HIGHER TECHNICAL SCHOOL OF ARCHITECTURE OF SEVILLE

UNDERGRADUATE DEGREE ELECTIVE COURSES

All elective courses in this program are one semester long and worth **6 ECTS**, conducted in **60 class hours over the course of 15 weeks** in the corresponding semester. Each course is taught one day per week in a 4-hour class. Please consider the compatibility of the different course schedules in the summary table.

ARCHITECTURAL PROJECTS

ARCHITECTURE AND SUSTAINABILITY

2nd semester (Friday morning/afternoon) Contact Prof. Rafael Casado Martínez rafaelcasado@us.es

The course approach is based on the need for training in a new kind of architectural thought, open to new forms of development in the profession. New architecture is more of a physical action in the environment with sustainable social benefits rather than the antiquated model of creating shapes and spaces for sublime perceptions.

The course proposes training exercises to incorporate these new tools for producing architecture. The course aims to train the ability to build the best habitat, organize spaces to support inhabitation in order to meet future demands, and raise awareness of using the available resources at all times.

We will consider changing problems that must be solved through knowledge and innovation, in multiple formats, taking into account that their immediate determination lies more in suggesting and providing means than in designing forms. We will formulate strategies disassociated from the form, supported by analysis diagrams, in order to use them to develop solutions prior to the form diagram.

The graphic component and capacity for creative innovation, which have primarily already been developed in the project courses, will help students design effective strategies. We will use project resources, exercising both the graphic effectiveness of the diagrams as well as the conceptual parameters and indicators that generate new structures. Diagrams are very helpful for synthesizing concepts – not only for explaining them, but also to clarify our own ideas. These graphics provide ideas, clear images for planning the complex problem of sustainable development.

The new generation of sustainable projects takes into account multiple facets of the physical reality of each territory: economy of means, resources and the society that inhabits it.

Topics and Objectives

This course is intended to exercise a mutual understanding between architecture and the available resources, paying attention to the major associated social costs and the need of collective cooperation to face them. This is not a course on bioclimatic architecture or ecological construction. The topics discussed address other aspects of sustainability including culture, heritage, social aspects, economy, energy, flows, mobility, infrastructure, recycling, reusing, regenerating what has been inherited, etc. Identification-connection of the built world with reality and the economy of available resources is a *sine qua non* condition of new architecture.[1]

[1] Nowadays, new urban and architectural culture is based on sustainability and the environment, economic efficiency and culture, heritage, recycling, innovation and, above all, the safety and comfort of citizens.

ARCHITECTURE AND HERITAGE

1st semester (Friday morning/afternoon) Contact Prof. Francisco Reina Trujillo reinaft@gmail.com

The Department of Architectural Projects has extensive experience in the curricular area of Heritage, and is aware that this subject has become increasingly important in the teaching and practice of architecture. Under the current social circumstances, intervention in the field of heritage provides good employment opportunities and demands certain knowledge in the fields of protection, conservation and the rehabilitation of building heritage.

The knowledge taught in the Architecture and Heritage course – in terms of both theoretical and practical knowledge – are an essential complement to the rest of the educational content in the undergraduate degree program, addressing specific aspects of heritage activities. It is essential to approach the understanding and interpretation of historical architecture, construction techniques, transformation processes, sequences, and places. The necessary analysis and contextualization of these architectures forms a natural link to investigating the landscape and territory.

We will not only look at architecture that has traditionally been considered monumental, but also all the elements with some sort of typological, construction, spatial, or even environmental value. Urban configurations, connections and fabrics will be considered together their own unique nature, as well as the relationships these elements may have with certain landscapes or activities of interest. We will value the potentiality that places and architectures have accumulated with fluctuations in history, determined by the strata, topography, and different cultural transformations, coming a long way – an inertia or dynamic that the heritage project may focus on. On a practical level, a chosen area of study will serve as the basis for the field of educational experimentation, which includes analysing and testing various intervention strategies, intermediary actions between the past and the present, being aware of the project's transformation capacity and our responsibility in the disappearance or recognition of assets.

FUNDAMENTALS OF INHABITATION

1st semester (Friday morning/afternoon) Contact Prof. José Morales Sánchez disoluciones@arrakis.es

This course interweaves subjective, social, cultural, and anthropological aspects that serve as the fundamentals of architectural space. Based on these relationships, the space of the city and the territory overlap, thereby forming the meaning of the Habitat.

Spaces for inhabitation are influenced by the inhabitants' itineraries, paths and daily practices, as well as the instruments and tools that they use and manufacture (technologies). Everything has a place within this ideological framework, from the most phenomenological conceptions of these uses and practices to the most idealistic conceptions of the individual and collective space. This course addresses culture and civilizations from current and emerging perspectives regarding the architectural project.

The subject Fundamentals of Inhabitation offers a wide range of opportunities to address collective demands and subjective interests in the architectural project in terms of space, architecture, the city, and the territory.

The main topics discussed and developed include the diversity of domestic space, buildings, public and urban space, and their relationships with landscapes and territories.

ARCHITECTURE, LANDSCAPE AND TERRITORY

2nd semester (Tuesday morning/afternoon) Contact Prof. Pablo Diañez Rubio pdianez@us.es

Learning Objectives

The required learning objectives include *designing and managing the landscape, as well as providing advice on landscape intervention projects and policies.*

The architectural project as an interpretation and transformation of reality allows us to integrate its characteristic town council and urban considerations into the territorial scale. The development of projects on this scale requires skills in areas that are shared with other professionals. The workshop should promote the practice of intervention strategies in such a way that the architect's actions significantly contribute to the entire collective. Specifically, the relationships between historical processes and their territorial footprint through the evolution of the city system, means and networks of communication, production systems and their ways of occupying space, in addition to physical elements such as orography, masses of vegetation and transformations derived from extractive processes, among other transformation processes. In summary, the course should provide students with the abilities to manage an especially complex project scale with objectives shared by other professional specialties.

Topics and Objectives

The objective is to develop a synthesis that reveals the keys through which a school of transdisciplinary thought that is practically void of architectural perspectives to interpret reality has been developed: geographers, anthropologists, historians and archaeologists, among others, are often on the teams that address the complexity of the territory in support of social action. They are not only present in the initial analytical phases, but are also involved in the proposal documentation that explains action strategies and projects, sometimes with a significant project component similar to the terms in which the issue would be addressed by the architecture itself.

Once the purely physical and geomorphological dimensions have been considered, the territory incorporates physiographic aspects that contribute its complete complexity, being recognized as a palimpsest in which the notion of time is integrated as a determining factor. Settlement systems, productive structures, communication networks and demographic flows overlap in a continuous process in which the so-called permanent, architectural structures exist and intertwine with different ways of occupying space. The role of the architectural project's vision should be substantiated. Therefore, the most important measure is to provide content for what may be considered lacking and should be repaired in the architect's study plans. It is therefore necessary, at a minimum, to know how the so-called territorial sciences have developed over the past two decades and their growing influence on the processes to be changed.

The European Landscape Convention - Florence 2002 – provides a mandatory legal reference framework that defines landscape and promotes its protection, conservation and management through consensus. The European Landscape Convention has been consolidated as a valid legal reference framework for territorial transformation processes in Spain since 2008, as well as in most countries in the EU.

A few years ago, the Spanish Cultural Heritage Institute developed a National Cultural Landscape Plan and the Andalusian Historical Heritage Institute (IAPH) created a transdisciplinary laboratory for landscape study and protection. The concept of historical urban landscape based on the 2007 Vienna Memorandum has served as a response to the lack of sites declared World Heritage Sites, which were confirmed to be insufficient, if not erroneous, after a few years' time. The well-known case of the city of Seville involves three buildings that were considered autonomous entities and declared to be World Heritage Sites without taking into account the complex architectural relationship between the buildings and their environment in a clear exercise of continuity with the 19th century concept of monuments.

The program proposes a specific workshop within the framework of Architectural Projects that allows evaluating the scope of these conceptualizations in which administrative and professional teams are the main actors nowadays, rarely including the architects themselves.

URBAN DEVELOPMENT AND LAND PLANNING

PUBLIC SPACE IN PLANNING

1st semester (Friday morning/afternoon) Coordinator: Manuel Vigil-Escalera Pacheco mvigil@us.es

Course topic 1. Open public space.
1. Concept of open public space. The system of open spaces. Open space in planning and landscaping possibilities. 2. Main lines of design in open spaces up to the 20th century. 3. Current lines in open garden landscaping. 4. Types of landscaped public spaces. Influence on the city. 5. Public squares. Roundabouts and traffic circles. 6. Streets and promenades. Boulevards. Median strips. 7. District gardens. 8. Urban parks and gardens. Peri-urban parks. 9. Forest areas. 10. Landscaping along riverbanks. Riverbank promenades.
Course topic 2. Landscaping design elements and landscape architecture.
11. Terrain and rock architectural techniques. 12. Water architecture techniques. 13. Plant/Vegetation architectural techniques. 14. Design and construction of public parks and gardens.
Course topic 3. Landscape and Environmental Architecture.
15. Environmental corrections using landscaping techniques. 16. Landscape science.

Methodology
The theoretical classes will present and analyse different types of public spaces where landscaping plays an important role. We will also look at different design possibilities using real-world examples and will address the current project lines of this type of spaces and their particularities. Finally, we will specifically study the ornamental plants most frequently used for this climate in plant treatments for these kinds of spaces. The practical classes propose: either a public space for your project, with special emphasis on its plant and landscaping treatments, or an existing space to be rehabilitated through landscape architecture. All of this is intended to practically – and if possible actually – implement the knowledge acquired in the practical classes.

Evaluation criteria and tools.
Students will be evaluated based on the practical exercise and will receive a passing grade for the course if their performance is considered to be satisfactory. If their performance is considered unsatisfactory, it is still possible to pass the course or obtain a better grade by taking a final written exam on the relevant subject content. To be admitted to this exam, students must resubmit the assigned practical exercise for evaluation if they did not previously receive a satisfactory grade. In this case, the final grade would be the average of the written exam and the practical exercise. Later exam dates will only offer a written exam.

PLANNING AND SUSTAINABILITY

1st semester (Fr morning / Tu afternoon) Coordinator: Domingo Sánchez Fuentes dsanchez@us.es

Course topic 1. Introduction. The architect's professional practice.
Course topic 2. Paradigms of growth
2. Contemporary development paradigms. Growth, degrowth, environment. Ecology. Sustainability. 3. The effects of land used for urban purposes. Sustainability observatories: water, land, energy, climate. Mobility, urban development. 4. The 2Cs' city: compact and continuous, and the 4Ds' (in Spanish) city: different (to the traditional) disperse, predatory and wasteful.
Integrated urban regeneration. The neighbourhood scale. 5. Sustainability indices and indicators. 6. Mobility. Sustainability indicators. 7. The urban form. Sustainability indicators.
Course topic 3. Planning and the environment. Integrated urban regeneration on an urban and territorial scale. Legal framework. Planning as a process. Tourism space.

Learning Objectives
1. Plan cities with sustainability criteria and work in a multidisciplinary context. 2. Manage tools that permit a sustainable transformation of the built and natural environment, through the planning and design of cities. 3. Manage up-to-date techniques and criteria in the environmental field according to the directives of the governmental organizations in charge of their management and transformation. 4. Understand the global energy problem associated with building and planning cities, as well as its impact on global warming and CO_2 emissions. 5. Acquire a perspective of solidarity. Recognize the limitations of the urban development model in which we operate, and establish new lines of action that are more environmentally efficient, with a greater capacity for maximizing internal potentialities and reducing their impact on the environment. 6. Improve citizens' quality of life, making effective, efficient use of available resources, separating the socioeconomic development from the use and deterioration of resources and the reduction of environmental quality. 7. Understand the new conditions of the territorial scale of cities in new productive spaces resulting from mobility and major territorial infrastructures, and the active contribution of transportation, tourism and the territory to the unsustainability of the predominant model. 8. Combine scientific and popular knowledge to formulate landscape planning and quality objectives in order to promote the rehabilitation of the social habitat. 9. Use tools for conservation, rehabilitation, requalification, and intervention in the urban space of the consolidated city as an indispensable means for improving sustainability in the social habitat.

Evaluation criteria and tools.
Students with at least 80% attendance to practical classes will be evaluated on both theory and practical work and must pass both of these components. Students with less than 80% attendance will only be evaluated based on the final exam. In order to voluntarily improve their grade, students may complete an individual project following their theory professor's instructions. 45% of the final grade is based on the theoretical component and the remaining 55% on the practical component.

URBAN HERITAGE AND PLANNING

2nd semester (Tu morning / Fr afternoon) Coordinator: Mª Teresa Pérez Cano tpcano@us.es

The objective of this course is to familiarize students with the various aspects of the urban figure of Special Planning, so that by the end of course, they will be able to develop their own criteria and manage a methodology that will allow them to successfully undertake this type of planning on a professional level in the future.

The theoretical and practical course components will be closely related. The practice will be based on the analytical knowledge of what has been learned in theory. The goal is for students to demonstrate the knowledge they have learned by concentrating their efforts in a collective group document. We will visit specific case studies in order to see on-site fieldwork, which is essential for planning.

Course topics:
1. Heritage Planning and Protection.

2. The heritagization process.

3. Drafting the Special Plan.

Work methodology:
We will work as if we were a special planning drafting team in terms of information, diagnosis, evaluation and progress. The different areas of study will be divided among the student groups, establishing periodic sharing sessions as a follow-up strategy for sectorial tasks. In coordination with the professor, the teams will address each of the most important heritage aspects for which they are responsible and provide their classmates with their progress and conclusions.

Evaluation system:
Attendance is mandatory. Active, continuous follow-up throughout the course, as well as timely completing and presenting all the assigned exercises and the written exam or paper – based on the theory classes – are mandatory requirements for successfully passing the course.

ARCHITECTURAL HISTORY, THEORY AND COMPOSITION

LANDSCAPE, CITY AND ARCHITECTURE IN ANDALUSIA

2nd semester (Tuesday morning/afternoon) Coordinator: José Manuel Aladro aladroprieto@us.es

Course topics
1. Approach to the Andalusian city, landscape and territory.

2. Roman Andalusia and Islamic Andalusia: major heritage groups.

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. Emergence of the dictatorship in the architectural discourse.

6. Architecture and democracy. Major urban and architectural projects. Current scope of the Andalusian heritage proposal.

Learning objectives
1. Understand the general lines of architectural evolution in Andalusia and its landscape as an image and form of its territory and cities.
2. Critically identify and evaluate relevant elements of the various studied chronologies that determine the characteristics of the architecture, the city and the landscape in Andalusia as a legacy, from a historical and heritage perspective.
3. Understand and manage the cultural complexity of the historical reality and the inherited landscape in Andalusia as a determinant in architectural interventions in key heritage sites.
4. Recognize the relevant role of Architectural History as a tool for understanding the complexity of the landscape and the urban reality within the current reality of Andalusia.
5. Value and compare the contribution and meaning of recent architectural, urban and landscape interventions in Andalusia's cultural assets with other external experiences.
6. Develop the basis for formulating alternative models of historiographical definitions and heritage management established regarding qualified elements with urban and landscape dimensions that form the cultural heritage of Andalusia.
7. Address landscape and urban factors that reinforce the contribution of architecture as a factor of development and innovation for the Andalusia region.

Evaluation criteria and tools.
Students will be evaluated based on their critical participation at class and the development of the specific assigned studies; the project's clarity, synthesis and documentary value, as well as its oral presentation; attendance to conferences and/or visits; and students' critical contributions and ability to work in groups.

The grade is based on an individual test that assesses the student's assimilation of the knowledge taught in theory classes and their critical development (20%) as well as a practical group project (80%).

ARCHITECTURE OF THE AMERICAS

2nd semester (Friday morning/afternoon) Coordinator: José Ramón Moreno García jrmg@us.es

An approach to the territorial, urban and architectural panorama of a continent that, in large part, is left on the sidelines of conventional historiographical treaties. The main objective is to understand the development of architecture in America since the origins of its civilizations until the present time, distinguishing the areas associated with the Anglo-Saxon influence from the Latin American world, closely linked to Portugal and Spain.

The course program covers the America from North to South, paying special attention to the physical environment and, particularly, the sociocultural and political context of the city and architecture throughout time. Through this contextualized approach, a general introduction will address the geography of the continent's primary landscapes (the Amazon Rainforest and the Andes Mountains), the layout of the settlements and the historical evolution of the very diverse regions that form the map of the Americas.

We will discover the first fascinating cultures that settled in the plains of Mexico and Central America and the peaks of the Andes, continuing with the colonizing presence of European powers over the course of three centuries. This left an indelible footprint of language, religion, urban development and Baroque and Neoclassical styles of architecture from this intense phase of unjust domination, which ultimately exacerbated the population.

Independence movement processes in the 19th century occurred quickly and efficiently, producing republican forms of government that would give new impetus to the territories, which, in this climate of political effervescence, led to an expansion and embellishment of the cities, as well as a broad spectrum of eclectic architectures.

The first half of the 20th century reflects the influence of North America with its technological advances and the modern Central European movement with its approaches that are contrary to the academicism of architecture. Over the course of these decades, successive generations of architects reached expressive maturity from the 50s to the 70s, prior to the imposition of bloody military dictatorships, which were usually backed by the United States, in nearly all the Latin American republics.

It is only now, at the beginning of a new century, that political stability has been extended and economic circumstances have improved, and a renewal phase is beginning with well-trained professionals exploring their reality in the search of their own architecture, adapting to the local conditions and the expectations of the population and the political powers.

The course combines theory sessions with student projects developed either individually or in teams about emblematic cities, relevant architects, and masterful architecture, which will be presented in public and recorded in the class journals. Students' continuous evaluation will also take into account the relationship of the disciplinary content with cultural aspects, from literature to cinematography, for a better understanding of American architecture, the city and territory. Students will have the opportunity to learn with an integrating vision of the evolution of countries that still remain very close.

ARCHITECTURE AND THE ENVIRONMENT

1st semester (Friday morning/afternoon) Coordinator: José Manuel Almodóvar jmalmodovar@us.es

Our objective is to consider architecture in terms of the diverse requirements in the field that have emerged since the end of the 20th century. We hope to provide students with tools for the systematic treatment of environmental problems in buildings and urban areas. Our primary concern is to disseminate and reinforce tools that allow us to approach contemporary issues involving Architecture and Ecology. On the one hand, we present various ways of implementing Ecology-applied scientific and compositional architectural designs with multiple purposes: combining design, architecture and humanism (an area that pure physics does not cover). On the other hand, we will focus on Social Ecology and our participation in the multiple socio-spatial problems that architecture faces throughout the various regions around the world. We will study processes such as recycling, mobility, borders, tourism, landscapes, and identities. The program therefore moves from the committed search for an ecological design for future generations to the cultural and social reflection involved in living and sharing the planet in the present day.

Course topics
1. Introduction to environmental architecture and ecological policies.
2. Science, technique and technology: a genealogy of artificiality and building design.
3. Environmental design and ecological inhabitation.
4. Community and ecology: climatic framework and urban design.

Methodology
The course involves comprehensive teaching-learning activities:
1. Theoretical lessons with audio-visual content.
2. Guided development of an individual or group project, applying the course's theoretical content to the field of the architectural project.

Evaluation criteria and tools
The evaluation consists of two continuous tests: an individual test on the theoretical content and a group test on a practical case. Each exercise is worth 50% of the final grade. There is only one final submission and minimum 80% attendance is required. If the submitted exercises have not been passed by the end of the course, a final exam can be taken.

GRAPHIC ARCHITECTURAL EXPRESSION

DRAWING AND THE AVANT-GARDE

1st semester (Fr mor/aft) Coords: J Joaquín Parra & Concha Guerra jjpb@us.es conchaguerra@us.es

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

The subject's practical content focuses on the analysis of certain interdisciplinary case studies of graphic processes in the conceptualization, construction and communication of the contemporary architectural project as well as the application and proposal of graphic processes for the conceptualization, construction and most appropriate communication of the contemporary architectural project.

This course offers the possibility of developing a Final Degree Project and is intended to be an initial research experience, and therefore has a relevant component of training in analytical methodologies and the generation of knowledge.

Learning objectives
1. Develop critical thinking about avant-garde concepts in culture, art and architecture, as well as the avant-garde as a radical, unprecedented transformation proposal.

2. Explain and evaluate graphic processes in the conceptualization, construction and communication of the contemporary architectural project and analyse architectural projects from their conceptualization to their construction and destruction.

3. Analyse different forms and means of communicating architecture in contemporary society (photography, film, advertisement, art, writing, virtual spaces, competitions, publications, etc.)

Content
1. Avant-garde concepts in culture, art and architecture. The avant-garde as a radical, unprecedented transformation proposal. **2**. Graphic processes in the conceptualization, construction and communication of the contemporary architectural project. Analysis of case studies. **3**. Forms and means of communicating architecture in contemporary society. Photography, film, advertisement, art, writing, virtual spaces, competitions, publications, etc.

DRAWING AND MACHINES

2nd semester (Friday morning/afternoon) Coordinator: Francisco Pinto Puerto fspp@us.es

This subject is based on a general theory of architecture and a specific theory of the relationship between drawing and technology. The course focuses on the role of digital graphic media in architectural analysis, projects and construction processes: BIM (Building Information Models), GIS (Geographic Information Systems), parametric design, digital capture, etc. The course is intended to be an initial experience in research and professional activity, with an important practical training component in methodologies and strategies based on new graphic digital technologies, geared towards the possible development of a Final Degree Project.

Learning objectives
1. Develop critical thinking about the concepts of drawing and technology in culture, art and architecture. Analyse the graphic medium as a place for architecture.

2. Experience and evaluate thought, technology, programming and machines for surveying and analysing architecture (photography and photogrammetry).

3. Experience and evaluate the conceptualization, communication and construction processes of the contemporary architectural project, effectively integrating digital processes (parametric design, building information models) and non-digital processes.

4. Propose and develop advanced graphic architectural projects: space, structure, facilities, infrastructure, the city, territory, etc.

Content
1. General theories of analysis and methodological similarities with digital media. **2**. Theoretical foundations and architectural critique of digital models (BIM): thought, technology and programming in architectural project development. **3**. Theoretical foundations and architectural critique of geographic information systems (GIS): thought, technology and programming in knowledge and management of the city and territory. **4**. Theoretical foundations and critique of the creation of complex geometries and their management using digital models (BIM, visual programming editors) **5**. Theoretical basis of digital capture systems for survey and management using digital models (digital photogrammetry, BIM) **6**. Advanced graphic architectural projects in collaborative environments. Information management in the project development process.

Practical activity and evaluation.
The course's practical content involves case studies in which digital graphic media can be recognized and applied to architectural documentation, survey, analysis, projects, and construction processes. The practical exercise will be developed throughout the course and submitted at the end of the course, with partial submittals for review at intermediary stages. Students will be evaluated based on class participation and punctual attendance, which must be at least 80%, as well as partial and final submittals for the course's practical component.

DRAWING AND HERITAGE

2nd semester (Tue mor/aft) Coords: J. Joaquín Parra & Federico Arévalo jjpb@us.es farevalo@us.es

This course is based on a general theory of architecture and a specific theory on the relationship between drawing and the notions of heritage. The course focuses on the analysis and communication of designed and/or built architecture and proposes the critical use of drawing in architectural processes.
The course's practical content focuses on the analysis of case studies of certain graphic processes for documenting, registering, surveying, and analysing heritage, historical and contemporary architecture, in order to implement appropriate interventions and apply graphic process proposals for documenting and registering architecture and relevant architectural intervention projects.

The course offers the possibility of developing a Final Degree Project, and is intended to be an initial experience in research and heritage interventions, and therefore has a relevant component of training in analytical methodologies and the generation of knowledge.

Learning objectives
1. Develop critical thinking about concepts of heritage in culture, art and architecture, from its first formulations to the present. Analyse heritage as a material and immaterial pre-existence and the subject of the architectural project.
2. Experience graphic processes in the documentation, registration, survey, and analysis of architectural heritage and the conceptualization, construction and communication of relevant contemporary intervention projects.
3. Develop graphic processes that express the passage of time in architecture: origin, footprint, process, transformation, destruction. Understand and analyse case studies.
4. Understand and evaluate the expression and contemporary communication of architecture in the designation, legislation and management of architectural heritage.
5. Propose and plan the generation of knowledge regarding heritage and relevant contemporary interventions.

Content
1. Concepts of heritage in culture, art and architecture. Heritage as a material and immaterial pre-existence and as a result and subject of the architectural project. **2**. Graphic processes in the documentation, registration, survey, and analysis of architectural heritage and the conceptualization, construction and communication of relevant contemporary intervention projects. **3**. Graphic processes that express the passage of time in architecture: origin, footprint, process, transformation, destruction. Analysis of case studies. **4**. The implication of expression and contemporary communication of architecture in the designation, legislation and management of architectural heritage. **5**. Generation of knowledge regarding heritage and relevant contemporary interventions.

ARCHITECTURAL CONSTRUCTIONS

ENVIRONMENTAL CONSTRUCTION AND SUSTAINABLE TECHNOLOGY

2nd semester (Tu morning/afternoon) Coordinator: Angel Luis Candelas Gutiérrez alcg@us.es

Within the current panorama of architecture and other fields, we can observe a certain conventionalization and even abuse of the term "sustainable." The very ambiguity of the term permits its misuse. This course proposes a scientific approach to designing and assessing buildings that respond to diverse dimensions of sustainability, thereby distinguishing between actions that are clearly environmentally friendly and those that are merely commercially strategic. The course therefore definitively provides students with the specific knowledge and operative tools to allow them to begin developing a distinct specialization in the area of environmental awareness within the field of architecture.

Starting with a familiar context – the South – we will study architectural solutions in "warm and Mediterranean climates" and later extrapolations to the architectural models from other cultural and climatic environments that influence modern-day architecture.

Course topics
1. Basic concepts of environmental deterioration mechanisms: understanding what, why and how building products and/or systems interact with the environment. **2**. Implication of architectural design in energy-efficient construction that is healthy for users: passive solar architecture, natural ventilation, renewable energy accumulation architecture and integration systems. **3**. Evaluation criteria, procedures and "quantification" of environmental impacts on architecture: introduction to the Life Cycle Analysis methodology and the primary environmental certification tools (LEED, BREEAM, VERDE). **4**. Study of construction and production systems based on their impact. Comparative analysis and selection criteria for possible products used in a system. Knowledge of state-of-the-art products and recovery of traditional procedures.

Learning objectives
1. Understand the main aspects relating to environmental architecture.
2. Knowledge and application of the primary simulation, evaluation and "quantification" tools (ACV, Ecotect, Leed, Breeam, Verde).
3. Qualification for new professional career directions.

Evaluation criteria and tools.
Continuous evaluation through practical group work, which consists of analysing architectural models with a low degree of complexity, applying acquired knowledge and using the various assessment tools. Various Solardecatlon 2014 proposals were analysed during the 2014-15 academic year.

FROM TRADITION TO INNOVATION. EVOLUTION AND CONCEPT OF CONSTRUCTION SYSTEMS

2nd semester (Tu morning/afternoon) Coordinator: Juan Carlos Gómez de Cózar gcozar@us.es

"Thousands of buildings without any quality have brought an end to the economy."
Architecture, Paul Goldberger, 16/10/2012

Since the last decade of the 20th century, the improper use of new materials with a total absence of relationship with industry, energy waste, exhibitionist architecture and the real estate market crisis have created a widening gap between architecture and society. Nowadays, most architects cannot even find formulas that would allow them to survive. What they designed in the past no longer serves its purpose.

Considering the uncertain future of architecture in modern times, we believe that it is necessary to reinforce training in basic aspects related to the proper development of the architectural form in its most material facet (relationships between materiality and geometry based on architectural needs and technological possibilities).

Basic objectives
1. Understand the evolution of the development processes of the architectural form from ancient times to the present day based on society's needs (of all types, both functional and cultural) and technological possibilities (materiality and geometry). 2. Define a sustainable architectural model based on lightness, fast assembly, flexibility, and reversibility as a continuation of the logical evolution of architecture based on the previous objective.

Course topic 1. *Tradition*: Form, materiality and architecture. (6 lessons)
Course topic 2. *Innovation*: Lightness and sustainability. Assembly work. (6 lessons)

Training sections and activities.
Science, technique and architecture. Transfer of knowledge. Transformations and innovation in construction. From masonry work to assembly work. Digital manufacturing. Makers, models and prototypes.

Students are intended to acquire adequate training based on the proposed objectives and the weekly educational approach, including: the explanation of 12 theoretical lessons; completing exercises (a basic, initial individual exercise and an extensive group exercise); use of tools, such as BIM and ETSA's Fab-Lab; weekly workshops with at least two professors. Three critical sessions with all professors.

Evaluation criteria and tools.
Class attendance and participation (15 weeks): 10.0%. Exercise 0. Individual (2 weeks): 20.0%. Exercise 1. Group (13 weeks): 70.0%. There is no written exam.

FACILITIES AND SYSTEMS FOR DESIGNING EFFICIENT SMART BUILDINGS

2nd semester (Friday morning/afternoon) Coordinator: Samuel Domínguez Amarillo sdomin@us.es

This course explores the fundamental aspects of energy use in buildings and the control of building design-related features, and applies energy efficiency and environmentally friendly design concepts and methods. Topics include characterizing building energy systems, assessments, features and the potential for optimization, incorporation of renewable rather than conventional energy, building management and control systems, and incorporation and maximization of ICTs. The course will introduce students to different technologies and analysis techniques for designing comfortable, functional environments that also ensure the least possible consumption of energy.

Students will be challenged to apply these techniques and explore the different roles of energy and the smart layer in building development. An Energy Optimization Game will be organized during the course, allowing students to apply their diverse knowledge and serving as the unifying thread of the course.

Block 1: Smart buildings: building control: features and capacities.
Block 2: Building energy systems
Block 3: Energy evaluation and qualification

Objectives:
1. Design environmental conditioning systems and advanced facilities in unique buildings, control facilities, and efficient, automated systems. 2. Integration of renewable energy. 3. Conduct building energy use assessment procedures and develop energy qualification and certification processes.

Learning objectives:
This course is intended to help students:
1. Understand and apply technical and scientific principles of energy behaviour in buildings.
2. Learn to evaluate the ups and downs of different technologies for designing comfortable interior environments adapted to energy use and its repercussions.
3. Acquire knowledge for the critical discussion and presentation of environmental and energy values for buildings.

Evaluation tools:
The course format consists of weekly workshops with periodic readings and analyses of practical case studies. The individual and group work, class presentations and exercises will help students study the use of environmental technology in contemporary buildings.

APPLIED PHYSICS

ENERGY AND SUSTAINABILITY IN ARCHITECTURE

2nd semester (Friday morning) Coordinator: Sara Girón Borrero sgiron@us.es

This course is organized in theory sessions based on the course topics listed below, practical exercise sessions or workshops, and laboratory practice. The course offers the possibility of organized visits to a centre of interest during class hours, seminars covering certain topics, and/or conferences with guest professors.

Course topics
1. The Earth's energy resources: environmental impact and efficiency.
2. Transporting solar energy: extra-terrestrial and terrestrial radiation. Solar angles and angles of incidence. Solar diagrams and climate.
3. Heat transfer in buildings.
4. Physical fundamentals of solar thermal and photovoltaic energy conversion.
5. Thermal comfort, thermal balance in the human body and bioclimatic diagrams.
6. Bioclimatic strategies and heat accumulation.
Laboratory: Psychometric Trainer. Solar flat plate collector for hot water. Vacuum tube collector. Photovoltaic panels. Thermography applied to buildings.

Learning objectives
1. Recognize the Earth's different energy sources and resources. Analyse their environmental impact and efficiency. 2. Propose and solve mixed heat transfer problems in a variable and steady state system in the building area. 3. Describe physical and dynamic processes in the atmospheric gas system as a basis for its influence on the climate and other energy impacts. 4. Express radiometric magnitudes and discuss physical processes of solar radiation in the atmosphere-building system. 5. Calculate basic solar angles of the entire solar collection system. 6. Identify different heat transfers in the human body and factors influencing thermal comfort. 7. Establish comfort areas in bioclimatic diagrams and identify bioclimatic strategies suitable for each area.

Evaluation criteria EV-C1, EV-C2, EV-C3 and EV-C4, as cited in the curriculum.

Evaluation tools
1. A mandatory written exam, including multiple choice and/or short practical questions, at the end of the semester (30-40%).
2. Individual or group reports on the laboratory practice (30-40%).
3. Submittal of papers, presentations, oral exams, attendance, and individually assigned exercises (30-40%).

ACOUSTICS APPLIED TO ARCHITECTURE AND URBAN PLANNING

1st semester (Friday morning) Coordinator: Teófilo Zamarreño García teofilo@us.es

This course is organized in theory sessions based on the course topics listed below, practical exercise sessions or workshops, and laboratory practice. The course offers the possibility of organized visits to a centre of interest during class hours, seminars covering certain topics, and/or conferences with guest professors.

Course topics
1. Room acoustics: wave, geometric and statistical acoustics; acoustic materials; parametric and sensorial evaluation, auralization, etc.
2. Environmental acoustics: noise measurement and assessment; noise sources; noise maps; noise and planning, etc.
3. Building acoustics: sound transmission, simple, double and triple panels; structural connections; noise transmission in buildings; vibrations; transmission in ducts, etc.
4. Regulations, simulation, laboratory and in situ testing.

Learning objectives
1. Apply criteria of acoustic conditioning in the room design process.
2. Interpret acoustic tests for acoustic comfort and quality in rooms.
3. Use basic IT tools for acoustic room design.
4. Consider and apply acoustic criteria in building design.
5. Learn about testing for acoustic assessments of enclosure insulation, in the laboratory and in situ.
6. Interpret the results of said tests.
7. Identify the importance of noise impacts on territory planning and restructuring.
8. Interpret noise regulations relevant to the field of architecture and urban planning on both a local level and European scale.
9. Use and apply said regulations.

Evaluation criteria EV-C1, EV-C2, EV-C3 and EV-C4, as cited in the curriculum.

Evaluation tools
1. A mandatory written exam, including multiple choice and/or short practical questions, at the end of the semester (30-40%).
2. Individual or group reports on the laboratory practice (30-40%).
3. Submittal of papers, presentations, oral exams, attendance, and individually assigned exercises (30-40%).

APPLIED MATHEMATICS

NUMERIC TECHNIQUES FOR CALCULATION AND DESIGN IN ARCHITECTURE

2nd semester (Friday morning) Coordinator: Enrique Domingo Fernández Nieto edofer@us.es

In this course, students will numerically solve problems related to various facets of architecture, such as building sustainability and efficient design.

We will solve problems with the Finite Element Method, using specific computer software that facilitates the results and their subsequent processing, which will consequently reinforce students' capacity for analysis and help them develop critical thinking in regard to the obtained results.

Course topic 1. Introduction to the Finite Element Method.

Course topic 2. Introduction to specific software for problem solving, visualization and analysis of results.

Course topic 3. Applications of bioclimatic architecture.

Materiality: a. Energy use: analysis of heat and solar radiation transmission factors. b. Selection of construction materials based on their potential energy use. c. Material durability and elasticity.

Passive cooling: a. Energy efficiency with natural ventilation. b. Sustainable design: thermal comfort and internal air quality.

Learning objectives

1. Study and analyse mathematical models relating to design and energy efficiency in architecture.

2. Understand and apply numeric methods to solving these mathematical models.

3. Understand and use computer-based implementation techniques for numeric methods.

4. Developing critical thinking in regard to the results.

Evaluation criteria and tools
Various projects will be proposed, either individually or in groups, based on architecture-related applications.

To pass this course, students must actively participate in the development and presentation of at least one project, which will be graded on: the project's originality, the theoretical foundations of the problem, the criteria used, the solution, conclusions, and analysis of the results, as well as a presentation of the materials produced. Students' class participation will also be evaluated.

DATA ANALYSIS AND LOCALIZATION OF URBAN RESOURCES

2nd semester (Tuesday morning) Coordinator: Francisco Ortega Riejos riejos@us.es

Course topic 1: Statistical data analysis
Sociological spatial analysis is based on the availability of updated statistical data and its proper processing. Statistics provides techniques to obtain, organize and analyse data. The vulnerability of districts can be detected and quantified using statistical indicators that help guide the intervention priorities and policies.

Course topic 2: Graph Theory
Graph Theory allows us to outline and solve many problems in different scientific and technological fields. Specifically, it can be used to model the configuration of uses and pathways in a building or the efficiency of urban transportation, obtaining optimal itineraries based on alternative criteria.

Course topic 3: Localization Theory
Localization Theory basically consists of searching for the best places to locate services (hospitals, industries, transportation stations, warehouses, dumps, etc.). Localization models are mathematical formulations that are applied to solve these types of problems on an urban, metropolitan or regional scale.

Fundamental objectives
1. Understand and use statistical data analysis techniques.

2. Create mathematical models for real-world problems.

3. Develop critical thinking: evaluating the final solution and questioning the model's limitations.

4. Understand and use localization models for decision-making processes regarding the location of urban services.

Evaluation criteria and tools
Various projects will be proposed throughout the class sessions, either individually or in groups, relating to the three course topics. To pass the course, students must actively participate in the development and presentation of said projects. Students will be evaluated based on: originality, presentation, theoretical foundations, criteria, solution, and conclusions.

LAND ENGINEERING

043. COMPLEMENTS OF SOIL MECHANICS AND FOUNDATIONS

1st semester (Friday afternoon) Coordinator: José Mª Sánchez Langeber langbr@us.es

Architects have to solve a multitude of problems that often require in-depth geotechnical knowledge that goes beyond basic concepts.

For example, urban infrastructure and land planning require the study and evaluation of the land's characteristics. Furthermore, both infrastructure construction and land planning require environmental impact studies that are often related to land and water. In fact, the Building Code of Andalusia states that *land that cannot be developed* should include land with *natural irrigation,* landslides, floods, etc. The region of Andalusia presents a high degree of geotechnical risks due to expansiveness and landslides, and also includes areas with a high level of seismic risks, such as Granada.

Students will learn about numeric methods and calculations using specific geotechnical programs (finite elements, finite differences) and simple spreadsheets.

Course topic 1. Geotechnical expansion
1. Pile expansion. 2. Slope stability. 3. Soil improvement and treatment. Geomembranes, geotextiles and geogrids. 4. Rock foundations. 5. Numeric geotechnical methods. Computer programs for soil mechanics.

Course topic 2. Environmental geotechnical earthquake engineering
1. Geotechnical mapping. Environmental impacts. 2. Ecological walls. 3. Landfills. 4. Underground construction. 5. Urban planning-land relationship. 6. Seismic activity. Calculation of seismic activity.

Learning objectives
Using advanced calculation techniques for piles, slope stability, model simulations, seismic risk assessments, etc.

Evaluation criteria and tools
Continuous evaluation based on projects developed by students, with mandatory class attendance and visits to unique geotechnical construction sites. Two individual tests will be given (one per topic), and two practical projects in groups of 3 students (maximum), which will involve the development of different course topics for a specific environment. The grade consists of 20% for theoretical exams and 80% for practical projects. Under special circumstances, a final exam may be given with a theoretical section and a problem-solving section with two questions pertaining to curriculum-related topics.

062. FOUNDATIONS: PATHOLOGY AND UNDERPINNING

1st semester (Friday morning) Coordinator: Antonio Jaramillo Morilla jarami@us.es

The study of damaged buildings and urban developments is an important field of intervention for architects. Statistics show that approximately one out of every 5000-1000 buildings sinks due to foundation problems, and the number for retaining structures is one out of one thousand. We also know that 80% of the buildings that have disappeared over time were due to foundation problems.

The *pathology and underpinning of foundations* is therefore a field of intervention that is nearly exclusive to *architects*, and employment in this field is growing in the present day.

Students will analyse a practical case study of foundation pathology and develop an intervention proposal, explaining everything in detail, including the economic assessment. Throughout the course, we will visit different buildings and urban developments to learn first-hand about problems relating to the soil, foundation structures, retaining structures, and various underpinning techniques. At least three visits will be made to relevant construction sites or buildings.

Course topic 1. Foundation Pathology
1. The land as the origin of building damages: introduction, legal aspects. 2. Foundation damage assessment: causes and origin (design, execution, changes in the environment, general problems), evolution, safety of the different elements. 3. Technical reporting documentation.

Course topic 2. Underpinning and Repairs
1. Selection of a suitable system. 2. Surface underpinning and land improvements. 3. Complementary actions. 4. Deep underpinning. 5. Repairing retaining structures (walls, screen walls). 6. Slope repair and stabilization. 7. Repair and underpinning projects and associated controls and tests.

Learning objectives
Use techniques for the evaluation, control and repair of foundations, model simulation, underpinning calculations, etc.

Evaluation criteria and tools
Continuous evaluation based on projects developed by students, with mandatory class attendance and visits to buildings and construction sites. Two individual tests will be given (one per topic), and two practical projects in groups of a maximum of 3 students (pathology report and repair proposal). The grade consists of 20% for theoretical exams and 80% for practical projects. Under special circumstances, a final exam may be given with a theoretical section and a problem-solving section with two questions pertaining to curriculum-related topics.

BUILDING STRUCTURES

SPECIAL STRUCTURES IN ARCHITECTURE

2nd semester (Tuesday morning) Coordinator: José Sánchez Sánchez josess@us.es

Course topic 1. Shell and membrane behaviour.
Membranes and axis-symmetric, cylindrical and transfer shells, and specific case studies.

Course topic 2. Space frames with beams.
Arches and trusses. Slatted trusses. Stereo Space frames. Single-layer domes. Complex frames.

Course topic 3. Structures in traction.
Introduction to tensile structures. Prestressed structures. Textile structures.

Learning objectives
By the end of the course, students should be able to:

1. Apply knowledge of new structural typologies and unconventional structures.

2. Use IT tools, such as SAP200 and Formfinder, for design and predimensioning.

3. Use models to relate design and its materialization.

Evaluation criteria and tools.
This course is graded using a project-based continuous evaluation system. Students will work in groups on three projects relating to the three course topics.

Various projects of each type will be proposed, so that each group will work on one of them. Students will make presentations and engage in group debates in order for everyone to share their experiences and produce collaborative learning.

STRUCTURAL INTERVENTION IN EXISTING BUILDINGS

1st semester (Friday morning) Coordinator: Enrique Vázquez Vicente ev@us.es

Course topic 1. Expert structural reports
Basic concepts of structural pathology. Inspection, instrumentation, testing, and regulations. Surveying and stabilization systems: types, calculation methods, regulations.
Masonry, steel, concrete and wood structural types. We will study the usual damages for each type, as well as specific inspection methods and safety level assessment procedures.

Course topic 2. Reinforcing and repairing structures
Basic concepts. Repairing and reinforcing structures: general criteria, regulations and quality control.
Masonry, steel, concrete and wood structural types. We will study the specific design criteria for each type, as well as intervention techniques, calculation methods, regulations, and quality control.

Learning objectives
By the end of the course, students should be able to:

1. Identify structural damages.

2. Prepare a research campaign.

3. Assess the scope, importance and possible evolution of damages.

4. Explain the origin of the damages.

5. Design shoring and stabilization systems.

6. Estimate the safety of existing structures.

7. Design and calculate reinforcement elements for the aforementioned structural types.

8. Draft the documentation for a structural intervention project: plans, reports and appendices.

Evaluation criteria and tools
This course is graded using a project-based continuous evaluation system. Students will work in groups on two structural building intervention projects, one for an expert report and the other for repairs or reinforcements. Various projects of each type will be proposed, so that each group will work on one of them. Students will make presentations and engage in group debates in order for everyone to share their experiences and produce collaborative learning.

The learning process will be evaluated based on the following criteria:

1. Clarity of the technical documentation, including the building's geometric description and structure in current and rehabilitated conditions, a study of the damages, study interpretation and foreseeable evolution, and the order of execution of different work at the construction site.

2. The proper selection of actions, regulations, and other parameters that may affect the problem.

3. The proposed repair and reinforcement systems should be suitable for the identified problems.

4. The calculation appendices will be evaluated based on the use of justified simplifications and the accuracy and adequacy of the numeric verifications of structural safety.

*** ALL ELECTIVES are worth 6 ECTS / 4 HOURS of class per week**