1. BASIC INFORMATION

Course	TECHNICAL SYSTEMS
Degree program	Bachelor Degree in Architecture
School	Architecture, Engineering and Design
Year	Fourth
ECTS	6 ECTS (150 hours)
Credit type	Mandatory
Language(s)	English
Delivery mode	In Campus
Semester	Second
Academic year	25/26
Coordinating professor	Pablo Saiz Sánchez

2. PRESENTATION

The course is taught in workshop format in which students rehearse and exercise one of the basic and fundamental aspects of the architectural profession: integration of architectural design with technical systems that materialize and make it possible.

The aim is to learn how to jointly develop the architectural design, structural systems, construction systems and installations of a project in order to be able to generate a global, coherent and integrated project. The project is finally translated into technical documentation with the quality, precision and definition necessary for the execution of the defined works.

This subject includes the experiences acquired in previous courses, both in the different areas of Building Technology and in Projects, with regard to terminology, concepts, functional, energy, structural and constructive organization. Theoretical lessons and practical exercises will focus on providing an effective documentary basis and realistic application criteria that will allow undertake both, the conception of an integrated and efficient design and its detailed constructive definition.

The objective of the practical development exercise, which acts as the core of the course, is that the student reflects on what has been learnt up to that point, takes initiatives by proposing his own solutions and adjusts the result in successive approximations and simulations. Finally, the student will submit a professional documentation that will be duly justified and represented.

3. COMPETENCIES AND LEARNING OUTCOMES

Core competencies:

• **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 high level of autonomy.

General competencies:

• **CG4**: Understanding of the structural design, construction and engineering problems associated with building design.

• **CG5**: Knowledge of physical problems and technologies and of the function of buildings so as to provide them with internal conditions of comfort and protection against climatic factors.

• **CG6**: Knowledge of the industries, organisations, regulations and procedures involved in translating design concepts into buildings and integrating plans into overall planning.

• **CG7**: Understanding of the relationship between people and buildings, and between these and their environment, and of the need to relate buildings and the spaces to human needs and scale.

Cross-curricular competencies:

• **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:** Communicative 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:

• **CE13:** Ability to apply technical and construction standards and regulations

• **CE16:** Ability to evaluate construction works.

• **CE17:** Ability to conceive, calculate, design, integrate buildings and urban units and execute building structures

• **CE35:** Ability to address passive environmental conditioning, including thermal and acoustic insulation, climate control, energy efficiency and daylighting.

• **CE43:** Ability to carry out security, evacuation and protection projects in buildings.

Learning outcomes:

• **LO1**: Ability to identify construction elements and systems, define their function and compatibility, and their implementation in the construction process. Plan and resolve construction details.

• **LO2**: Ability to execute an integrated design in Architecture of Installations, Construction and Structures, emphasising the mutual interaction of these three disciplines in the project process, seeking the most rational solutions in all cases, as well as their influence on the architectural design.

• **LO3**: Ability to analyse projects and their translation into the execution of works.

• **LO4**: Ability to apply technical regulations to the construction process, and generate technical specification documents for building construction procedures and methods, with a critical vision.

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

Competencies	Learning outcomes
	LO1: Ability to identify construction elements and systems, define

	their function and compatibility, and their implementation in the construction process. Plan and resolve construction details.
	LO2: Ability to execute an integrated design in Architecture of Installations, Construction and Structures, emphasising the mutual interaction of these three disciplines in the project process, seeking the most rational solutions in all cases, as well as their influence on the architectural design.
	LO3: Ability to analyse projects and their translation into the execution of works.
	LO4: Capacidad para aplicar la normativa técnica al proceso de la edificación, y generar documentos de especificación técnica de los procedimientos y métodos constructivos de edificios, con visión crítica.

4. CONTENT

The contents of the course are structured by the following main approaches:

• Integrated design in Architecture of Installations, Construction and Advanced Structures, emphasising the mutual interaction of these three disciplines and their influence on architectural design.

• Traditional and non-traditional building systems and the management of the specific construction process.

• Integration of flows, networks and server spaces (energy production, treatments, transport, transfers, etc.) in architectural design.

• Standardised and non-conventional structural systems, selection criteria, definition, predimensioning and documentation.

5. TEACHING-LEARNING METHODOLOGIES

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

• Lectures, conferences, trips, visits to construction sites, companies and institutions.

• Problem based learning

• Workshops

6. LEARNING ACTIVITIES

Listed below are the types of learning activities and the number of hours the student will spend on each one:

Campus-based mode:

Learning activity	Number of hours	Use of AI
Master lectures/classes	12,5h	Allowed

Guided studies, practical exercises, problem-solving	50h	Assessed
Exhibition of works	12,5h	Allowed
Inclusive approach to working groups	25h	Promoted
Independent study	25h	Promoted
Tutorials, activities follow-up and review	25h	Allowed
TOTAL	**150h**	

7. ASSESSMENT

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

Campus-based mode:

Assessment system	Weight
Activity 1 : Research work	30,00%
Activity 2: Team work projects	70,00%

Active participation in the classroom is a substantial for assessment. 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, you will need to obtain a grade of at 4.0 in the final exam in order for it to count towards the final grade along with all the grades corresponding to the other activities.

7.2. Extraordinary 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).

In any case, you will need to obtain a grade of at 4.0 in the final exam in order for it to count towards the final grade along with all the grades corresponding to the other activities.

The student must deliver the activities not successfully completed in the first exam period after having received the corresponding corrections from the professor, or those that were not delivered in the first place.

8. SCHEDULE

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

Assessable activities	Deadline
Activity 1 - Research	Week 1 to 6
Activity 2 - Project	Week 7 to 18

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 main reference work for this subject is:

• Staib, Dörrhofer, Rosenthal. *Components and Systems.* Basel. Detail. Birkhauser. 2008

The recommended Bibliography is:

Books:

• Saiz Sánchez Pablo. *La Casa Industrializada. Seis Propuestas para este Milenio. Ediciones Asimétricas. 2023*

• Allen, Deward and Iano, Joseph. *Fundamentals of Building Construction: Materials and Methods*. New York. Wiley editors. 2008.

• Allen, E. y Zalewski, W. *Form and Forces, Designing efficient, expressive structures*. New Jersey: Wiley and sons, 2010.

• Araujo, R. *La Arquitectura como Técnica (1) Superficies*. Madrid: A.T.C. Ediciones, 2007

• Araujo, R. *La Arquitectura como Técnica (2) Construir en Altura*. Madrid: Ed. Reverte. 2012

• Araujo, R. y Seco, E. *Construir con acero. Arquitectura en España*. *Tomo 5.* Ed.Publicaciones ENSIDESA. 1994.

• Arroyo Portero, J. Carlos. *Números gordos en el proyecto de estructuras*. Madrid: Ed. Cinter, 2001.

• Charleson, A. W., Correa, J. y Nuñez, I. *La estructura como arquitectura*. Madrid: Reverte, 2007.

• Herranz Aguilar, J.C. y Vázquez Moreno, J. N*úmeros gordos en el proyecto de instalaciones*. Madrid: Cinter, 2012.

• Paricio, Ignacio. *La piel ligera*. Barcelona. Actar. 2010

• Schittich, C. (Ed). En *Detail. Pieles nuevas*. Basel: Birkhäuser, 2003.

• Schaich, Jörg y Bergermann, Rudolf: *Light Structures*. Ed. Prestel. München. 2003.

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• Varios. *DETAIL. Construction Manual*. Ed. Birkhäuser.

o Polymers & Membranes

o Glass

o Facade

o Timber

o Components and Systems

Journals:

• Tectónica, ATC Ediciones, en especial números 1 (envoleventes I fachadas ligeras), 2

(envolventes II cerramientos pesados), 6 (cubiertas planas), 8 (cubiertas inclinadas),

10 (vidrio), 16 (muro cortina), 17 (geometrías complejas), 19 (plásticos),

21 (instalaciones), 22 (aluminio) 25 (hormigón III), 32 (envolventes metálicas) y

34 (cubiertas).

• DETAIL edición española, en especial números: 7+8/2003 y 7/2001 (Fachadas y muros

exteriores), 11/2005, 7+8/2004 y 5/2001 (Estructuras de cubiertas), 7+8/2002 y

7+8/2005 (Cubiertas planas, inclinadas y onduladas).

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.

12. USE OF AI 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.

13. 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.