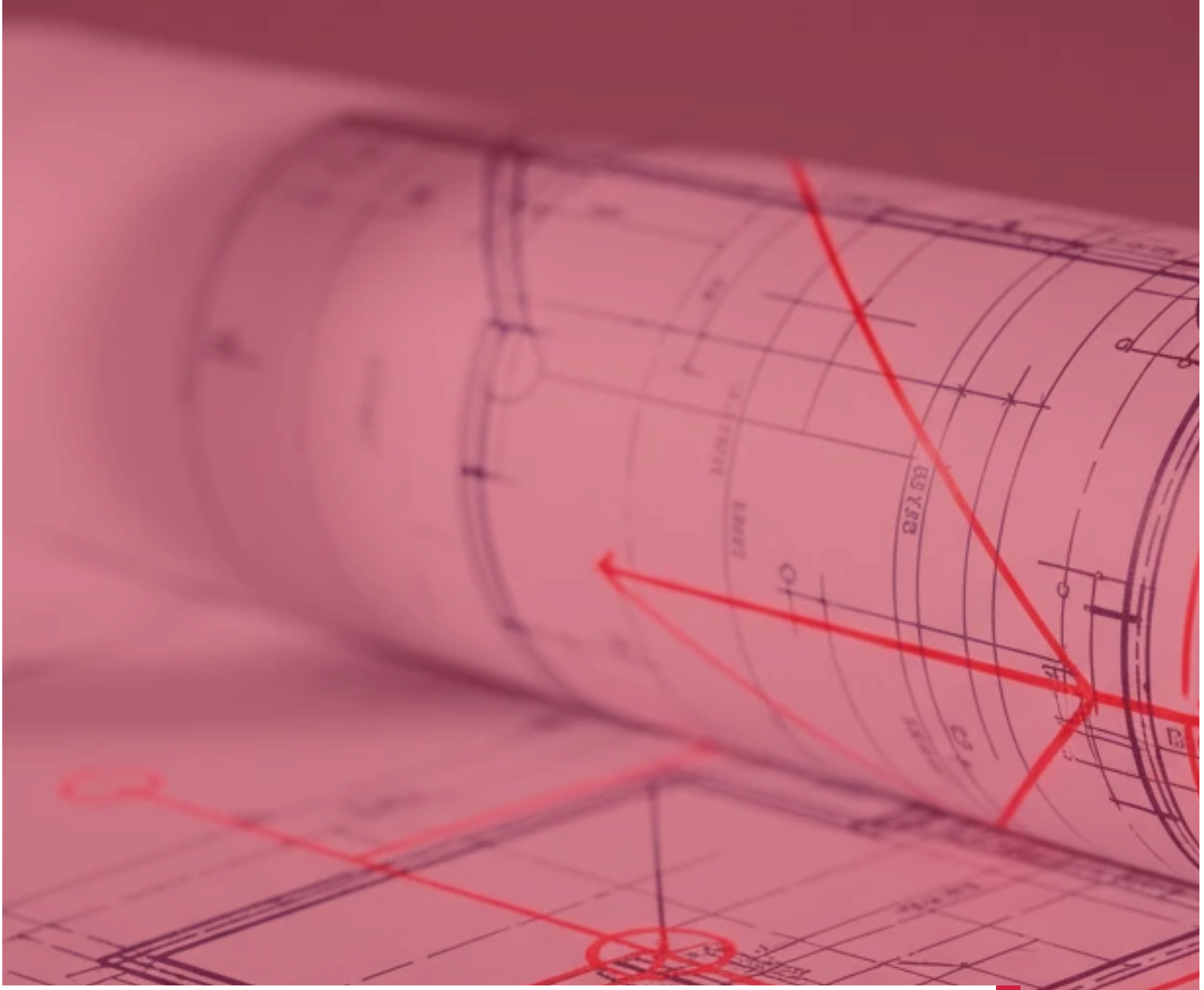


Máster online 100%

Master in Analysis and Calculation of Structures + 60 ECTS Credits

Structuralia

Máster online 100%

Master in Analysis and Calculation of Structures + 60 ECTS Credits

Modality
Online

Languages
Español

Duration
1500 hours (60 ECTS)

No Limit
AI Assistant

Does it include practices?
NO

Educational Institutions

Structuralia Engineering eLearning

UNIVERSIDAD NEBRIJA

Summary

The Master in Analysis and Calculation of Structures is a high-level specialization designed for professionals in the construction sector who seek to consolidate and deepen their skills in the design, calculation and dimensioning of structural elements. This program will allow you to address the challenges of civil and building works with technical rigor, from initial conception to final execution. You will fully integrate into the digital environment, mastering the BIM methodology and the most advanced software tools for structural analysis. You will refresh and strengthen the bases of manual calculation, to then apply and solve complex problems using specific software, both matrix and finite element, ensuring a deep understanding of each process. You will thoroughly explore the types of structures and their connections, stress analysis, and bending, shear, and buckling phenomena, applying these fundamental concepts to real situations and large projects. In addition, you will specialize in the behavior and application of key materials such as steel, concrete, wood and prestressed concrete, integrating sustainability criteria and the latest innovations in your projects. Thus, you will develop an analytical capacity that will allow you to make informed

decisions, optimize resources and contribute to innovation in the construction sector, adapting to the demands of a constantly evolving technical environment.

Agenda

MODULE 1. CALCULATION OF STRUCTURES

1. DIDACTIC UNIT 1. TYPES OF STRUCTURES AND CONNECTIONS

1. Typology of structures
2. Typology of structures according to their behavior
3. Typology of structures according to their deformation
4. Types of support for structures: joints, embedments and sliders
5. Types of joints in the metal and concrete structure

2. DIDACTIC UNIT 2. STRESS ANALYSIS: ACTIONS AND EFFORTS

1. Actions in structures
2. Ultimate limit state and serviceability limit state
3. Calculation combinations
4. Stresses in the structures
5. Structural design methods

3. DIDACTIC UNIT 3. BENDING, SHEER, BUCKING

1. Calculation of flexion, shear and flexo-compression
2. Types of instabilities and their solution
3. Compression buckling
4. Lateral buckling
5. Dent, profiles that can be reinforced, criteria and solutions

4. DIDACTIC UNIT 4. APPLICATION OF FUNDAMENTAL CONCEPTS

1. Application of structural concepts
2. Deformation calculation
3. Calculation of a beam
4. Calculation of a pillar
5. Calculation of a porch

MODULE 2. CONSTRUCTION MATERIALS

1. DIDACTIC UNIT 1. STEEL IN CONSTRUCTION

1. Introduction: manufacturing and typology
2. Steel for concrete
3. Types of structural steels
4. Galvanized steel
5. Aluminum

2. DIDACTIC UNIT 2. CONCRETE IN CONSTRUCTION

1. Types of concrete. Special concretes
2. Mechanical properties of concrete
3. Sizing of shallow foundations

4. Sizing of short corbels
5. Cracking in reinforced concrete

3. DIDACTIC UNIT 3. WOOD IN CONSTRUCTION

1. Wood: properties and products for construction
2. Calculation of dowel-type wood joints (I): nails
3. Calculation of dowel-type wood joints (II): staples, bolts, pins and lag bolts
4. Calculation of carpentry joints: splices and without screws
5. Sizing of wood in a fire situation

4. DIDACTIC UNIT 4. OTHER MATERIALS AND SUSTAINABILITY

1. Factory works. Blocks and bricks. Typologies
2. Basis for calculating a masonry wall
3. Glasses. Typologies. Sizing
4. Synthetic polymers. Typologies. Applications
5. Reinforcement of structural elements with fiber material

MODULE 3. CALCULATION OF TYPE STRUCTURES OF CIVIL WORKS

1. DIDACTIC UNIT 1. PRESTRESSED CONCRETE

1. Introduction.
2. Materials.
3. Tensing force. Instantaneous prestress losses.
4. Delayed prestress losses.
5. Calculation of prestressing forces in hyperstatic structures.

2. DIDACTIC UNIT 2. UNDERPASSAGE OR BURIED WORKS.

1. Underpass works (I). Typologies
2. Underpass works (II). Acting loads
3. Cylindrical sheets. Concepts and behavior.
4. Pre-sizing of cylindrical sheets (I). Concept and calculation.
5. Pre-sizing of cylindrical sheets (II). spandrels and edge beams.

3. DIDACTIC UNIT 3. CONCRETE TANKS.

1. Calculation elements in deposits.
2. Design elements in tanks. Principles of calculation of rectangular reinforced concrete tanks.
3. Example of calculating the wall of a rectangular reinforced concrete tank.
4. Principles of calculation of cylindrical reinforced concrete tanks.
5. Principles for the analysis of the slab of a reinforced concrete tank. Example of calculating the slab of a rectangular reinforced concrete tank.

4. DIDACTIC UNIT 4. METAL TANKS

1. Introduction. Design codes.
2. Types of tanks. Materials, joints and welds.
3. Design and calculation. Bottom and body.
4. Calculation of fixed ceilings.
5. Calculation by manometric pressure.

MODULE 4. SURFACE FOUNDATIONS

1. DIDACTIC UNIT 1. FLUID DYNAMICS IN POROUS MATERIALS

1. The fundamental states of water
2. Darcy's Law. Soil permeability analysis
3. Definition of phreatic and capillary water
4. Introduction to total, effective and neutral pressures
5. Definition of hydraulic gradient
6. Liquefaction as an effect of overpressures
7. Analysis of the types of aquifers and catchment hydraulics
8. Development of the general flow equation
9. Groundwater

2. DIDACTIC UNIT 2. STUDY OF EFFECTIVE STRESS AND INTERSTITIAL PRESSURE

1. Analysis of the stress state in geotechnical media
2. Graphic representation of the state of stress: Mohr's circle and Mohr-Coulomb criterion
3. Characterization of mechanical behavior through shear and triaxial tests
4. Soil instability associated with groundwater flow
5. Design and application of filters for flow control in the field
6. Interaction of water with the matrix and the rock mass
7. Underground flow behavior

3. DIDACTIC UNIT 3. PRINCIPLES OF SOIL MECHANICS

1. Introduction to soil consolidation
2. Soil properties
3. Soil resistance: basic concepts
4. Loads and actions on the ground
5. The magnitude of the consolidation entry
6. The evolution of the consolidation entry
7. Theory of parabolic isochrones
8. Preload and radial and mixed consolidation
9. Identification and status tests
10. Resistance tests

4. DIDACTIC UNIT 4. STABILITY

1. Water collection systems
2. Design of individual wells. Analytical solutions
3. Well group design
4. Conception and construction of wellpoints
5. Well points design

5. DIDACTIC UNIT 5. MATERIALS AND LOADING HYPOTHESES

1. Introduction to materials
2. Stress calculation
3. Loading hypothesis

6. DIDACTIC UNIT 6. INTRODUCTION TO SURFACE FOUNDATIONS

1. Introduction to shallow foundations
2. Classification and calculation methods
3. Water in the foundations
4. Sinking: safety, load and allowable pressure
5. Safety against sliding, overturning and overall stability
6. The geotechnical study
7. Soil samples

7. DIDACTIC UNIT 7. TYPES AND COMPONENTS OF SURFACE FOUNDATIONS

1. Insulated shoes. Definition
2. Combined shoes. Definition
3. Foundation slabs. Definition

8. DIDACTIC UNIT 8. CALCULATION AND DESIGN OF SURFACE FOUNDATIONS

1. Stress distributions under rigid footings
2. Sinking and bearing capacity
3. Correction factors of the general formula
4. Some particular cases of bearing capacity
5. Sinking pressure from in situ tests
6. Considerations in particular soils
7. Bearing capacity in Rock
8. Definitions and concepts of Service Limit States
9. Stress distributions in the soil
10. Settlement estimation in granular soils
11. Settlement estimation in cohesive soils
12. Other methods and other deformations

9. DIDACTIC UNIT 9. CONSTRUCTION ASPECTS AND QUALITY IN SURFACE FOUNDATIONS

1. Construction processes of shallow foundations
2. Quality control of materials and execution

10. DIDACTIC UNIT 10. SLABS, WELLS, DYNAMIC ASPECTS AND OFFSHORE SCOPE

1. Slabs
2. Semi-deep foundations or foundation pits
3. Dynamic aspects
4. Surface foundations in the maritime and offshore fields

MODULE 5. DEEP FOUNDATIONS. PILES

1. DIDACTIC UNIT 1. BASIC CONCEPTS AND COLUMN PILES IN SOILS

1. Typology of deep foundations
2. Definitions
3. Design bases for deep foundations
4. Basic formulation
5. Calculation of ground resistance against vertical actions in soils
6. Tip resistance in granular soils.

7. Analytical solutions Tip resistance in cohesive soils
8. Analytical solutions Tip resistance in soils through in situ tests

2. DIDACTIC UNIT 2. FLOATING PILES IN SOIL, PILES IN ROCK AND GROUPS OF PILES

1. Shaft resistance in granular soils
2. Analytical solutions Shaft resistance in cohesive soils
3. Analytical solutions Stem resistance in soils through in situ tests
4. Ground resistance against vertical actions in rocks Resistance of a group of piles

3. DIDACTIC UNIT 3. WORKLOADS AND SEATING ON PILES

1. Safety against sinking
2. Safety coefficient
3. Structural stop on piles Seats on piles
4. Pile pullout resistance Formulas for pile driving

4. DIDACTIC UNIT 4. CHOICE OF PILES AND UNCOMMON SITUATIONS

1. Piles subjected to lateral loads Negative friction in piles
2. Load tests on piles
3. Selecting the type of pile
4. Geotechnical calculation of micropiles

MODULE 6. GROUND PUSHES AND EARTH CONTAINMENT STRUCTURES

1. DIDACTIC UNIT 1. SOIL MECHANICS

1. Previous works
2. Design and planning of research campaigns
3. The geotechnical study
4. Soil samples
5. Preliminary investigations and field surveys
6. Drilling and sampling techniques
7. In situ tests for soils and rock masses

2. DIDACTIC UNIT 2. MAIN FIELD TESTS

1. Concept of identification and state of resistance
2. Identification and status tests
3. Resistance tests
4. Introduction to triaxial testing. Previous concepts
5. Definition of the triaxial test
6. Interpretation of the triaxial test
7. Practical applications of triaxial testing

3. DIDACTIC UNIT 3. SOIL AND ROCK TESTS

1. Deformability test
2. Interpretation of the oedometric test
3. Compaction and reuse tests
4. Laboratory tests for rock characterization

5. In situ tests for rock characterization

4. DIDACTIC UNIT 4. DEFINITION OF SERVICE LIMIT STATES

1. Definitions and concepts
2. Stress distributions in the soil
3. Settlement estimation in granular soils
4. Settlement estimation in cohesive soils
5. Other methods and other deformations

5. DIDACTIC UNIT 5. THEORETICAL FOUNDATIONS OF EARTH THRESSES

1. Fundamental Coulomb Hypotheses
2. Soil mechanics according to Terzaghi and Rankine
3. Thrust coefficients at rest. Empirical relations of Jaky and Mayne
4. Winkler module
5. Numerical models (2D/3D FEM, LEM, DEM)
6. The earthquake and its mechanical influences on the ground

6. DIDACTIC UNIT 6. RIGID WALLS (NON-MOVABLE)

1. Introduction to rigid wall design
2. Design and calculation of gravity walls
3. Gravity Wall Geometry and Construction Procedures
4. Classification and stability of rigid walls
5. Masonry systems
6. Other rigid walls

7. DIDACTIC UNIT 7. FLEXIBLE WALLS (MOVABLE)

1. Principles of flexible behavior
2. Design and specifications of gabion and sieve walls
3. Continuous Reinforced Concrete Screens
4. Pile and micropile screens
5. Types of anchors on screens
6. Excavations in sheet piles and trenches

8. DIDACTIC UNIT 8. GENERAL DESIGN AND CONSTRUCTION CONSIDERATIONS

1. Wall construction procedures
2. Auscultation instrumentation for ground movements and monitoring
3. Main land problems (expansive, collapsible, liquefiable soils, anthropic fills, improvement treatments)
4. Selection of type sections and filtration design

MODULE 7. SEISMICITY AND EARTHQUAKE-RESISTANT DESIGN

1. DIDACTIC UNIT 1. INTRODUCTION AND CHARACTERIZATION OF SEISMIC ACTION

1. What is an earthquake? Definition. Causes and effects. Regions of high seismicity in the world
2. Characterization of seismic action. PGA concept. Earthquake levels, return periods and seismic hazard curves.

3. Definition of response spectra. Local geology and amplification factors. Liquefaction
4. Importance coefficients
5. Consideration of seismic action in the project. Vertical action of the earthquake, associated mass, combination of seismic action

2. DIDACTIC UNIT 2. ANALYSIS METHODS

1. Introduction to modal analysis
2. Seismic-resistant design methodology. Guide to steps to follow
3. Static linear analyzes (i). Equivalent Lateral Force Method
4. Dynamic linear analyzes (ii). Spectral and modal-spectral analysis
5. Nonlinear analysis. Pushover analysis and time history method with accelerograms (time history)

3. DIDACTIC UNIT 3. EARTHQUAKE-RESISTANT DESIGN. METHODOLOGY AND REQUIREMENTS

1. Basic design criteria in seismic zone
2. Ductility. Behavioral factors
3. Ductile design requirements for reinforced concrete
4. Ductile design requirements for metallic structures
5. Travel evaluation. Seismic joints and separation of adjacent structures
6. Gravity and containment structures. Pseudostatic analysis: seismic design and thrust formulation
7. Seismic-resistant design strategy. Dissipate vs Isolate

4. DIDACTIC UNIT 4. APP. PRACTICAL CASES

1. Application example. Structural design of an earth retaining wall
2. Application example. Design of a reinforced concrete building. Application of the spectral modal method
3. Bibliography, reference standards and guides

MODULE 8. DESIGN OF INDUSTRIAL WAREHOUSES AND HIGH-RISE BUILDINGS

1. DIDACTIC UNIT 1. DESIGN OF INDUSTRIAL SHIPS (I)

1. The industrial warehouse. Constituent elements. Typologies
2. Foundations
3. Porticos (I). Typology
4. Porticos (II). Calculation
5. Example of calculation of a gabled porch

2. DIDACTIC UNIT 2. DESIGN OF INDUSTRIAL SHIPS (II)

1. Bracing systems. Typologies
2. Roof and facade purlins. Design and calculation
3. Braced roof and façade. Practical examples
4. Bridge cranes (I). Introduction
5. Bridge cranes (II). Actions and calculation

3. DIDACTIC UNIT 3. CALCULATION AND DESIGN OF HIGH-RISE BUILDINGS (I)

1. High-rise buildings. Introduction. General criteria
2. Portico systems

3. Rigid core structure
4. tubular structure
5. Stiffening systems for lateral stability

4. DIDACTIC UNIT 4. CALCULATION AND DESIGN OF HIGH-RISE BUILDINGS (II)

1. Building porches
2. Seismic calculation of buildings (I). Simplified method
3. Seismic calculation of buildings (II). Application example
4. Study of the action of the wind
5. Influence of axial deformations

MODULE 9. REHABILITATION OF STRUCTURES

1. DIDACTIC UNIT 1. FUNDAMENTAL CONCEPTS

1. Fundamental concepts
2. Seat cracks
3. Crack control
4. Pathologies in reinforced concrete structures
5. Wood pathologies

2. DIDACTIC UNIT 2. PATHOLOGIES IN BUILDING ELEMENTS

1. Introduction
2. Roof pathologies. General aspects
3. Roof pathologies according to their typologies
4. Facade pathologies
5. Pathologies in pillars and slabs

3. DIDACTIC UNIT 3. PATHOLOGY IN BRIDGES

1. Pathologies in the foundation
2. Pathologies in the substructure
3. Pathologies in the superstructure of concrete bridges
4. Pathologies in the superstructure of an arch bridge
5. Pathologies in the superstructure in metallic and mixed bridges

4. DIDACTIC UNIT 4. REPAIRS AND REINFORCEMENTS

1. Underpinnings in shallow foundations
2. Repairs to concrete structures
3. Reinforcements in concrete structures
4. Detailed design of composite columns
5. Therapeutics in humidity and water leaks

MODULE 10. TFM. MASTER IN ANALYSIS AND CALCULATION OF STRUCTURES

Qualification

University Degree in Master of Lifelong Training in Analysis and Calculation of Structures issued by the Antonio de Nebrija University with 60 ECTS University Credits. Teachings not leading to obtaining an official qualification

Objectives

- • Consolidate mastery of the fundamental principles in the calculation of structural elements for civil and building works. • Address complex structural engineering challenges, using manual calculation methodologies and advanced finite element software. • Implement the BIM methodology in the process of conception and dimensioning of structures, improving efficiency and precision. • Analyze the tension response of structures to various actions and efforts, including bending, shear and buckling. • Apply advanced criteria for the selection and use of materials such as steel, concrete, wood and prestressed concrete in the design of components. • Develop innovative solutions in the design of structures, integrating sustainability and emerging materials. • Evaluate the feasibility and safety of large-scale structural projects, from the initial phase to execution. • Direct the application of advanced sizing techniques in multidisciplinary teams, guaranteeing technical and regulatory coherence. • Formulate strategic decisions in the conception and execution of structures, optimizing resources and anticipating risks.

What does it prepare you for?

This program prepares you to lead the integration of advanced methodologies in the design and structural analysis of systems, updating your approach in building and civil works projects. You will master the fundamental bases of structural calculation, from tension analysis and efforts to bending, shear and buckling, applying these concepts to various structural configurations and typologies. You will implement calculation solutions both manually and through software specialized in matrix and finite element structures, fully adapting to the BIM methodology for structures. You will evaluate the impact of different structural materials such as steel, concrete and wood, including prestressed concrete, to make strategic decisions and optimize performance. The Master in Analysis and Calculation of Structures trains professionals in the integration of advanced methodologies for the design and analysis of structural systems, in order to optimize efficiency and safety in building and civil works projects. You will develop a comprehensive perspective that will allow you to manage complex projects with an innovative and digital approach.

Who is it addressed to?

This program is aimed at professionals in the construction, civil engineering and building sectors who are already dedicated to structural design, analysis and sizing of structures. If you are looking to reinforce and consolidate your knowledge in advanced structural engineering, adapting to the demands of digitalization and the BIM methodology for structures, this specialization offers you the necessary tools. It is for you if you work with load-bearing elements and feel the need to master structural calculation software for advanced analysis, enhancing your resolution capacity and the quality of your complex projects.

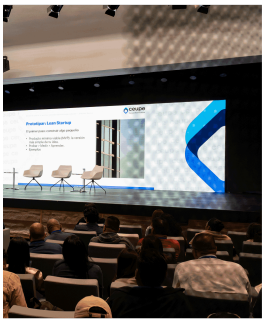
Official Character

This training is not included within the scope of official regulated training (Early Childhood Education, Primary Education, Secondary Education, Official Vocational Training FP, Baccalaureate, University Degree, Master University Officer and Doctorate). It is therefore a complementary and/or specialization training, aimed at the acquisition of certain competencies, skills or aptitudes of a professional nature, which can be assessed as merit in job boards and/or competitive examinations, always within the section of Complementary Training and/or Continuous Training. It is always essential to review the specific grading requirements of the specific public job boards to which we wish to apply.

Professional Outings

- In the construction, civil works and building sector, this specialization prepares you to assume roles of high responsibility and technical leadership. You will be able to work as a Senior Structural Engineer, leading the structural design and sizing of structures in complex and large-scale projects. It also positions you to be BIM Project Manager in the structural area, integrating the BIM methodology for structures and advanced calculation software to optimize workflows and information management. Another route is that of a Specialized Consultant in Structural Engineering, offering your expertise in structural analysis to various companies and projects, providing innovative solutions. Finally, you will be able to apply for roles as Technical Director of the Project Office, where your knowledge of structural materials and finite element tools will be crucial for making strategic decisions and leading teams.







Live Madrid

Live the International Week

As an additional complement to your training, you can be part of the SIM: Week International in Madrid. A unique meeting that brings together students from all over the world. For seven days you can live an academic and cultural experience in the heart of Europe, culminating with the graduation ceremony in Madrid.

- Conferences and workshops with international experts
- Visits to companies and reference organizations
- Networking with students from different countries
- Cultural activities and discovery of Madrid
- graduation ceremony

Structural

Structuralia is a leading educational institution in postgraduate and highly specialized online training, focused on the fields of engineering, architecture, construction, energy, technology and digital transformation.

Founded in 2001 with a strong industrial DNA, the result of collaboration between large companies in the sector and the Universitat Politècnica de Catalunya (UPC), for more than 25 years we have accompanied technical professionals in their academic and professional development through practical, flexible training aligned with the reality of the labor market.

Our training proposal connects advanced technical knowledge, real employability and international projection, acting as key support in the professional evolution of those seeking to specialize, grow professionally and generate impact in their sector, with a firm commitment to the democratization of access to technical excellence.



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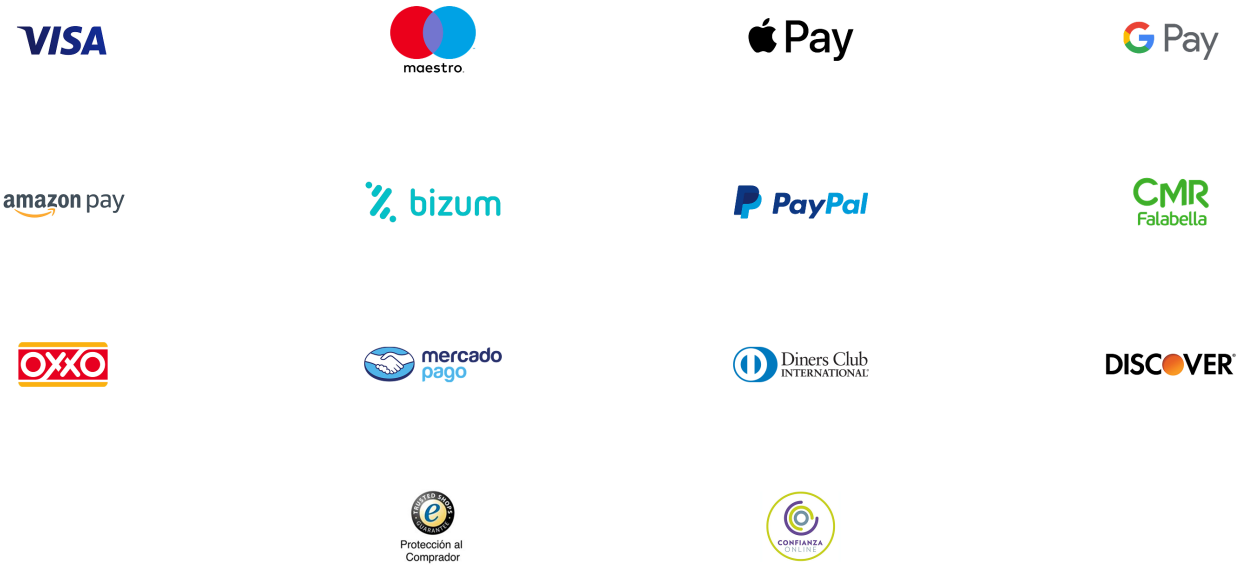
EDUCA EDTECH Group leads the digital revolution in education, promoting the continuous learning and technological transformation. The group is made up of recognized training institutions and its mission is to democratize access to education, promote the transfer of knowledge, technological development and research.

With the experience accumulated over more than 20 years, we have perfected our learning platform EDUCA LXP (Learning Experience Platform), the basis of our educational methodology, which provides students with online training practical and meaningful.



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20%
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