory of materials. Lectures

- Lesson 1: Introduction: history and concept of building materials.
- Lesson 2: Families of materials. Properties of materials.
- Lesson 3: Stone I: Properties and types; Wood II: Formats; Wood III: Finishes.
- Lesson 4: Wood I: Species and II: Shapes and Finishes.
- Lesson 5: Ceramics I. Properties and types II. Formats
- Lesson 6: Metals I: Properties. Metals II: Steel Metals III: Aluminum. Metals IV: Formats
- Lesson 7: Binders. Cements, Limes and Plasters
- Lesson 8: Concrete I: Composition and properties. Concrete II: Types and textures.
- Lesson 9: Glass
- Lesson 10: Synthetic materials
- Lesson 11: Insulating Materials. Paints, adhesives, sealants and bituminous materials.
- Lesson 12: Other materials, fibers, composites and new materials.

LU2: Laboratory Tests

- Laboratory session group 1: analysis of general physical properties.
- Laboratory session group 2: analysis of specific materials
- Laboratory session group 3: manufacture and destructive tests of composite materials.

LU3: Research Project

- Project 01: Applied materials
- Project 02: Creation of a hybrid or composite material.

5. TEACHING-LEARNING METHODOLOGIES

The types of teaching-learning methodologies used are indicated below:

- Lectures
- Guided studies, practical exercises and problem solving
- Independent study/work
- Tutorials, academic monitoring and assessment
- Laboratory practices

6. LEARNING ACTIVITIES

The following table shows, for each learning activity: i) the total time the student will spend; ii) the course policy about the use of Artificial Intelligence (AI) in that activity.

Campus-based mode:

Learning activity	Total time	Use of AI
Lectures	12,5h	Allowed
Guided studies, practical exercises and problem-solving	37,5h	Allowed
Independent study/work	50h	Promoted
Tutorials, academic monitoring and assessment	25h	Allowed
Lab tests	25h	Not allowed
TOTAL	**150h**	

Further details about the use of IA policy will be published through the virtual campus platform once the course has started

7. ASSESSMENT AND CLASS ATTENDANCE

Listed below are the assessment systems used and the weight each one carries towards the final course grade:

Campus-based mode:

Assessment system	Weight
Projects and research	50 %
Personal exposition of acquired knowledge	40 %
Practical application through lab tests	10 %

When you access the course on the *Campus Virtual*, you'll find a description of the assessment activities you have to complete, as well as the delivery deadline and assessment procedure for each one.

7.1. First exam period

To pass the course in the first exam period, you must obtain a final course grade of at least 5 out of 10 (weighted average).

In any case, it will be necessary to obtain a grade higher or equal to 4.0 as an average mark in the theoretical exams, as well as a minimum mark of 4.0 in the last practical research project of the course in order to obtain an average mark for the rest of the activities. Students who do not obtain an average mark of at least 4.0 in the theory exams and a mark of at least 4.0 in the last practical research project will automatically fail the course, even if the aggregate average mark for all the activities exceeds 5.0.

7.2. Second exam period

To pass the course in the second exam period, you must obtain a final grade of at least 5 out of 10 (weighted average).

Students who have followed the course and have not passed the practical exercises have the option of completing them during the extraordinary exam period and handing them in on the day of the exam.

Students who have followed the course and have not passed the theory exams will keep the grade obtained for the practical exercises during the course and will take the theory exam on the day of the extraordinary exam.

Students who have not followed the course will have to complete the practical exercises during the period prior to the extraordinary exam and hand them in on the day of the extraordinary exam. In addition, they will also have to take the theory exam on the day of the extraordinary exam.

In any case, it will be necessary to obtain a grade higher than or equal to 4.0 in the theory exam, as well as a minimum grade of 4.0 in the practical research work of the course so that it can be averaged with the rest of the activities. Students who do not obtain a mark of at least 4.0 in the theory exam and a mark of at least 4.0 in the practical research work will automatically fail, even if the average aggregate mark for all the activities exceeds 5.0.

7.3 Class attendance

Class attendance is mandatory. Students must attend at least 70% of the classes and are allowed to miss a maximum of 10% with no need for justification. Students who fail to attend a minimum of 70% of the classes will automatically fail the course.

8. SCHEDULE

This table shows the delivery deadline for each assessable activity in the course:

Assessable activities	Deadline
Project 01: Applied materials. Submission I	Week 2
Project 01: Applied materials. Submission II	Week 3
Project 02: Creation of a new material. Submission I	Week 10
Exam 1	Week 10
Project 02: Creation of a new material. Submission II	Week 13
Exam 2	Week 15
Project 02: Creation of a new material. Submission III	Week 15

This schedule may be subject to changes for logistical reasons relating to the activities. The student will be notified of any change as and when appropriate.

9. BIBLIOGRAPHY

The recommended Bibliography is:

GENERAL CONCEPTS

- Manfred Hegger, Volker Auch-Schwelk, Matthias Fuchs & Thorsten Rosenkranz. *Construction Materials Manual*. Birkhäuser Architecture; Basel 2006
- Deplazes A. (ed). *Constructing Architecture, Materials Processes Structures.* A Handbook. Birkhäuser; Basel 2008
- ALLEN, Edward; IANO, Joseph. Fundamentals of Building Construction: Materials and Methods. Wiley. 7th Edition, 2019.
- Cowan H., Smith P., *The Science and technology of building materials*. Van Nostrand Reinhold Company Inc. New York 1988.
- Manfred Hegger, Hans Drexler & Martin Zeumer *Materials*. Basics Birkhäuser Architecture; Basel 2017.
- Arredondo y Verdú, Francisco. *Generalidades sobre materiales de Construcción. ETS Ingenieros de Caminos. Madrid 1990.*
- Camuñas, A. *Materiales de Construcción. Guadiana Publicaciones SA. Madrid, 1971*

REINFORCED CONCRETE:

- F. CASINELLO, Fernando. Hormigonería. Madrid: Rueda, 1996.
- J. CALAVERA, José. Manual detalles constructivos obras de hormigón armado, Madrid: Intemac, 2004.

STEEL:

- HART, F. et al. El Atlas de la construcción metálica. Barcelona: Gustavo Gili, 1976. (N.B. Out of print; ask for an extract).
- ARAUJO, Ramón y SECO, Enrique. Construir arquitectura en España en Acero, Pamplona: Ensidesa (Aceralia), 1994.

- HURTADO MINGO et al. Estructuras de acero en edificación. APTA, 2008.

TIMBER:

- Miguel A.R. Nevado. Diseño Estructural en Madera. Madrid: AITIM, 1999.
- T. Herzog et al. Timber Construction Manual. Munich: Birkhäuser, ed. Detail, 2004.

MASONRY:

- KUMMER, Robinson M. Masonry construction. Basel, Switzerland: Birkhäuser, 2007.

10. DIVERSITY MANAGEMENT UNIT

Students with specific learning support needs:

Curricular adaptations and adjustments for students with specific learning support needs, in order to guarantee equal opportunities, will be overseen by the Diversity Management Unit (UAD: Unidad de Atención a la Diversidad).

It is compulsory for this Unit to issue a curricular adaptation/adjustment report, and therefore students with specific learning support needs should contact the Unit at unidad.diversidad@universidadeuropea.es at the beginning of each semester.

11. ONLINE SURVEYS

Your opinion matters!

The Universidad Europea encourages you to participate in several surveys which help identify the strengths and areas we need to improve regarding professors, degree programs and the teaching-learning process.

The surveys will be made available in the “surveys” section in virtual campus or via e-mail.

Your assessment is necessary for us to improve.

Thank you very much for your participation.

WORK PLAN FOR THE COURSE

HOW TO COMMUNICATE WITH YOUR PROFESSOR

Whenever you have a question about the content or activities, don’t forget to post it to your course forum so that your classmates can read it.

You might not be the only one with the same question!

If you have a question that you only want to ask your professor, you can send him/her a private message from the Campus Virtual. And if you need to discuss something in more detail, you can arrange an advisory session with your professor.

It’s a good idea to check the course forum on a regular basis and read the messages posted by your classmates and professors, as this can be another way to learn.

PLAGIARISM REGULATION

In accordance with the current student disciplinary regulations at Universidad Europea:

- Plagiarism, in full or in part, of intellectual works of any kind, is considered a very serious offense.
- Very serious offenses relating to plagiarism and the use of fraudulent means to pass assessment tests shall result in exclusion from the exams for the relevant period, as well as the inclusion of the offense and its details in the student's academic record.

USE OF IA REGULATION

The student must be the author of his/her work/activities.

The use of Artificial Intelligence tools (AI) must be authorized by the teacher in each assignment/activity, indicating in what way it uses is permitted. The teacher will inform in advance in which situations AI tools may be used to improve spelling, grammar and editing in general. The student is responsible for clarifying the information given by the tool and duly declaring the use of any AI tool, according to the guidelines given by the teacher. The final decision on the authorship of the work and the appropriateness of the reported use of an AI tool rests with the lecturer and those responsible for the degree.

DISCLAIMER

If there are doubts regarding the authorship of the submitted material, even within the AI usage policy of the subject, the teacher reserves the right to request additional observation to verify and properly control the origin of the produced work and to ensure that the expected learning outcomes have been duly achieved.

APENDIX: DESCRIPTION OF ASSESSMENT ACTIVITIES

and the weight each activity carries towards the final course grade.

Assessable activity	Assessment rubric	Weight (%)
Activity 1	• The student knows the answers to fundamental questions about traditional materials science • The student knows how to respond to case studies on the application of traditional materials to architecture	20%
• Activity 2	• The student knows how to elaborate laboratory tests following a predetermined script. • The student demonstrates that is capable of applying the regulations on the testing of construction materials. • The student knows how to make complete, synthetic and accurate reports on the laboratory sessions	10 %
Activity 3	• The student knows the answers to fundamental questions about traditional materials science	20%

	• The student knows how to respond to case studies on the application of traditional materials to architecture	
Activity 4	• The student demonstrates that is able to work efficiently in groups • The student makes an in-depth and interesting research • The student knows how to translate the research carried out into a precise and detailed report • The student knows how to clearly articulate the development and results of the research orally.	50%
Activity 5	• participates actively in classes and develops classroom exercises appropriately	10 % (additional)