

## **1. Building Construction 1**

1. Introduction to architectural construction.
2. Bioclimatic design of architecture. Natural energy and lighting. Principles of comfort.
3. The building's "skeleton". Durable construction systems.
4. Vertical building covering. Fundamentals of construction.
5. Communication construction systems.
6. Air quality. Bioclimatic design.
7. Acoustic comfort in the building.
8. Horizontal building enclosure. Fundamentals of construction.
9. Bioclimatic design of the building. Fundamentals.
10. Materiality of construction. Characterization.

## **2. Architectural Drawing 1. Geometry and Perception**

1. Architecture as the basis and objective of drawing. Architectural thinking and graphic action. Language and code: convention, transgression, invention.
2. Drawing as an action, as a process. Architectural intention and graphic intention: identification and differentiation of architectural drawings.
3. The perceptive attributes of form and its graphic expression. Drawing as an expression of the limits of architectural form.
4. Introduction to graphic resources. Qualification of calligraphic lines and ruled lines.
5. Drawing and graphic operations: dot, line, spot. Drawing and support: proportion, measurement, scale, graphic composition.
6. Drawing as a construction of lines governed by geometry. Formal control: geometric structure and graphic form.
7. General projection concept: control of volume in the space and in the plane. Introduction to different types of projections and representation systems. Development of straight and oblique cylindrical projections: fundamentals and geometric properties.
8. Operations with geometric elements in representation systems: intersection of dots, lines and surface, bodies, intersections, and distance measurements.
9. Operations with basic architectural forms in a space: geometric construction, groups, planar sections, and notes.
10. Introduction to architectural sketching: observation, capture and expression of formal and dimensional data, graphic records.
11. Introduction to the appropriate graphic expressions for the terrain and urban planning.
12. Description of architectural form through a series of projections: floors, elevations, sections. Section drawing as a form of expression for architecture.
13. Sketching as a codified expression of form. Sketches of basic architecture.

## **3. Physical Principles of Building Structures**

1. Designate the units of basic physical quantities in Mechanics using the International System of Units.
- 2/3. Recognize simple material systems: particles, rigid bodies, rigid body systems. Identify forces and torques as physical values involved in the balance of material systems.
4. Convert complex force and torque systems into other simpler equivalents.

5/6. Distinguish between free and linked material systems. Identify the different categories of links or bonds.

7/8. Distinguish the external and internal links in solids systems. Recognize whether a solids system behaves as a mechanism, an isostatic system or a hyperstatic system.

9. Outline the main principles of Statics.

10/11. Apply Statics equations to solving problems of balancing mechanisms and isostatic systems. Calculate centers of mass and moments of inertia for planar sections.

12. Associate the 'moment of inertia' concept of a beam's planar section with beam bending when subjected to loads.

13/14. Apply the method of joints to obtain the forces of the bars in simple, flat jointed structures. Plotting shearing forces, axial forces, and bending moments in simple beams subjected to force and moment systems in the plan.

15/16. Know and apply the principles of fluid statics to simple cases. Form conclusions based on a comparison of the experimental and theoretical results.

## **4. Architectural History, Theory and Composition 1**

1. Enjoy the observation and study of architecture, the city and the territory.
2. Identify the cultural time periods of different architectural proposals in the age of Modernity.
3. Identify the historical time period of terms, concepts and relevant works of architecture to acquire disciplinary language and a basic repertoire.
4. Distinguish (on a basic level) different urban fabrics based on their historical dimensions.
5. Comprehensively analyse the architecture, its compliance with original requirements, initial determinants and its environment within the corresponding cultural, technological and economic context.
6. Use the richness of the specific terms and vocabulary in architectural language to communicate your ideas accurately, effectively and fluidly, both verbally and in writing.
7. Manage information resources and distinguish tools based on their usefulness and origin.
8. Recognize the ethical component that is latent or absent in architecture and urban planning in order to activate critical thinking.

## **5. Architectural Projects 1**

Process development for the analysis and synthesis of reality. Introduction to critical thinking and the study of cultural and architectural models, as well as models from other disciplines.

Introduction to architectural projects as an interpretation-transformation of reality. Study and understanding basic fundamental concepts involved in conception.

Development of architectural strategies and planned ideas. Introduction to processes of creating the architectural form and its representation as a foundation for the project, physically defining proposals through sketches, layouts, and graphic documentation drawn to scale.

## **6. Architectural Drawing 2. Expression and Communication**

1. Drawing as thought and project. Graphic expression as a communication project for architecture.
2. Disciplinary contextualization of the expression and communication of architecture. Culture, evolution, present.
3. Qualification of architectural surfaces, textures and colors, and their graphic expression.
4. Introduction to digital media for the expression and communication of architecture. Visualizations: fundamentals and types.
5. Generation and operations with surfaces.
6. Light and shadow in the architectural form.
7. Conic projection: geometry and vision.
8. Introduction to codified representation of the terrain.
9. Sketch: drawing nature as a graphic expression of the perceptive experience.
10. Complex architectural sketches.
11. Sketching as a codified expression of complex forms through a series of projections: floors, elevations, sections, and perspectives.

## **7. Building Structures 1**

1. Introduction to structural systems and types.
2. Introduction to building actions.
3. Introduction to structural safety.
4. Analysis of bar behaviour.
5. Analysis of bar structure behaviour.
6. Introduction to structural design and analysis.

## **8. Mathematics 1**

1. Plane analytical geometry.
2. Functions with multiple variables. Warped curves and surfaces.
3. Differential calculation of functions with multiple variables.
4. Integration of functions with multiple variables. Applications.
5. Self-values and diagonalization.
6. Descriptive statistics.
7. Introduction to differential equations and finite elements.

Learning objectives.

- Apply analytical geometry to the creation of roofs and other architectural elements.
- Use the differential calculation of functions with multiple variables and apply it to solving optimization problems in the field of architecture.
- Use and apply the integral calculation of functions with multiple variables for planimetry and volumetric analysis.
- Matrix diagonalization.
- Acquire basic techniques of statistical data processing and linear regression analysis.
- Use computer software related to the course content.

## **9. Architectural Projects 2**

The project as an interpretation/transformation of reality. Architectural projects and the practice of architecture. Knowledge, information, memory and invention. Architectural materials and their integration in the project.

Place as a structure. Domestic space.

Processes for creating the architectural form. Modification, transformation. Permanence and discontinuity. Materiality, technique and architectural projects.

## **10. Urban Planning 1**

Introduction to an urban-territorial understanding. Analysis and understanding of the urban form.

- Multiple approaches to the City: historical, functional, cultural, economic, political, social, etc. Population and socioeconomic structure.

- City and Territory. Urban-territorial system. Territory: geography, hypsometry, clinometry, water networks. Establishment of the City in the Territory. Representation of the Territory and the City

- Form and structure of the city. Empty space: streets, squares, free spaces. The built space: blocks and land plots. The orthogonal-linear-radial-irregular plan. Land division. Building typologies. Forms of growth.

- Urban ordinances and regulations. Introduction to the conservation of historical heritage and cataloguing. Introduction to building systems of equipment-resources-free spaces and networks.

Construction process of the city and territory. Urban morphogenesis.

- The origin of urbanity and the first civilizations. Mesopotamia, Assyrian Empire, Ancient Egypt, Indus Valley, Aegean Sea.

- Classical Greek cities. Innovative Greece and territorial understanding. The Poleis: Hippodamus of Miletus. Colonies of Magna Graecia. Hellenism in Spain.

- The Roman city: centuriation and the city system. Roman Hispania. Visigoths.

- The medieval Christian city. Stability and permanence until the 18<sup>th</sup>-19<sup>th</sup> century. From Roman Hispania to the medieval Christian city and the Muslim city.

- Renaissance and Baroque actions. The ideal renaissance city and theoretical contributions: interventions in inherited cities and proposals for newly established cities. Baroque cities and their contributions to landscaped spaces. Latin America.

- Utopic models as a result of the Industrial Revolution: urban explosion. Industrial and Residential Suburbs. Utopian socialists.

- Solutions to the problem of the industrial city. Linear City. Garden City and introduction to planning. Landscaped Suburbs.

- Pragmatic models for solving the urban problem of the industrial city as a dimensionally effective response to urban growth and transformation. The 'widening' of the city: meaning, legal regulations, theoretical principles, and widening requirements. Historical models. Other examples of widening. Reaction against the widening of the City.

- Forms of city growth and Modern Movement. The Athens Charter and the polygon as a form of urban growth. City reconstruction actions after World War II.

### **11. Architectural Drawing 3. Graphical Analysis**

1. Graphic analysis of architecture: architectural and urban forms. Theoretical fundamentals.

- Architectural drawing, analysis and production. Further exploration of certain concepts and theories of perception. Analytical focus.

- Review of certain analytical theories and approaches. Analysis of form, geometry, function, construction, space and other dimensions of architecture, city, territory, and landscape.

2. Analysis as a knowledge method. Graphic processes and strategies.

- Designate, classify, compare, etc. Create, shape, build. Geometry as a formal control system. Sketches and diagrams for knowledge processes. Analytical capacity of the digital space.

3. Analytical drawing in architectural production. Introduction to concept drawing.

- Drawing to understand architecture; to capture, retain, describe; to test and ask; to explain and organize.

- Drawing to create and configure; to build the idea; to shape the idea, imagine; to control and check.

- Drawing to communicate.

### **12. Mathematics 2**

Topic I. Differential equations and systems

Topic II. Differential geometry of curves and surfaces

Learning objectives.

- Use and apply basic symbolic and numeric problem-solving techniques for first and second order differential equations and differential systems to mathematical models in architecture.

- Use and apply the concepts of differential geometry for curves and surfaces to architecture.

- Use computer software related to the course content.

### **13. Architectural History, Theory and Composition 2**

Course topic 1. Inhabitation: definitions, genealogies and panoramas.

Course topic 2. Typologies: property types and dimensions, and inhabitation experiences.

Course topic 3. Residence: contextual, vernacular and ecological solutions.

Learning objectives.

1. Relate contemporary architectural theories based on inhabitation with the most relevant developments in the history of architecture.

2. Write comprehensive, critical texts on the relationships between forms of inhabitation and the residential architectural proposals directly involved in the social and cultural context.

3. Distinguish different types of inhabitation and relate them to their urban and/or territorial context, recognizing their historical origins and transformations.

4. Experience the sense of vernacular architecture with a direct approach in terms of adaptation to the site environment and the material culture.

5. Determine the existence or absence of environmental and ecological approaches and devices in inhabitation proposals.

6. Evaluate experimentation processes in inhabitation proposals with their temporary coordinates considered from

a programmatic, urban, landscape, and technological perspective.

7. Recognize heritage values inherent to inhabitation forms in terms of cultural resources for the city and landscape.

### **14. Architectural Projects 3**

Course topic: Home

The project as an interpretation/transformation of reality.

Architectural projects and the practice of architecture.

Knowledge, information, memory and invention. Architectural materials and their integration in the project.

Place as a structure: territory, type and morphology; landscapes. Place and heritage. Subjects and culture.

Fundamentals of inhabitation and material culture. Domestic space.

Processes for creating the architectural form. Modification, transformation. Permanence and discontinuity.

Materiality, technique and architectural project. Sustainable use of the environment and heritage.

### **15. Architectural Workshop 1**

1. Develop graphic and intermodal analysis and synthesis processes that integrate the conditions of the intervention's context and needs, incorporating cultural and architectural references, as well as references from other disciplines, in addition to memories and experiences of domestic life as a basis for defining the intervention criteria.

2. Define implementation strategies that make urban sense within the specific context of the intervention, expressing the relationships between the home and the surrounding environment on different scales.

3. Conceptualize programmatic organizations based on the contribution of historically relevant architectural references and critical thinking about the culture of inhabitation, applied to a specific situation.

4. Propose a domestic space, a room concept that exceeds standards, paying attention to: scale, body dimensions, relationships with objects, working with light, formal and material configuration of spatial limitations, and the relationship between public and private.

5. Introduction to graphic conceptualization and configuration processes according to domestic architecture scales of production. Design the document's comprehensive coordination in order to communicate the proposal.

6. Design, in an introductory, schematic way, appropriate structures for the domestic scale architectural proposal, choosing the structure type, geometry, materials and connections, with initial predimensioning sketches.

7. Discretize and evaluate differences, similarities, properties and formal possibilities for the adaptation of the product in the architectural proposal, both in terms of its geo-climatic and eco-cultural aspects. Justify your choice as compared to the other possible proposals.

8. Propose bioclimatic design strategies using enclosure control techniques, including thermal and acoustic insulation, climate control and natural light, and analyse the problem using mathematical models.

## **2<sup>nd</sup> Academic Year. 2<sup>nd</sup> Semester.**

### **16. Building System and Facilities 1**

1. Safety in the case of fire.
2. Wastewater facilities. Plumbing. Sanitary Hot Water (SHW). Gas. Ventilation.
3. Air conditioning facilities and ventilation.
4. Electrical, telecommunications and transportation facilities.

### **17. Building Construction 2**

Course topic 1. Construction of structures.

Redesign. Construction of reinforced concrete structural systems. One-way slabs. Foundations.

Course topic 2. Construction of heavy enclosures.

Heavy masonry façades. Flat roofs. Sloped roofs.

Course topic 3. Products I.

Reinforced concrete. Masonry elements. Vertical or wall linings, and horizontal covering or paving.

### **18. Physical Principles of Building System & Facilities**

1. Designate the units of basic physical quantities in fluid dynamics, thermodynamics, circuit theory and lighting using the International System of Units.

2/3. Recognize different types of flows in closed ducts. Apply the principles of steady state energy and mass conservation to solve simple hydraulic facilities.

4/5/6/7/8/9. Distinguish between open and closed thermodynamic systems. Distinguish between Work and Heat as a form of energy exchange between a system and its surroundings. Understand the First and Second Principle of Thermodynamics and their consequences. Describe different heat transfer mechanisms: conduction, convection and radiation. Solve simple problems of steady state heat transfer. Interpret phase diagrams of pure substances.

10/11. Describe how a simple refrigeration machine works using an ideal vapour compression cycle. Describe the atmosphere's thermodynamic properties.

12/13. Create simple hygrothermal conditioning facilities. Know how to use a psychrometric chart.

14/15. Recognize the simple elements of an electrical circuit: resistance, self-inductance and capacitors. Apply the laws of Kirchoff to solve simple electrical circuits.

16/17/18/19/20/21. Understand basic concepts of mechanical waves. Understand and describe attributes of the sound experience. Justify the use of the decibel scale to quantify acoustic magnitudes. Conduct basic operations with magnitudes expressed on the decibel scale. Designate and relate the basic acoustic parameters of a room. Propose simple solutions for sound conditioning in rooms.

22. Understand basic concepts of the theory of light and colour in terms of architecture.

### **19. Architectural Projects 4**

Course topic: Blocks

The project as an interpretation/transformation of reality. Architectural projects and the practice of architecture.

Knowledge, information, memory and invention. Architectural materials and their integration in the project.

Place as a structure: territory, type and morphology; landscapes. Place and heritage. Subjects and culture.

Fundamentals of inhabitation and material culture. Domestic space. Processes for creating the architectural form. Modification, transformation. Permanence and discontinuity.

Materiality, technique and architectural project. Sustainable use of the environment and heritage.

### **20. Architectural Workshop 2**

1. Develop graphic and intermodal analysis and synthesis processes that integrate the conditions of the intervention's context and needs, incorporating cultural and architectural references, as well as references from other disciplines, in addition to memories and experiences of block building as a basis for defining the intervention criteria.

2. Define implementation strategies that make urban sense within the specific context of the intervention, expressing the volumetric, use, collective-individual, orientation and landscape relationships on different scales, considering the pre-existing elements that must be incorporated within the block and its environment.

3. Conceptualize programmatic organizations through critical thinking about the culture of inhabitation, supported by the typology and social approach associated with building in blocks and in a specific location.

4. Develop the formal, spatial configuration of the proposal according to existing needs; the assessment and balance of the functional programme; the proportions and scale of the building and its location; the light and available space of all the rooms; and the integration of structural, construction and facility systems.

5. Introduction to graphic conceptualization and configuration processes according to block building scales of production. Design the document's comprehensive coordination in order to communicate the proposal.

6. Design, in an introductory, schematic way, appropriate structures and foundations for the architectural block project, choosing the structural type, geometry, materials and connections, with initial predimensioning sketches.

7. Discretize and evaluate construction regulations, identifying the design criteria for the construction systems to be used, and analysing application and compliance with regulations. Define the heavy enclosure, specifying its components and the features of the products selected for its design, based on the aforementioned analysis and within the framework of the cyclical process of the architectural proposal solution.

8. Determine the need for resources, access to services, implementation and maintenance of facilities in residential buildings in order to ensure habitability, safety and environmental comfort.

### **21. Building Construction 3**

Course topic 1. Enclosures.

Façade requirements. Brick-face work façades. Carpentry. Panelling. Façades made of prefabricated concrete panels.

Course topic 2. Concrete structures and foundations.

Two-way slabs. Direct foundations with slabs. Deep foundations with piles. Retaining walls and cellar walls. Reinforced concrete control, installation, formwork.

Course topic 3. Urban planning construction.

Roadway construction. Construction of public squares. Planting. Urban furniture.

### **22. Architectural Drawing 4. Conceptualization & Configuration**

Drawing in conceptualization and formal creation processes. Sketching.

Graphic configuration processes through thought and conceptualization of architecture.

Course topic 1. Strategy of architectural thinking.

Intentional limits. Thought and idea. Thought and image. Action and creation.

Course topic 2. Conceptualization, design and drawing.

Sensitivity and emotion. Knowledge and memory. Abstraction and structuring. Imagination and configuration.

Course topic 3. Process, intention and communication.

Silence and meaning. Construction of an idea. Definition of form. Configuration development.

### **23. Building Structures 2**

Course topic 1. Design of steel structures.

Design of porticos, stabilization systems against horizontal actions and connections, girder slabs. Limit states, actions and combinations of actions. Selection of the type of steel, selection of profiles and predimensioning.

Course topic 2. Analysis of steel structures. Part 1.

Structural model, part 1: geometry, connections, materials, profiles, and sections, simple hypotheses of actions and combinations.

Verification of limit states. Ultimate Limit State (ULS) of section resistance. Verification of service limit states for deflections and collapses.

Computer analysis: structural models, analysis of forces and deformations, verifications, design readjustment.

Course topic 3. Analysis of steel structures. Part 2.

Structural and seismic dynamics. Lateral stability, traslationality, imperfections, analysis in first and second order.

ULS of bar resistance. Bending, lateral bending, combined forces.

Complete models. Computer analysis with complete models. Joints.

### **24. Architectural Projects 5**

#### **EQUIPMENT**

The project as an interpretation/transformation of reality. Architectural projects and the practice of architecture. Knowledge, information, memory and invention. Architectural materials and their integration in the project.

Place as a structure: territory, type and morphology; landscapes. Place and heritage. Subjects and culture.

Fundamentals of inhabitation and material culture. Domestic space. Equipment and public spaces.

Processes for creating the architectural form. Modification, transformation. Permanence and discontinuity. Materiality, technique and architectural project. Sustainable use of the environment and heritage. Urban projects, landscape projects. Heritage intervention projects.

Theory and practice of the architectural project, integrating the disciplines involved in the project. Project documents. Project methodology, organization and management. Regulations.

#### **25. Architectural Workshop 3**

1. Develop graphic and intermodal analysis and synthesis processes that integrate the conditions of the intervention's context and needs, incorporating cultural and architectural references, as well as references from other disciplines, regarding public buildings as a basis for defining the intervention criteria. These criteria cover phenomenological considerations of the location and/or architectural space as well as aspects of contemporary culture and society.

2. Define implementation strategies that address relationships with the natural and/or urban landscape that make urban and/or territorial and landscape sense in the specific context of the intervention, expressing the relationships that should be coordinated between the equipment and the surrounding environment on different scales.

3. Engage in critical thinking from a contemporary perspective in terms of the equipment's relevant conditions and needs, approaching them from programmatic aspects, according to the cultural, social and environmental needs of our context. The interdisciplinary nature is the mechanism that integrates culture, society, city, territory, and landscape.

4. Develop thinking and structural design processes in a schematic way, to coherently address the relationship between the programme, the architectural space and the geometrically and materially defined structural solution.

5. Discretize and evaluate construction regulations, identifying the design criteria for the construction systems to be applied, analysing their application and compliance with regulations. Define enclosure systems, specifying their components and the features of the products selected for the design, based on the aforementioned analysis and within the framework of the architectural proposal solution cyclical process.

6. Design and integrate all the equipment facilities in the architectural proposal, as well as passive fire protection, planning the location and reservation of space for facilities, and all required maintenance aspects, complying with and applying the current legislation.

## **26. Building System and Facilities 2**

Course topic 1. Conditioning and facilities in tertiary buildings.

Facilities in buildings for tertiary use. Passive fire protection. Fire prevention, sanitation, and sanitary hot and cold-water facilities. Solar contribution to SHW production.

Electrical facilities 1: transformation, design and transportation. Environmental and emergency lighting. Grounding and lightening protection.

Telecommunications, VDI, anti-burglary and robbery security, and loudspeaker facilities.

Course topic 2. Urban facilities.

Sewage and water evacuation system. Supply. Electrical distribution. Lighting. Telecommunications infrastructure. Combustible gases. Urban solid waste facilities.

## **27. Geotechnical Engineering and Foundations**

Course topic 1. Presentation, land and foundation regulations. Geotechnical study, on-site testing.

Course topic 2. Soil properties, laboratory testing.

Course topic 3. Surface foundations.

Course topic 4. Earth and water pressures, retaining elements, slopes.

Course topic 5. Deep foundations.

Course topic 6. Terrain conditioning, difficult terrain. Pathology and underpinning.

## **28. Architectural Projects 6**

Neighbourhood

The project as an interpretation/transformation of reality. Architectural projects and the practice of architecture. Knowledge, information, memory and invention. Architectural materials and their integration in the project.

Place as a structure: territory, type and morphology; landscapes. Place and heritage. Subjects and culture.

Fundamentals of inhabitation and material culture. Domestic space. Equipment and public spaces. Processes for creating the architectural form. Modification, transformation. Permanence and discontinuity. Materiality, technique and architectural project. Sustainable use of the environment and heritage.

Urban projects, landscape projects. Heritage intervention projects.

Theory and practice of the architectural project, integrating the different disciplines involved in a project. Project documents. Project methodology, organization and management. Regulations.

## **30. Urban Planning 2**

Course topic 0. Subject outline and presentation. The current dynamics of urbanity: paradigms of the contemporary city.

Course topic 1. Analysis and knowledge of the city plan: urban structure.

The concept of urban structure. From urban systems to the city as an ecosystem. The city plan and recognition of the urban form. Identification of homogeneous areas and spatial-functional analysis of connections: inclusion in ordinance zones.

Mobility and accessibility: from the city network to the regional network. Communications systems and the integral conception of transportation: approaching a sustainable model.

Nature and the city: open spaces and their impact on urban formalization. The design of contemporary public space.

Social needs and urban equipment: standards and quality of life. Urban metabolism: urban infrastructure and its meaning in the city. From basic networks to info structure: smart cities.

Course topic 2. Urban episodes: intervention in the consolidated city.

Urban renewal: from interior renovation to urban rehabilitation. The culture of degrowth: urban ecology. Intervention tools in the consolidated city: regulatory framework. Scales and levels of intervention. Governance and participation.

The inherited city: historical centres. Heritage and intervention. Cultural landscapes. Dwelling forms in the modern city: problems and rehabilitation techniques. Space for economic activities: productive areas and globalization.

## **29. Architectural Workshop 4**

1. Develop analysis and synthesis processes that integrate the proposal's conditions and needs, incorporating interdisciplinary references as a basis for defining the intervention criteria.

2. Define strategies that make urban and/or territorial sense of the intervention, through the capacity of negotiation with pre-existing elements and built elements or urban and/or territorial obsolescence, promoting the hybrid character and compatibility of landscapes and nature within the framework of sustainable development.

3. Conceptualize the urban form through critical thinking, considering new forms of urbanity in terms of public space, which offer solutions to the complexity of new social and cultural conditions aspects implicated in of modern-day inhabitation.

4. Develop the proposal's configuration based on assessment and introduction of the concept of daily life and the relationships between domestic and public space into the neighbourhood debate, as well as its impact on determining different forms of coexistence fostered by current society and culture.

5. Develop urban-architectural scenarios that enable society to identify with its territory, understanding different ways of inhabiting public and domestic space as part of the urban fabric.

6. Use tools to build urban space, from the urbanizing process to the remodelling and design of consolidated urban spaces: regulations, design, control, and maintenance.

7. Design, outline and integrate the organization of urban facilities in planning proposals on a schematic level, planning the corresponding location and reservation of spaces, as well as all required maintenance aspects, and applying the current legislation.

## **4<sup>th</sup> Academic Year.1<sup>st</sup> Semester.**

### **31. Building System and Facilities 3**

1. Energy demand and efficiency in buildings.
2. Air conditioning facilities and services.
3. Thermal balance in buildings.
4. Direct expansion systems. Variable Refrigerant Volume System.
- 5/6. Hydronic system. Principle of terminal operations and units. Thermal production.
7. Noise pollution from air conditioning equipment.
8. Air diffusion and components.
- 9/10. Energy transportation: Duct networks. Design and calculation. Pipeline networks in hydronic systems. Design and calculation.

### **32. Building Construction 4**

Course topic 1. Light constructive-structural systems.

Metal and wood constructive-structural systems. Features, properties and applications of wood in structural elements. Configuration of joints.

Course topic 2. Enclosure systems with light elements. Construction configuration.

Enclosure systems with light elements: unventilated and ventilated façades. Enclosure systems with curtain walls. Light roofs: concept, components and regulations.

Course topic 3. Products for use in light enclosures. Construction configuration.

Cement-matrix products. Metal products. Polymer-matrix products and others. Material protection systems and construction systems.

Course topic 4. Light partitions.

Light partitions. Suspended ceilings. Accessible raised floors.

### **33. Architectural Projects 7**

Infrastructure. Systems and networks.

Architectural reality as a system. Elements and relationships. Infrastructure and scales. Production, communications and storage architecture. Architecture, technology and infrastructure.

The city as Infrastructure. Flows and processes. Project and landscape. Project and urban landscape, project and natural landscape. Infrastructure as a foundational reality.

Infrastructure and permanence. Actions for reactivating resources. From economy to ecology.

### **35. Urban Planning 3**

Course topic 1: Conceptual introduction.

Urban planning: fundamentals, justification and needs. Scales of intervention: the system of planning figures. The periphery and building the new city.

Course topic 2: The medium-scale urban project.

Medium-scale urban planning. Criteria and objectives for designing a public space system. Criteria and objectives for designing an equipment system. Criteria and objectives for residential design.

Course topic 3: The Partial Urban Development Plan.

The Partial Plan: level of determinations. Quantification of resource reserves. Ordinance as a tool for urban formalization. Documentary content of the Partial Plan.

### **34. Architectural Workshop 5**

1. Develop analysis and synthesis processes that integrate the proposal's conditions and needs, incorporating interdisciplinary references as a basis for defining the intervention criteria for infrastructure architectural proposals.

2. Address the complete development process of an architectural intervention proposal in the field of Infrastructure, using graphics and explanatory and supporting texts, including the data collection, interpretation, development, and execution phases.

3. Understand and integrate the history and theory of architecture based on cultural and architectural references in the field of Infrastructure, as well as implementing the proposal and defining the corresponding needs in the urban and territorial support, paying attention to qualitative and quantitative aspects.

4. Develop descriptive, analytical, expressive images and conceptualization outlines for territorial, urban and architectural infrastructure on different scales of approximation.

5. Define architectural intervention strategies in the field of urban and territorial infrastructure, consistent with the concept of the consubstantial network or system, considering the variety of scales, agents and variables involved in the infrastructure.

6. Select different solutions based on criteria of economy, construction, structural and legal viability, as well as defining the appropriate level for proper execution of the analysed systems, within the framework of infrastructure intervention.

7. Analyse and propose intervention solutions based on the required, technical, economic, project, sustainability, and regulatory determinants in the field of infrastructure.

8. Define and justify passive and active systems for meeting required environmental and safety conditions in interior spaces in the field of infrastructure.

### **36. Building Construction 5**

Fundamentals, Regulations, Cracking.

Damages and repairs: enclosures, roofing, foundations, concrete, steel, wood, stone, earth.

Props and shores.

Energy rehabilitation.

Technical assessment and expert reports.

Project documents. Measurement and assessment.

### **37. Building Structures 3**

Course topic 1. Introduction to reinforced concrete: historical introduction, general concepts and fundamental variables.

Course topic 2. Structural analysis of reinforced concrete buildings. Predimensioning.

Course topic 3. Linear structural elements of concrete subjected to flexion: ultimate limit states of bending, shear and torsion, service limit states.

Course topic 4. Linear structural elements of reinforced concrete subjected to compression: instability limit state, pillar dimensioning.

Course topic 5. Surface structural elements of reinforced concrete subjected to flexion: typology, ultimate limit states and service limit states.

Course topic 6. Reinforced concrete foundation and retaining elements: calculation and dimensioning methods.

### **38. Architectural History, Theory and Composition 3**

Course topic 1. TERRITORY AND CULTURE

1. Relate cultural, economic, political and social transformations with architectural experimentation and parallel disciplinary developments, as well as the relationship with aesthetics, theory and the history of fine arts and applied arts.

2. Identify and distinguish architectural systems, as well as the architect's technical, cultural and social role in the cultural times of the History of Civilization.

3. Recognize implementation strategies for the architecture of different time periods, relating them to contemporary urban transformation processes.

4. Interpret an urban sector's morphogenesis based on the contemporary urban territorial reality, historical planimetry and other graphic and written documentation.

5. Identify different types of urban spaces, relating them to the territorial and cultural framework in their historical time period.

Course topic 2. HERITAGE PROCESSES

1. Manage the variety of inherent factors in a heritage assessment as a basis for the investigation, protection, intervention and activation of Cultural Assets.

2. Recognize and evaluate how historical transformations affect the environment of certain works.

3. Analyse typological aspects, formal conceptions and technical procedures of different transformations as a basis for the heritage assessment.

4. Assess the degree of relevance of the architectural and urban work and the possibilities of accommodating new programmes.

5. Develop the bases for cataloguing and protecting architectural and urban works that meet their own heritage management requirements.

Course topic 3. INTERVENTION BASIS.

1. Identify and distinguish the different intervention theories and methods in architectural and urban heritage.

2. Compare architectural interventions produced with similar objectives, methodologies and cultural contexts, in order to critically evaluate the cultural scope of the approach of an architectural work.

3. Manage and evaluate historical documentation for the proper understanding of the project's location and intervention.

4. Develop graphic conceptual drawings and sketches that restore the sense of the architectural and urban work and its transformations, making it understandable.

5. Coordinate factors involved in local development, sustainable management of resources and the value of recycling cultural assets in the heritage analysis.

### **39. Architectural Projects 8**

Rehabilitation and transformation. Rehabilitation of the territory and the city. Recovery of spaces: identity. Activation of vacant spaces.

Concepts of heritage. Project and heritage. Project and time. Zeitgeist and contemporaneity.

Rhythms. Habits and events. Traveling as transgression. Recycling. Building reuse.

From industrial society to knowledge management. New technologies, ecologies.

### **40. Architectural Workshop 6**

1. Develop analysis and synthesis processes that integrate the proposal's conditions and needs, incorporating interdisciplinary references as a basis for defining the intervention criteria.

2. Conduct architectural projects as an applicable thought operating in all types of situations, compensating for obsolescence and improving the response capacity of the affected architecture.

3. Define suitable intervention strategies for reactivating, recovering and rehabilitating urban areas and spaces, through the capacity of negotiation with obsolete or valid, vacant or built pre-existing elements, promoting the hybrid character and compatibility of landscapes and nature within the framework of sustainable development.

4. Apply heritage-related concepts and the corresponding legislation to obsolescence and the deterioration of architecture, the magnitude and aging of real estate assets, the criteria of efficiency and sustainability, the principles of economy and efficiency in the use of resources, the benefit of reuse and recycling, and the history of architectural typologies.

5. Survey and analyse buildings undergoing rehabilitation, as well as their spatial and cultural contexts and time frames, defining construction, structural and infrastructure features based on the graphic documentation available and/or expressly prepared for this purpose, in order to identify problems of accessibility, habitability, hygiene and health, as well as construction, structural, fire safety, use, environmental comfort or energy efficiency issues.

6. Analyse and propose intervention solutions based on required technical, economic, project, sustainability and regulatory determinants.

**49. Architectural History, Theory and Composition 4**

Subject Unit 1:

CONTEMPORARY CITY, SOCIETY AND CULTURE.

Subject Unit 2:

CITY, LANDSCAPE AND TERRITORY.

Subject Unit 3:

THEORY AND PRACTICE OF INTERVENTION IN THE CITY

**51. Architectural Projects 9**

Understanding the city: end-of-the-century urban paradigms. The city as an organism. The designed landscape. The manipulation of nature and its artefacts. The "undersigned" landscape: nature and "sprawl".

Urban utopias. Social agenda and architecture. The invention of architecture. The creation of shapes. City and precedents. Regional readings. Responding to the climate and physical environment.

Conditions of the contour. Dialogic relationships with regulations. Readings of history. Memory. Architectural types, *Genius loci* and the spirit of the ages. Intertextuality and the present.

Architecture in imagination. Forms in thought. Literature and architecture. The architectural project itinerary. Interlocutors. Architecture in process. Creation vs. Manipulation.

The city within the city. Urban archipelagos.

**53. Urban Planning 4**

Course topic 1: Conceptual introduction.

The city and its territory: structural urban planning tools. The existing city and municipal planning: organization, conservation and regeneration. Territorial municipal structure and urban transformation proposals.

Course topic 2: The city in the territory and structural organization.

Urban planning structural elements and systems. The city and the public space: criteria, objectives and strategies. The city as a building and infrastructural support: use, activity, intensity. Mobility and accessibility in the city: criteria, objectives and strategies.

Course topic 3: The General Urban Development Plan.

General planning: level and nature of its determinations. Structural and detailed planning. Coordination of the urban transformation proposals, criteria and requirements.

Development of planning, techniques, strategies and sustainability of the general plan. Development of the general plan: citizen participation and sectorial determinants. Documentary content of general planning.

**52. Architectural Workshop 7**

1. Develop graphic and intermodal analysis and synthesis processes that integrate the conditions of the intervention's context and needs, incorporating cultural and architectural references, as well as references from other disciplines regarding the city and territory as a basis for defining the intervention criteria. These criteria cover phenomenological considerations of the location as well as aspects of contemporary culture and society.

2. Define intervention and transformation strategies, addressing relationships with the territory and the urban reality that make urban and territorial sense in terms of the intervention strategy, and express the relationships supporting said process on the necessary scales.

3. Engage in critical thinking, from a contemporary perspective, about the use of urban space as a versatile system of relationships and exchange, integrating mobility and coexistence in the same environmental matrix.

4. Establish critical thinking about the use of private and/or public spaces divided into lots, both in terms of coexistence and multifunctionality.

## 5<sup>th</sup> Academic Year. 2<sup>nd</sup> Semester.

### 62. Building Construction 6

Course topic 1: ANALYSIS OF PROFESSIONAL ACTIVITY. REGULATIONS AND DOCUMENTATION.

Regulations and the architect. Agents of the construction process. Professional ethics. The architect's professional framework. Direction and management of work teams, company organization. Leadership techniques, project manager. Professional practice. Management of architectural projects. Reports, graphic documentation, specifications, regulations, energy efficiency. Renovation, restoration and urban planning projects. Construction management documentation. Health and safety in projects and construction sites. Public sector contract law. Awarding and contracting construction projects. Construction project planning. Construction project budgeting and cost control. Quality control of the project and construction. Technical Suitability Document.

Course topic 2: CONSTRUCTION SUPERVISION AND CONTROL.

Supervision of demolitions, redesigns, earthworks, cement, infrastructure, connections, and permits.

Supervision of enclosure installations: roofs and façade-enclosures, partitions, linings and carpentry.

Course topic 3: BUILDING REPORTS AND ASSESSMENTS.

Reports, statements, expert reports and assessments. Appraisal report. Property appraisal methodology. Tax and mortgage assessments. Environmental assessments of buildings and infrastructure.

### 71. Architectural Projects 10

Architectural project theory and practice, integrating all the involved disciplines. The construction and building process. Project execution in architecture, urban planning and heritage interventions:

Preliminary studies, regulations, project definition, calculation procedures, inspections, bill of quantities. Building safety, evacuation and protection projects. Accessibility.

Construction management: project start-up, quality control and pathology. Conservation of construction systems. Applicable regulations.

The architect's professional activity in the building: professional organization and regulations. Roles, contracts and responsibilities: project design, project and construction supervision. Quality control. Construction management and supervision. Statements, expert reports, assessments, and appraisals.

### 72. Architectural Workshop 8

1. Develop analysis and synthesis processes that integrate the proposal's conditions, environment and start-up needs, incorporating interdisciplinary references as a basis for defining the decision-making criteria.

2. Develop the project as an efficient mechanism, not only as a tool for defining the formal and spatial values, but also its technical content, administrative management and capacity for transmitting and planning the execution process.

3. Define self-assessment and transformation strategies for the project, anticipating contingencies that may occur upon start-up. Activating the project's assimilation capacity to relate and balance aspects and proposals of such a diverse nature as the motivations of the several agents participating in the process.

4. Choose between various solutions based on economic, technical and legal viability criteria.

5. Appropriately interpret the building's and the industry's civil and administrative regulations regarding professional performance in the field of work in question.

6. Define the required level of detail for the proper implementation of the different project documents:

Planimetry. Preliminary studies, regulations, project definition. Technical specifications. Bill of quantities. Health and safety projects. Quality control.

7. Understand the architect's available documentation during construction management, including certifications, minutes and certificates that are part of the Building Logbook (*Libro del Edificio*). Especially, the Order and Assistance Logbook for documenting and resolving contingencies on the construction site, including exact instructions for the project's proper interpretation and occasional modifications that may be required over the course of the works execution, which must always comply with regulations.

8. Integrate and coordinate projects partially designed by other experts that are complementary to the main project designed by the project architect.

## 6<sup>th</sup> Academic Year. 1<sup>st</sup> 2<sup>nd</sup> Semester

### 73. Degree Final Project

Once all the curriculum credits have been obtained, students must present and defend an original, individual project before the university examining committee, which must include at least one professional of recognized prestige proposed by professional organizations. This project is a professional, integral architectural project that synthesizes all the skills acquired throughout the degree programme, and satisfactorily demonstrates the capacity to complete the execution of the building works in question, complying with applicable technical and administrative regulations.