optional subjects etsas

All the optional subjects in this table are semestral and of 6 ECTS. They are developed in 60 classroom hours in 15 weeks. They are taught on a single day each week with 4 hours of class. Timetable compatibility between subjects must be studied.

Architectural Projects

Architecture and Sustainability—*2nd semester*

Sustainability calls for a new architectural thinking open to new ways of developing the profession. The new architecture will be more a physical action in the environment with a sustainable social benefit, than the outdated model of creating forms and spaces for sublime perceptions. New problems, messy situations, require multiform solutions of adjustable formulas, based on knowledge and innovation. The new generation of sustainable projects considers multiple facets of the physical reality of each territory, at each moment, as well as the economy of its available resources and the society that inhabits it. We do not think about the design of forms. The concreteness will be to arrange ways and draw up strategies that are not linked to the form in order to propose alternatives with them. The graphic component and the capacity for creative innovation, already developed especially in other Project subjects, will be used to design effective strategies. We will use the resources of the project, exercising the graphic effectiveness of the conceptual parameters and indicators that generate new structures. These graphics provide ideas, maps, clear images for planning the complex problem of sustainable development. They are a great help in synthesising concepts, not only to explain them but also to clarify the problems and the process of solutions.

Topics and objectives
The aim is to exercise the complicity of architecture with the available resources and to eliminate the distance between architecture and its habitual users; without ignoring the immense social costs and the cooperative need to confront them. Each course has as its work a collective publication called SHEETS ON ARCHITECTURE and SUSTAINABILITY that establishes a line of thought and action. It is not a course on bioclimatic architecture, nor on green building; the topics also cover other aspects of sustainability. also cover other aspects of sustainability such as cultural, heritage, social, economic, energy, flows, mobility and infrastructures,... and the actions of recycling, reusing, regenerating what we have inherited... The course brings together specialists from other disciplines: mathematical analysis, engineering, geography, economics, etc., who enrich the course by providing other points of view and tools. The exercises incorporate these new tools to produce architecture that generates solutions and is able to respond to the demands of the future: to rebuild the best habitat, to restructure spaces as a support for living and with the economy of the resources available at any given moment. The identification - linking the built with reality is a sine qua non condition for the next architecture. Economic efficiency and culture, heritage and recycling, innovation and, above all, the safety and comfort of citizens. The figure of the architect, what he has been able to build, the way in which his teaching has been produced and how citizens have revolutionised what for them was their right to decide on their habitat and its use, seems to be a path of no return in the relationship between architecture and the city.

Architecture and Heritage—*1st semester*

In today's social circumstances, intervention in the field of heritage has become a certain professional opportunity that demands knowledge in fields such as the protection, conservation and rehabilitation of built heritage. The knowledge imparted in the subject of Architecture and Heritage -both theoretical and practical- is an essential complement to the rest of the training content of the courses that make up the degree, focusing on the specific aspects of heritage work. It will be essential to approach the knowledge and interpretation of historical architecture, construction techniques, transformation processes, sequences and places. The necessary analysis and contextualisation of these architectures is the natural link with research into the landscape and the territory.

Our gaze will not only focus on the architectures traditionally considered monumental, but also on all those elements that present some typological, constructive, spatial or even environmental value to be taken into account. Urban configurations, plots and fabrics endowed with their own character and uniqueness, as well as the relationships that these elements may have with a particular landscape or an activity that has signs of interest. The potential of places and architectures accumulated by the ups and downs of history and conditioned by the strata, the topography, the different cultural transformations, with a path travelled, an inertia or dynamic on which the heritage project could have an impact, is valued. On a practical level, a chosen area of study will serve as the basis for the field of teaching experimentation where the analysis and testing of different intervention strategies will be developed, mediating actions between the past and the present, aware of the project's capacity for transformation and of our responsibility in the disappearance or valuation of the assets.

Bases of inhabiting—*1st semester*

In this subject, the subjective, social, cultural and anthropological aspects that underpin architectural space are interwoven. On the basis of these relationships, the space of the city and the territory are superimposed, thus configuring the meaning of habitat. The itineraries or routes, the daily practices of the subjects, as well as the instruments and tools that they use and manufacture (technologies), have an impact on the spaces for inhabiting. From the most phenomenological conceptions of these uses and practices to the most idealistic conceptions of individual and collective space have a place in its ideological framework. This subject is characterised by its approach to culture and civilisations from current and emerging perspectives, with reference to the architectural project. The subject Fundamentals of Inhabiting opens up a framework of opportunities from which to address collective demands and subjective desires in the field of architectural design in terms of space, architecture, the city and the territory. The essential themes to be dealt with and developed range from the domestic space in its diversity, the building, the public and urban space, as well as their relationship with landscapes and territories.

Architecture, landscape and territory—*2nd semester*

Learning Outcomes
The required learning outcomes are to design and manage the landscape and to advise on projects and policies related to landscape intervention. The architectural project as an interpretation and transformation of reality allows the integration of its own materials in the building and urban environment, on a territorial scale. The practice of the project on this scale requires training in areas common to other professionals. The workshop should encourage the practice of intervention strategies so that the architect's specific approach makes a relevant contribution to the whole. Specifically, the relationships between historical processes and their territorial footprint through the evolution of the system of cities, modes and networks of communication, productive systems and their forms of occupation of space. Also, physical elements such as orography, masses of vegetation or transformations derived from extractive processes, among other transformation processes. In short, the learning outcome must enable students to be trained in the management of a particularly complex design scale, the object of which is shared with other professional specialities.

Topics and objectives
The aim is to draw up a synthesis that, by way of a state of the question, reveals the keys to the development of a current of transdisciplinary thought in which the interpretation of reality from architectural keys is practically absent: geographers, anthropologists, historians and archaeologists, among others, are commonplace in the teams that tackle the complexity of the territory as a support for social action. But not only in the initial analytical stages, but also in the propositional documents in which strategies and action projects are set out, some with a notable design component analogous to the terms in which architecture itself would be approached. The territory, once the purely physical and geomorphological dimension has been considered, incorporates aspects of a physiographic nature to acquire the fullness of its complexity by being recognised as a palimpsest in which the notion of time is integrated as a determining factor. Settlement systems, productive structures, communication networks and demographic flows are superimposed in an uninterrupted process in which the so-called permanent, architectural structures succeed one another and intertwine with various forms of spatial occupation. The role played by the architectural project's own gaze is a task that must be substantiated, and to do so the first thing is to give content to what can be considered an absence that must be remedied in the architects' own training plans. And for this, it is necessary, at least, to know how the so-called territorial sciences have developed in the last two decades and their growing influence on the processes for their transformation.

The agreed European Landscape Convention - Florence 2002 - has given way to a legal and obligatory reference framework in which it has been defined by consensus what is understood by landscape and how to operate for its protection, conservation and management. The European Landscape Convention, in force in Spain since 2008, has been consolidated as a legal framework of reference, as in most EU countries, in the processes of territorial transformation.

The European Landscape Convention -Florence 2002-, has given way to a legal reference framework of obligatory compliance in which it has been defined by consensus what is understood by landscape and how to operate for its protection, conservation and management. The European Landscape Convention, in force in Spain since 2008, has been consolidated as a legal framework of reference, as in most EU countries, in the processes of territorial transformation.

A few years ago, the Spanish Cultural Heritage Institute drew up a National Cultural Landscape Plan and the IAPH itself has also developed a transdisciplinary laboratory for its study and protection. The concept of historic urban landscape, developed on the basis of the 2007 Vienna Memorandum, has been the response to the inadequacy of numerous declarations of world heritage which, after a few years, were found to be insufficient, not to say erroneous. The case of the city of Seville is notorious, where three buildings considered as autonomous entities were declared as such without taking into account the complex architectural relationship that exists between them and their surroundings in a clear exercise of continuity with the nineteenth-century concept of monument. Within the framework of the Architectural Projects area, the programme proposes a specific workshop to evaluate the scope of these conceptualisations in which administrative bodies and professional teams, which rarely include the architects themselves, are the main actors today.

Urban and Territorial Planning

Public space in planning—*1st semester*

Unit 1. Urban open space.
1. Concept of public open space. The system of open spaces. Open space in planning and its possibilities for landscaping.
2. Main lines of design in open spaces up to the 20th century.
3. Current lines of design in landscaped open spaces.
4. Types of landscaped public spaces. Influence on the city.
5. Public squares. Roundabouts and roundabouts.
6. Streets and promenades. Boulevards. Medians.
7. District gardens.
8. Urban parks and gardens. Peri-urban parks.
9. Forest greenery.
10. Landscaping of riverbanks. Riverside walks.

Unit 2. Design Elements in Gardening and Landscape Architecture.
11. Soil and rock architecture techniques.

12. Water Architecture Techniques.
13. Techniques of Plant Architecture.
14. Construction and design of Public Parks and Gardens.

Unit 3. Landscape Architecture and the Environment.
15. Environmental corrections through landscape techniques.
16. Landscape science.

Methodology
In the theoretical classes, the different types of public spaces in which landscaping plays an important role will be presented and analysed. The different design possibilities will also be shown by means of examples taken from reality. The current lines in the design of this type of spaces and their particularities will also be discussed. Finally, a specific study will be made of the ornamental vegetation most frequently used in this climate for the vegetation treatment of this type of space. In the practical classes, either a public space will be proposed for the project, with special emphasis on its vegetation and landscape treatment, or an existing one, where the aim is to rehabilitate it through the use of landscape architecture. The aim is to give practical - and if possible real - form to the knowledge acquired in the practical classes.

Evaluation Criteria
It will be assessed by means of the practical exercise. If the practical exercise is passed, the subject is passed. If it is not considered a pass, there is the possibility of passing it, or obtaining a better grade, by taking a final written exam on the content of the syllabus. In order to take this exam, the proposed practical exercise must be re-evaluated if the student has not previously obtained a pass mark. In these cases, the final grade will be the average of the written exam and the practical exercise. In subsequent ordinary examinations, only the written exam will be available.

Planning and Sustainability—*1st semester*

Unit 1. Introduction. The professional practice of the architect.

Unit 2. The paradigms of growth.
1. Contemporary development paradigms. Growth, degrowth, environment. Ecology. Sustainability.
2. The effects of land occupied for urban development purposes. Sustainability observatories: water, soil, energy, climate. Mobility, urbanisation.
3. The city: the 2Cs: compact and continuous and the 4Ds: different (from the traditional) dispersed, predatory and wasteful. Integrated urban regeneration. The neighbourhood scale.
4. Sustainability indices and indicators.
5. Mobility. Sustainability indicators. 7. Urban form. Sustainability indicators.

Unit 3. Planning and the environment. Urban regeneration integrated in the urban and territorial scale. Legal framework. Planning as a process. The tourist area.

Learning Outcomes
1. Planning cities with criteria of sustainability and working in a multidisciplinary context.
2. Handling of instruments that allow for a sustainable transformation of the built and natural environment, through the planning and design of cities.
3. Use of up-to-date techniques and criteria in environmental work in line with the guidelines of the governmental bodies in charge of their management and transformation.
4. Knowledge of the global energy problem associated with the construction and planning of cities, as well as its impact on global warming and CO2 emissions.
5. To acquire a perspective of solidarity. To recognise the limits of the very model of urbanisation in which we are installed, and to establish new lines of action that are more environmentally efficient, with a greater capacity to take advantage of internal potentialities and to reduce their impact on the environment.
6. Improve the quality of life of citizens, using available resources effectively and efficiently, decoupling socio-economic development from the use and degradation of resources and the loss of environmental quality.
7. To understand the new conditions of the territorial scale of cities in the new productive spaces generated by mobility and large territorial infrastructures, and the active incidence of transport, tourism and territory in the unsustainability of the predominant model.
8. To combine scientific and popular knowledge in the formulation of planning and landscape quality objectives, in order to promote the rehabilitation of the social habitat.
9. To use the instruments of conservation, rehabilitation, requalification and intervention in the urban space of the consolidated city as an indispensable means for the improvement of sustainability in the social habitat.

Evaluation Criteria
Students with at least 80% attendance in practical classes will be assessed on both theory and practical work and must pass each of these two components. Those with lower attendance will be assessed only with the final exam. In order to voluntarily improve the mark, with the instructions of the theory teacher, an individual work will be carried out. 45% of the final mark will correspond to theory and 55% to practice.

Urban Heritage and Planning—*2nd semester*

The aim of the course is to familiarise students with the different aspects of Special Planning, so that by the end of the four-month period students will be able, to a certain extent, to develop their own criteria and to manage a methodology that will enable them to deal successfully with this type of planning in the future. To this end, theoretical and practical teaching will try to be fully related. The practice will be nourished by the knowledge of analysis using what has just been learnt in theory and we will try to ensure that the student is capable of demonstrating his or her learning by concretising his or her efforts in a document produced in a group. We will try to support ourselves with visits to specific cases, to see on the ground what field work is like, which is essential in any planning.

Units
1. Planning and Heritage Protection
2. The process of Patrimonialisation
3. The drafting of the Special Plan

Methodology
We will try to work at the level of Information, Diagnosis and Advance as if it were a special planning drafting team. We will divide the possible areas of study among groups of students, establishing periodic common meetings as a strategy for monitoring the sectoral tasks. Each team will tackle, in coordination with their teacher, each of the most important heritage aspects for which they are responsible and will subsequently provide their colleagues with their progress and conclusions.

Evaluation Criteria
Attendance is compulsory. Active and continuous monitoring throughout the course, as well as the completion and punctual presentation of all the proposed exercises and the written test or work -the result of the theoretical classes- will be an essential requirement to successfully pass the course.

Architectural History, Theory and Composition

Landscape, City and Architecture in Andalusia—*2nd semester*

Units
1. Approach to the Andalusian city, landscape and territory.
2. Roman Andalusia and Islamic Andalusia: major heritage sites.
3. Renaissance and Baroque: urban renewal and architectural proposals.
4. The specificity of the industrial experience in Andalusia. The construction of an image.
5. Regionalism and modernity in the Andalusian architectural definition. The irruption of the dictatorship in the architectural discourse.
6. Architecture and democracy. The great urban and architectural works. Current scope of the Andalusian heritage proposal.

Learning Outcomes
1. Know the general lines of the architectural evolution of Andalusia and its landscape as an image and form of its territory and its cities.
2. Identify and critically evaluate, from a historical and heritage point of view, relevant elements of the different chronologies studied, which determine the characteristics of the architecture, the city and the landscape in Andalusia as a legacy.
3. Understand and manage the cultural complexity of the historical reality and the inherited landscape in Andalusia as conditioning factors of architectural intervention in terms of heritage.
4. Recognise the relevant role of the History of Architecture as an instrument for understanding the complexity of the landscape and the urban reality in Andalusia today.
5. Value and compare with other external experiences, the contribution and significance of recent architectural, urban and landscape interventions produced on cultural assets in Andalusia.
6. Elaborate the bases for the formulation of alternative models to the historiographical and heritage management definitions, established on qualified elements with an urban and landscape dimension, and which are part of the cultural heritage of Andalusia.
7. To articulate factors from the landscape and urban point of view aimed at strengthening the contribution of architecture as a factor of development and innovation for the territory of Andalusia.

Evaluation Criteria
The student's critical participation will be assessed both in the classes and in the development of the specific studies proposed; the clarity, capacity for synthesis and the documentary value of the work and its oral presentation; attendance at conferences and/or visits; the student's critical contribution and his/her capacity for coordination with the working group. The qualification will be carried out with an individual test that assesses the student's reception of the knowledge imparted in the theoretical classes and their critical elaboration (20%) and the elaboration of a practical group work (80%).

Architecture of the *Americas*—*2nd semester*

It presents an approach to the territorial, urban and architectural panorama of a continent that, for the most part, remains outside conventional historiographical treatises. The main objective is, therefore, to show the development of architecture in America from the origins of its civilisation to the present day, distinguishing the sphere linked to Anglo-Saxon influence from that of the Latin American world more closely linked to Portugal and Spain. The programme of the course covers America from North to South, taking into account the physical environment, but above all the socio-cultural and political context in which the city and architecture have been inserted over time. From this contextualised approach, there will be a general introduction that will focus on the geography, on the backbone landscapes of the continent (Amazon Rainforest and Andes Mountains), on the layout of settlements and on the historical evolution of the very diverse regions that have been shaping the American map. The first fascinating cultures settled on the plains of Mexico and Central America and on the peaks of the Andes will be explored, followed by the colonising presence, over three centuries, of European powers that left an almost indelible mark on the language, culture, religion, urban planning and architecture during an intense and complex period of domination.

The processes of independence in the 19th century took place quickly and efficiently, generating republican forms of government which gave new impetus to the territories, generating, in this climate of political effervescence, the widening and embellishment of towns and a wide range of eclectic architecture. In the first half of the 20th century, the American influence, with its technological advances, and that of the Central European modern movement, with its anti-academic approaches to architecture, were reflected in the first half of the 20th century. These decades saw the forging of successive generations of architects who reached their most expressive maturity between the 1950s and the 1970s, before bloody military dictatorships were imposed in almost all the Latin American republics. It is now, at the beginning of the new century, when political stability has spread and economic circumstances have improved, that a new phase is beginning, with highly qualified professionals exploring their reality in the search for their own architecture adapted to the conditions of the place and the expectations of the population and the public authorities. The course will be taught by combining theoretical sessions with work carried out by

students, individually or in teams, on emblematic cities, on relevant architects and on masterpieces that they will explain in public and record in class notebooks. Assessment will be continuous and will also take into account the relationship of the disciplinary content with cultural aspects, from literature to cinematography, which will help students to better understand American architecture, the city and the territory. Students will have the opportunity to learn about the evolution of countries that are still very close to each other from an integrated perspective.

Architecture and Environment—*1st semester*

Our aim is to situate architecture with respect to the various requirements that surround it in the 21st century. To this end, we want to provide student architects with tools for the systematic treatment of environmental problems in buildings and urban areas. The connection with the new media now available in artificial or mechanical equipment should not only not be neglected, but should also form the basis for the correct design of "intelligent" buildings and installations. Until now, these aspects have only dealt with the problems of intensity or regulation of the devices, to the detriment of natural gifts that are much richer, but also more complex and usually, for this reason, erroneously separated from the scope of architects and designers.

For this reason, our main concern will be to disseminate and consolidate those tools with which to approach the contemporary problems that link Architecture and Ecology. On the one hand, we will offer different ways to implement scientific and compositional architectural designs applied to Ecology, with a multiple vocation: to unite design, architecture and humanism (something that pure physics is not in a position to address). On the other hand, we will carry out a continuous reflection from the perspective of Social Ecology that will make us participants in the multiple socio-spatial problems that architecture encounters in the different territories of the planet. The programme therefore oscillates between the committed search for an ecological design for future generations and the cultural and social reflection involved in living and sharing the planet today.

In doing so, we will promote a professional practice that supports the design process with environmental implications, and that achieves social and economic benefit. To this end, we will take into account the various historical and social values that influence the creation of the built environment, developing procedures that allow us to integrate both environmental imperatives and the poetic dimension of architecture. The aim will be to reduce the impact on the environment as much as possible, while at the same time responding to the aspirations of the human being, without avoiding the richness of our cultural heritage.

Units
1. Introduction. Perspectives from the sciences and culture of environmental design.
2. Climate framework and architectural design.
3. Science, technique and technology. Applications in environmental design.
4. City, culture and environment.

Methodology
Teaching and learning will take place in two back-and-forth activities:
1. Theoretical lessons with audio-visual content.
2. Supervised development of a personal or group work, applying the theoretical contents of the subject to the field of architectural design.

Architectural Graphic Expression

Drawing and Avant-Garde—*1st semester*

The course is based on a general theory of architecture and on a specific theory of the relationship between drawing and the notions of the avant-garde. The course focuses on the analysis and communication of projected architecture and proposes a critical use of drawing in architectural processes.

The practical content of the course focuses on the analysis of certain exemplary and interdisciplinary cases of graphic processes in the ideation, construction and communication of the contemporary architectural project and on the application and proposal of graphic processes for the ideation, construction and most appropriate communication of the contemporary architectural project.

The subject is related to the possible development of the Final Degree or Master's Project, and is understood as an initiation experience to research, so it has a relevant component of training in analytical methodologies and knowledge generation.

Learning Outcomes
1. To develop a critical reflection on the concepts of the avant-garde in culture, art and architecture and on the avant-garde as a radical and unprecedented proposal for transformation.
2. Explain and assess the graphic processes in the ideation, construction and communication of the contemporary architectural project and analyse architectural projects from their ideation and drafting to their construction and destruction.
3. Analyse different forms and means of communicating architecture in the contemporary world. Exercise current processes of architectural communication.

Contents
1. The concepts of avant-garde in culture, art and architecture. The avant-garde as a radical and unprecedented proposal for transformation. The avant-garde as a project.
2. Graphic processes in the ideation, construction and communication of the eloquent contemporary architectural project. Analysis of exemplary cases.
3. Forms and means of communication of architecture in the contemporary world. Photography, cinema, advertising, art, writing, virtual spaces, competitions, publications, etc.

Drawing and Machine—*2nd semestre*

The course is based on a general theory of architecture and on a specific theory of the relationship between drawing and technology. It focuses on the role of digital graphic media in the processes of analysis, design and construction of architecture: BIM (Building Information Modelling), GIS (Geographic Information Systems), parametric design, digital capture, etc. It is proposed as an introductory experience to research and professional activity, with an important practical component of training in methodologies and strategies based on new digital graphic technologies and oriented towards the possible development of the Final Degree and Master's Thesis.

Learning Outcomes
1. To develop a critical reflection on the concepts of drawing and technology in culture, art and architecture. Analyse the graphic medium as a place for architecture.
2. Experiment with and criticise thinking, technology, programming and machinery for the survey and analysis of architecture (photography and photogrammetry).
3. Experiment with and critique the processes of ideation, communication and construction of the contemporary architectural project, effectively integrating digital (parametric design, building information models) and non-digital processes.
4. Propose and develop advanced graphic projects on architecture: space, structure, installations, infrastructures, the city, the territory, etc.

Contents
1. General theory of analysis and its methodological affinity with digital media.
2. Theoretical bases and architectural critique of digital models (BIM): thought, technology and programming in the development of the architectural project.
3. Theoretical bases and architectural critique of geographic information systems (GIS): thought, technology and programming in the knowledge and management of the city and the territory.
4. Theoretical bases and critique for the creation of complex geometries and their management through digital models (BIM, visual programming editors).
5. Theoretical bases of digital capture systems for surveying and their management through digital models (digital photogrammetry, BIM).
6. The advanced graphic project on architecture in collaborative environments. Information management in the process of developing a project.

Practical activities and evaluation
The practical content of the subject is developed on exemplary case studies where digital graphic media can be recognised and applied in the processes of documentation, survey, analysis, design and construction of architecture. The practical work will be carried out throughout the course, and will be handed in at the end of the four-month period, with partial control deliveries at intermediate stages. Punctual attendance and participation in face-to-face classes will be evaluated, which must be at least 80%, as well as the deliveries and the final pass mark for the course practice.

Drawing and heritage—*2nd semestre*

The course is based on a general theory of architecture and on a specific theory of the relationship between drawing and notions of heritage. The course focuses on the analysis and communication of designed and/or built architecture and on proposing a critical use of drawing in architectural processes. The practical content of the subject focuses on the analysis of exemplary cases of some graphic processes for the documentation, recording, survey and analysis of heritage, historical or contemporary architecture, and for subsequent intervention in it, and on the application and proposal of graphic processes for the documentation and recording of architecture and the architectural project of intervention in it. The subject is related to the possible development of the Final Degree or Master's Degree Project, and is understood as an initiation experience to research, as well as intervention in heritage, so it has a relevant component of training in analytical methodologies and knowledge generation.

Learning Outcomes
1. To develop a critical reflection on the concepts of heritage in culture, art and architecture from its first formulations to the present day. Analyse heritage as a material and immaterial pre-existence and as an object of the architectural project.
2. Experiment with graphic processes in the documentation, recording, survey and analysis of heritage architecture and in the ideation, construction and communication of the contemporary project of intervention in it.
3. Develop graphic processes in the expression of the passage of time in architecture: origin, trace, process, transformation, destruction. Know and analyse exemplary cases.
4. Know and criticise contemporary architectural expression and communication in the designation, legislation and management of architectural heritage.
5. Propose and plan the production of knowledge on heritage and on contemporary intervention in it.

Contents
1. Concepts of heritage in culture, art and architecture. Heritage as material and immaterial pre-existence and as a consequence and object of the architectural project.
2. Graphic processes in the documentation, recording, survey and analysis of heritage architecture and in the ideation, construction and communication of the contemporary project of intervention in it.
3. Graphic processes in the expression of the passage of time in architecture: origin, trace, process, transformation, destruction. Analysis of exemplary cases.
4. The implication of contemporary architectural expression and communication in the designation, legislation and management of architectural heritage.
5. The production of knowledge on heritage and on contemporary intervention in it.

Architectural Constructions

Environmental Construction and Sustainable Technologies—*2nd semestre*

The course proposes a scientific approach to design and evaluate buildings that respond to the various dimensions of sustainability, and to distinguish between environmentally friendly actions and mere commercial strategies. distinguish between environmentally friendly actions and mere commercial strategies. Starting from the immediate context -the south-, the architectural responses in "warm or Mediterranean climates" will be studied and subsequent extrapolations to influential architectural models in today's architecture from other cultural and climatic environments.

Units
1. Basic concepts of environmental impact mechanisms: understanding and knowing what, why, and how products and/or systems used in building interact with the environment.
2. Involvement of architectural design in the achievement of energy efficient and healthy buildings for the user: passive solar architecture, natural ventilation, storage systems and architectural integration of renewable energies.
3. Criteria and procedures for the evaluation and "quantification" of environmental impacts in architecture: approach to the Life Cycle Analysis methodology and the main environmental certification tools (LEED, BREEAM, VERDE level(s)).
4. Study of construction systems and products based on their impact. Comparative analysis and selection criteria of possible products to be used in a system. Knowledge of latest generation products and recovery of traditional procedures.
5. Construction waste management and circular economy.

Methodology
-Class presentation of the fundamental concepts and discussion of case analysis. All the material is provided on the virtual platform for monitoring.
-Development during the course of a group work that brings together all the contents.
-Analysis and evaluation of architectural proposals applying the knowledge and evaluation tools taught related to sunlight, life cycle analysis and environmental certification.
-Permanent interactive work in the classroom between teacher and students.
-The participation of the groups, with their coursework, in existing Architecture Competitions related to the subject is promoted. In previous years, various proposals have been analysed for participation in Solar Decathlon and other similar international competitions.

Learning assessment
Continuous assessment of the learning acquired during the development of the group work, which brings together all the contents of the subject. which brings together all the contents of the course. The practical exercise will account for 100% of the final grade.

From Tradition to Innovation: Latest Trends in Construction—*2nd semestre*

Faced with the uncertain future of architecture today, this subject promotes the training of students in basic aspects that have to do with the correct generation of architectural form based on the definition of a sustainable construction model that is fundamentally based on lightness and speed of assembly. generation of architectural form based on the definition of a sustainable construction model that is fundamentally based on lightness and speed of assembly. Students taking the course will learn to optimise their construction designs, correctly choosing the form, materiality, construction systems (especially latest-generation envelopes), passive conditioning strategies, possibilities of flexibility and reversibility, thus producing the most sustainable project in each case.

Objectives
1. Understand and assume the evolution of the processes of generation/construction of architectural form from antiquity to the present day based on the needs of society (of all kinds, functional and cultural) and the possibilities of technology (materiality and geometry), as a basis for understanding the way of building that must be produced today.
2. Transmit and understand the latest trends in construction based on the definition of a sustainable architectural model based on lightness, rapid assembly, flexibility, reversibility and the use of passive design strategies as a continuation of a logical evolution of architecture based on what was assumed in the previous objective.

Units
1. Tradition: Form, materiality, construction and architecture.
Analysis of selected built models from antiquity to the present day, showing their correct construction in accordance with the parameters indicated. Six topics are taught.
2. Innovation: Lightness and sustainability. The assembly work. The relationship between the proposed construction model and the reduction of the environmental impact is presented on the basis of a proposed itinerary that deals with the latest generation of envelopes, relations with industry, passive strategies in lightweight construction and analysis of built sustainable models.

Methodology
From the above headings, students are expected to acquire sufficient training in accordance with the objectives set and the weekly teaching design based on:
-Exposition of theoretical topics (12 topics).
-Performance of a basic and initiatory exercise carried out individually in which the student shows his skills to build his architectural ideas.
A group exercise in which students build a full-scale project developed by them, based on light construction. The use of BIM tools and the ETSA Fab-Lab is encouraged.
-Weekly workshops with the presence of at least two teachers.
-Critical sessions (3 are scheduled) with the presence of all teachers.

Learning assessment
A continuous assessment process will be followed based on face-to-face contact with the students to assess their ability to transfer the learning from the classes to the different models they build/fabricate. There will be no written tests. The final grade will correspond to:
-Attendance and participation in class (15 weeks): 10.0%.
-Exercise 0. Individual (2 weeks): 20,0%.
-Group exercise 1 (13 weeks): 70,0%.

Installations and Systems for Efficient and Smart Building Design—*2nd semestre*

The future of architecture and the construction sector lies in the comprehensive refurbishment of the building stock. All of this will be carried out under very demanding parameters of efficiency and technological integration, in search of neutrality in CO2 emissions and a better quality of life. and technological integration, in search of neutrality in CO2 emissions and a better quality of life. In the next 30 years, practically all existing buildings will have to be regenerated! practically all existing buildings! So... You can decide to watch how all this will happen... Or be part of the change!

Objectives
The course aims for students to acquire knowledge and tools that will enable them to develop efficient and intelligent buildings, as well as to verify them through energy certification. To this end, energy efficiency concepts and methods will be applied, integrated with environmentally friendly design and the control of comfort, environmental quality and health performance. Topics include the characterisation of building energy systems, the assessment of required performance and optimisation potentials, the incorporation of renewable and non-conventional energies, building management and control systems, as well as the incorporation and use of ICTs. Emphasis will be placed, both qualitatively and quantitatively, on the understanding of energy fundamentals, practical examples and design exercises. The course will examine the technical and scientific principles affecting the problem, introducing students to different technologies, simulation tools and analysis techniques for the design of comfortable and functional environments, while ensuring the lowest possible energy use.

Units
The thematic blocks on which the syllabus is organised mark out the steps towards the design of an Efficient and Intelligent Building:
1. First step towards the Efficient and Intelligent Building: How to know the energy and performance needs of my building?
2. Second step towards the Efficient and Intelligent Building: How to incorporate renewable energies?
3. Third step towards the Efficient and Intelligent Building: How to manage my building in an intelligent way?
4. Fourth step towards the Efficient and Intelligent Building: How to integrate all the principles and verify the process? The energy certificate

Methodology
The format of the course will consist of weekly workshops, with regular lectures and case studies. Throughout the course, an Energy Optimisation Game will be organised, which will allow the students to apply the different knowledge and will be the main knowledge and will constitute the main thread of the course. During the game, students will compete in groups of 3 or 4 students, who will develop the building with the lowest energy use ratio and the highest performance to the end user. Individual and group work, as well as class presentations and exercises, will help students to study the use of environmental technologies in contemporary buildings.

Learning assessment
Continuous assessment without an exam, through presentations, in-class exercises and the Energy Optimisation Game.

Applied Physics

Energy and Sustainability in Architecture: Solar Decathlon Strategies—*1st semestre*

After several decades since the introduction of the term sustainable development, the international community is currently committed to achieving the 17 Sustainable Development Goals (SDGs) adopted by the UN in its 2030 Agenda, which provides a great opportunity to include these goals and the promotion of sustainably minded professionals in educational projects. Given that a large part of global energy dependence can be attributed to the construction sector, integrating sustainability issues into architecture curricula implies the consideration of an architectural education that is attentive to its most innovative features and which are essential in professional practice to address the territorial, urban and architectural problems that arise today. Promoting sustainable architectural models, generating ideas that respond to passive conditioning strategies, and maximising the efficiency and self-sufficiency of the building and its environment, can and should be a fundamental field of research in this field. With increasing pressure on material resources, the UN estimates that 80% of the world's population will live in cities in the 21st century, making it more necessary than ever to focus on the reuse of urban, architectural, heritage and building resources.

The subject has changed its focus since its establishment and nowadays its main objective is the implementation of strategies and skills aimed at the design of energy-efficient and environmentally sustainable social habitats. The methodology is inspired by the international Solar Decathlon competition, in which the University of Seville has a long and successful track record of participation. Specifically with the application of strategies similar to the AURA Project of the Solar Decathlon 2019 team, aimed at obsolete residential neighbourhoods in the city of Seville, in order to transform existing buildings, adapting them to the current needs of comfort, health, energy efficiency, sustainability and with flexibility of adaptation over time. The aim is to provide efficient and self-sufficient solutions that do not involve the demolition of old buildings for their subsequent construction. In the neighbourhood chosen for each course, various social rehabilitation strategies will be developed, grouped into 4 major transdisciplinary lines:

1. Social, Cultural and Heritage Identity
Its main objective is to incorporate the cultural-heritage component when establishing criteria for intervention in obsolete residential neighbourhoods, considering identity as part of regeneration. It is proposed to propose inclusive rehabilitations with a focus from a social perspective and taking into account the multiple dimensions of accessibility.

2. Comfort and Health Conditions
The main objective is to find out the situation of the neighbourhood in the field of health and its connection with the social reality of the neighbourhood (demography, services, economic situation, etc.).

3. Rehabilitation of Building and Urban Materiality
The main objective is to identify and characterise the structural systems and the materiality of the case studies, analysing compliance or non-compliance with current regulations and making new proposals in the field of energy efficiency, comfort and accessibility measures.

4. Energy Rehabilitation and Bioclimatic Retrofitting
The main objective is to characterise the thermal conditions of the current state of the residential building stock under study.

Units
-Energy efficiency in buildings. Passive air-conditioning systems. Renewable energies.
-Innovation: construction materials and construction techniques.
-Thermal, acoustic and lighting comfort parameters.
-Sustainable urban development: the social environment.
-Recognition and assessment of landscape structures from different historical periods, taking into account the quality of superimposition.
-Adaptation, due to obsolescence, of existing residential architectural typologies to the needs of today's society and its future trends.
-Universal accessibility and design for all.

Methodology
Students will be organised in groups to carry out a practical project in the chosen neighbourhood, limited in accordance with the credits of the subject, inserted in one of the 4 lines indicated above, and supervised and directed by the teaching team comprising various areas of knowledge. In the statement of the work, the specific urban fragment or fragments to be worked on, the phases of development and presentation, as well as the conditions of delivery will be designated. As many visits to the neighbourhood as necessary will be made to the object of analysis and proposal, at the same time as access to information relating to it will be made possible, whether of an urban planning or technical nature (installations, state of conservation) or of a historical or sociological nature. Likewise, it will be possible to invite a professional or professor to give a class or lecture related to the case study.

Learning Outcomes
R1. Know the different energy sources and resources of the Earth, their characteristics, environmental impact and efficiency.
R2. Recognise passive space conditioning systems and designs applicable in a climatic environment.
R3. Know the physical parameters related to the comfort and health of the user of the dwelling.
R4. Recognise the construction materials and the construction and conditioning techniques appropriate to a climatic environment.
R5. Effectively manage the tasks assigned as a member of a transdisciplinary team.
R6. Recognise and respect the urban, social and heritage environment of the place where the intervention under study will be located.
R7. Value and effectively communicate the qualities of teamwork.

Acoustics applied to Architecture and Urbanism—*1st semester*

The subject is organised: in theoretical sessions based on the thematic blocks set out below; in practical sessions or exercise workshops; and in laboratory practice. There is the possibility of organising a visit to a centre of interest, the teaching of a subject in the form of a seminar and/or a guest lecture.

Units
1. Room acoustics: wave, geometrical and statistical acoustics; acoustic materials; parametric and sensory evaluation, auralisation...
2. Environmental acoustics: noise measurement and assessment; noise sources; noise mapping; noise and planning...
3. Building acoustics: Sound transmission, single, double and triple panels; structural connections; noise transmission in buildings; vibrations; transmission in ducts...
4. Regulations, simulation, laboratory and on-site testing.

Learning Outcomes
1. Apply acoustic conditioning criteria in the process of designing rooms.
2. Interpret acoustic tests related to the comfort and acoustic quality of rooms.
3. Use, at a basic level, computer tools for the acoustic design of rooms.
4. Consider and apply acoustic criteria in the design of buildings.
5. Know the tests related to the acoustic assessment of the insulation of enclosures, both in the laboratory and in situ.
6. Interpret the results of such tests.
7. Identify the importance of the incidence of noise in territorial planning and redevelopment.
8. Interpret noise-related regulations, from local to European level, of relevance in the field of architecture and urban planning.
9 Use and apply these regulations.

Evaluation Criteria
EV-C1, EV-C2, EV-C3 and EV-C4 referenced in the Syllabus.

Evaluation Instruments
1. EV-I1 Written tests: 20%.
2. EV-I4 Work, reports, studies, memory. Reports of laboratory/computer practices: 70%.
3. EV-I5 Knowledge/skills in the use of computer media (transversal): 10% 4.

Applied Mathematics

Numerical Techniques for Calculation and Design in Architecture. Parametric Design

—2nd semester

El objetivo de esta asignatura es proporcionar al alumnado las herramientas matemáticas básicas para un mejor aprovechamiento del Diseño Paramétrico en Arquitectura. Mediante el uso del software Grasshopper (plug-in de Rhinoceros) se aprenderán de forma práctica los conceptos de la geometría paramétrica y los algoritmos necesarios para el desarrollo de proyectos.

Objectives and Learning Outcomes
-Know and use the Rhinoceros programme and its plug-in Grasshopper for the graphic edition of free-form geometries.
-Elaborate and develop algorithms for the creation of parametric geometries.
-Know and use NURBS curves and surfaces in a basic way.
-Know and control the generation mode and the geometrical and graphical properties of architectural shapes.
-Know and use modelling by means of numerical and graphic techniques of different elements of the architectural project, especially those related to design and energy efficiency.
-Develop the ability to critically analyse the results.

Units
-Introduction to Rhinoceros and Grasshopper.
-Algorithms for the construction of free geometries.
-NURBS curves and surfaces.
-Introduction to other architectural applications: environmental, structural, lighting, etc.

Methodology
Presentation of activities, exercises and tasks related to the contents of the subject in each class session, which must be analysed and solved individually or jointly. Presentation and critique in class on the contents of the activities carried out.

Evaluation
Students will be asked to carry out several projects, individually or jointly, based on applications related to Architecture. In order to pass the course, the student must actively participate in the development of the classes and carry out the work proposed, obtaining a positive evaluation of the same. The presentation of at least one of these works will be required.

Data Analysis and Mapping of Urban Resources—*2nd semester*

The beginning of a project has a strong component of search and analysis of the information available on its field of study. Therefore, the main objective of the course is to enable students to handle the different official data sources (Cadastre, IGN, INE, SIMA, REDIAM, DERA...), to incorporate statistical techniques and algorithms in networks to analyse them and to use objective criteria in decision-making. To this end, the open source Geographic Information System QGIS is introduced as a computer tool, which allows both the visualisation and analysis of the information.

Unit 1: Statistical analysis of cadastral data.
Unit 2: Localisation of urban resources.

Learning Outcomes
1. Easy access to information available from official sources. Downloading csv data, vector and raster layers...
2. Intermediate command of QGIS software.
    a. Work with layers in vector and raster format, with emphasis on the handling of the associated databases.
    b. Use different techniques for visualisation, consultation, classification and symbolisation of spatial data.
    c. Cross-reference information from different data sources. Incorporation of data tables into existing layers.
    d. Use the map editor for visualisation of results.
    e. Create 3D views.
3. Perform statistical analysis of both vector and raster layers.
4. Apply algorithms to measure distances over networks and design optimal routes.
5. Construct grids and evaluate different indicators over an area.
6. Hierarchise criteria for decision making or evaluation of an area.
7. Analyse watersheds for sustainable territorial and urban planning.

Evaluation Criteria
The continuous assessment of the course will be based on the completion of a project in an area chosen by the student. During the semester, the project will be enriched with the analysis of cadastral data (use, number of dwellings, height, built surface...) and the profile of the population (age, income, Gini index...), with information on mobility (public transport, bicycle lanes...) and proximity to different facilities (schools, health centres, green areas...), etc.

The evaluation of the project will take into account: the originality of the subject, the theoretical basis of the problem, the criteria adopted, the resolution, the conclusions, the criticisms of the model and the solutions, and the presentation, both oral and written, of the material produced. Likewise, the degree of participation and involvement of the student in the development of the classes will be taken into consideration for the final grade.

Terrain Engineering

Complementary courses on Soil Mechanics and Foundations—*1st semester*

The architect has to solve a multitude of problems that require a knowledge of geotechnics that often goes beyond basic knowledge. For example, urban infrastructures and land planning require a study and evaluation of the characteristics of the terrain. In addition, both infrastructure works and In many cases, environmental impact studies related to land and water are required for both infrastructure works and planning. In fact, the Andalusian Land Law states that land with natural hazards, such as landslides, flooding, etc., must be undevelopable. In fact, the Andalusian community has the highest geotechnical risks due to expansivity, landslides, and also the area with the highest seismic risk, such as Granada. Notions of numerical methods and calculations with specific geotechnical programmes (finite elements, finite differences) or simple spreadsheets will be given.

Unit 1. Geotechnical Engineering Extension
1. Expansion of piles. 2. Slope stability. 3. Ground improvement and treatment. Geomembranes, geotextiles and geogrids. 4. Rock foundations. 5. Numerical methods in geotechnics. Software for Soil Mechanics

Unit 2. Environmental Geotechnics and Earthquake Engineering
1. Geotechnical mapping. Environmental impacts. 2. Ecological walls. 3. Sanitary landfills. 4. Underground works. 5. Relationship between urban planning and land. 6. Seismic movements. Seismic movement calculation

Learning Outcomes
Use advanced pile calculation techniques, slope stability, model simulation, seismic risk assessment, etc.

Evaluation Criteria
Continuous assessment through the work carried out by the students with the requirement of attendance to the classes and singular geotechnical works. There will be two individual multiple-choice tests (one per block), and two practical works in groups of a maximum of 3 students, where the different thematic blocks will be developed for a specific environment. The weight of the tests will be 20% to the theoretical part and 80% to the practical work. In special cases, a final exam may be held in individual cases, consisting of a theoretical part and two problems to be solved from the syllabus.

Foundations: Pathologies and Undermining

—1st semester

The study of damaged buildings and housing estates is an important field of intervention for architects. The figures indicate that approximately one in every 5000-1000 buildings collapse due to foundation problems and in retaining structures the percentage rises to one per thousand. We also know that 80% of the buildings that have disappeared are due to foundation problems.

The pathology and underpinning of foundations is therefore a field of intervention almost exclusively for architects, and in current times a growing field of work. Students will analyse a practical case of foundation pathology and develop an intervention proposal, including an economic evaluation. During the course we will visit different buildings and housing developments to learn first-hand about problems related to the ground, foundation structures, retaining structures and different underpinning techniques. At least three visits will be made to affected buildings or sites.

Unit 1. Foundation Pathologies
1. Soil as the origin of damage in buildings: introduction, legal aspects. 2. Assessment of foundation damage: causes and origin (in the design, in the execution, changes in the environment, generalised problems), evolution, safety of the different elements. 3. Documentation of technical reports.

Unit 2. Underpinning and Repairs
1. Choice of system. 2. Surface improvements and land reclamation. 3. Complementary Complementary actions. 4. Deep undermining. 5. Repair of retaining structures (walls, screens). 6. Repair and stabilisation of slopes. 7. the repair and underpinning project and its controls and tests.

Learning Outcomes
Use techniques for evaluation, control and repair of foundations, simulation of models, calculation of underpinning, etc.

Evaluation Criteria
Continuous assessment through the work carried out by the students, with attendance to classes, buildings and construction sites being required. There will be two individual multiple-choice tests (one per block), and two practical tasks in groups of a maximum of 3 students (pathology report and repair proposal). 20% of the tests will be weighted towards the theoretical part and 80% towards the practical tasks. In special cases, a final exam may be held in individual cases, consisting of a theoretical part and two problems to be solved from the syllabus.

Building Structures

Special Structures in Architecture—2nd semester

Unit 1. Films and Membranes. Definition, historical evolution, classification. Membranes and films of revolution, cylindrical and translational. Study of specific cases.
Unit 2. Bar meshes. Arches and trusses. Truss gratings. Stereo meshes. Cylindrical meshes. Single-layer domes. Complex meshes.
Unit 3. Tensile Structures. Introduction to tensile structures. Prestressed structures. Textile structures.

Learning Outcomes
At the end of the course, students are expected to be able to:
1. recognise different structural typologies corresponding to special (non-conventional) structures, specifically those that fall into the following types: sheets and membranes, bar meshes, tensile structures.
2. Design and pre-dimension, for each of these structural types, an initial structural model suitable for a given architectural project.
3. In the case of tensile structures, relate the design of the initial structural model and its subsequent materialisation through the execution of models. To this end, structural models will be made using FABLAB.
4. For each of the structural types, make a complete structural model using different computer tools (SAP2000 and FormFinder) that represents the initially designed structural model. Therefore, the handling of a structural analysis software by the Finite Element Method, SAP2000, will be learnt.
5. Analyse the different complete structural models and be able to readjust them to achieve an optimal structural design by improving, if necessary, the initial structural model.

Evaluation Criteria
The system adopted for the evaluation per course is continuous assessment. Students will work in groups on three structured projects related to the three thematic blocks. Several projects of each type will be proposed, so that each group will work on a different project, and then joint presentations and discussions will be held so that all students can share their experience and thus generate collaborative learning.

Structural Intervention in Existing Buildings

—1st semester

Unit 1. Structural Assessment
General information on structural pathology. Recognition, instrumentation and tests, regulations. Structural supports and stabilisation systems: types, calculation methods, regulations. Structural types of masonry, steel, concrete and wood. For each type, the usual injuries, specific methods of recognition and procedures for estimating the level of safety will be discussed.

Unit 2. Reinforcement and repair of structures
General. Repair and reinforcement of structures: general criteria, regulations and quality control. Structural types of masonry, steel, concrete and timber. For each type, specific design criteria, intervention techniques, calculation methods, regulations and quality control will be covered.

Learning Outcomes
At the end of the course, students are expected to be able to:
1. identify structural injuries.
2. Prepare a research campaign.
3. Quantify the extent, importance and possible evolution of the lesions.
4. Explain the origin of the injuries.
5. Design shoring and stabilisation systems.
6. Estimate the safety level of existing structures.
7. Design and calculate reinforcement elements for the mentioned structural types.
8. Draft the documentation of a structural intervention project: plans, reports and annexes. Assessment Criteria and Instruments The system adopted is one of continuous assessment, based on projects. Students will work in groups on two projects of intervention in building structures, one of expertise and the other of repair or reinforcement.
repair or reinforcement. Several projects of each type will be proposed for each group to work on one. And joint presentations and discussions will be held for all students to share their experience and generate collaborative learning.

The learning process will be assessed against the following criteria:
1. Clarity in the drafting of technical documentation, including the geometric description of the building and its structure in its current and renovated state, the study of the lesions, their interpretation and foreseeable evolution, as well as the order of execution of the different works on the site.
2. The correct choice of actions, regulations and other parameters that may affect the problem.
3. The repair or reinforcement systems proposed will be the most appropriate for the problems detected.
4. In the calculation annexes, the introduction of sufficiently justified simplifications and the correctness and elegance of the numerical checks of the structural safety shall be assessed.

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