Structuralia
Engineering eLearning

UNIVERSIDAD
NEBRIJA

Master´s Degree in Structural Analysis and Calculation + 60 ECTS Credits





Choose to learn at school
leader in online training

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ABOUT STRUCTURALIA

Structuralia is an online educational institution offering highly specialized postgraduate programs in engineering, infrastructure, construction, energy, building, digital transformation, and new technologies. Since our founding in 2001, we have been committed to providing quality training for the professional development of **engineers, architects, and STEM professionals.**

We provide a platform where you can acquire new skills and enhance your knowledge without being limited by time or location. Our methodology ensures an engaging, interactive, and **supportive educational experience,** equipping our students to meet future challenges in their respective fields of work.

More than **20** years of experience

Over **200k** student have learnt with us

More than **90** nationalities among our students



Specialize to
advance your career

STRUCTURALIA ALLIANCE AND NEBRIJA UNIVERSITY

Structuralia and the University of Nebrija successfully consolidate a strategic partnership. Thus, the collaboration between Structuralia and the University of Nebrija promotes a collaborative, innovative and accessible approach towards learning that is adapted to the individual needs of students.

The two institutions prioritize practical and flexible learning, adapted to the demands of today's working world, and which promotes the personal and professional development of each student. The purpose is to acquire new knowledge in a dynamic and didactic way, which facilitates its retention and contributes to developing the necessary skills to be ready to take part in a society in constant and rapid transformation.

Structuralia and the University of Nebrija have set as their main objective the democratization of education to bring it to even the most remote areas and taking advantage of the latest technological innovations. In addition, they have a team of highly specialized teachers and learning platforms that incorporate cutting-edge educational technology to provide academic support throughout the entire educational process.



STRUCTURALIA RANKINGS

Structuralia has achieved the recognition of different national and international rankings, thanks to its commitment to **democratize education** and bet on educational innovation to **achieve excellence.**

For the elaboration of these rankings, **indicators** such as online and offline reputation, the quality of the institution, social responsibility, educational innovation or the profile of professionals are used.















QS, seal of academic excellence

Structuralia: 5 stars in online education

BY EDUCA EDTECH

Structuralia is a brand endorsed by **EDUCA EDTECH Group,** which is composed of a group of experienced and recognized **educational institutions of online training.** All the entities that make it up share the mission of **democratizing access to education** and are committed to knowledge transfer, technological development and research.

EDUCA EDTECH Group

ONLINE EDUCATION

EUROINNOVA INTERNATIONAL ONLINE EDUCATION

inesem business school

INEAF BUSINESS SCHOOL

red educa.net

inesalud

EDU SPORT

EDUCA business school

ESIBE ESCUELA IBEROAMERICANA DE POSTGRADO

Educa.Pro

ceupe European Business School

UDAVINCI

CAPMAN testing solutions

Structuralia Engineering eLearning

UNIMIAMI International University of Miami

Educa PHAROS

LXP METHODOLOGY

The **EDUCA LXP** methodology enhances the learning experience by incorporating AI into e-learning processes. It utilizes highly customized predictive models based on the analysis of student interactions with their virtual environments.

EDUCA LXP is the outcome of **Research Results Transfer** from multiple interdisciplinary R&D+i projects, involving international universities dedicated to knowledge transfer, technological development and research.



1. Flexibility

100% online and flexible learning, allowing students to study where, when and how they want.



2. Accessibility

We believe in making education accessible to all, working to ensure that everyone has the opportunity to continue their learning journey.



3. Personalization

We offer customized learning paths tailored to each student's unique needs and preferences.



4. Accompaniment / Academic mentoring

Guidance and support. Our team of expert teachers provides academic guidance, advocating for educational quality and adapting to the needs of the ever-changing labor market.



5. Innovation

We are at the forefront of technological development, constantly evolving with AI-driven Learning Experience Platforms.



6. Educational excellence

Our didactic approach focuses on competence based learning, promoting practical and meaningful learning experiences to ensure professional development.



Programs

Our own university and official programs

WHY CHOOSIG STRUCTURALIA

1. Our Experience

- ✓ More than **20 years of experience**.
- ✓ More than **200.000 students** have already learnt in our virtual classrooms.
- ✓ More than **90 nationalities** among our student body.

2. Our Team

Currently, Structuralia has a team of **more than 550 professionals working in the STEM (Science, Technology, Engineering and Mathematics)**. Our staff is solidly framed in a structure that facilitates the highest quality in the attention to students.

3. Our Methodology



100% ONLINE

Study at your convenience, wherever you are. Access our virtual campus from any device.



LEARNING

We strive for a deep integration of new knowledge into your cognitive framework.



TEAM TEACHERS

Structuralia has a team of professionals to elevate your study experience with topquality education.



NOT BE ALONE

Receive continuous guidance from our tutoring team throughout your student journey.

4. AENOR Quality

- ✓ We are Collaboration Agency Nº99000000169 authorized by the Ministry of Employment and Social Security.
- ✓ Annual external audits are carried out to ensure the highest quality by AENOR.
- ✓ Our teaching processes are certified by AENOR under ISO 9001.

Master´s Degree in Structural Analysis and Calculation + 60 ECTS Credits

LENGHT
1500 horas

MODE
ONLINE

ASSISTANCE
PERSONALIZED

CREDIT
60 ECTS

Certificacion

Master´s Degree in Structural Analysis and Calculation with 60 ECTS Credits awarded by the Antonio de Nebrija University. Teaching not leading to an officially accredited qualification



Description

The Master’s degree in Structural Analysis and Calculation seeks to reinforce, increase, and strengthen the knowledge and skills of construction professionals in the areas of structural design, calculation, and dimensioning in civil works projects. This program consists of modules focused on the structural calculation of foundations, vaults, frames, screens, walls, among others, via conventional methods.

Goals

- Reinforce and increase the students' knowledge of structural engineering.
- Provide the essential theoretical / practical foundations to perform duties in the area of structural calculation.
- Provide criteria and solid knowledge for the design and calculation of structures made of reinforced concrete, structural steel and wood structures, among other materials.
- Provide students with the essential tools for the development of their professional and / or academic career in the field of structural calculation.
- Learn the main structural typologies, learning to perform the implicit calculation model in each typology, its calculation and dimensioning.

What does it prepare you for?

- Consulting project engineers - Consulting engineering project managers - Project engineers and technical study specialists at construction firms - Project and technical study manager at construction firms - Numerical modernization professionals

Who is the target audience?

In addition to providing the necessary theoretical framework, this master’s program will enable students to carry out a diversity of practical cases and exercises. Finally, a master’s final Project must be prepared for the students to apply all of the knowledge they have acquired throughout the course.

Job opportunities

The students will be able to acquire the necessary knowledge and skill required to perform duties, and develop their professional careers, related to structural engineering in civil works and construction firms, and in the areas of architectural studies in construction firms.

List of subjects

MODULE 1. STRUCTURAL CALCULATION

UNIT 1. STRUCTURE TYPES AND CONNECTIONS

1. Structure types
2. Structure types according to their behavior
3. Structure types according to their deformation
4. Types of structural support elements. joints, embeddings and rollers
5. Types of connections in metal and concrete structures

UNIT 2. STRESS ANALYSIS. ACTIONS AND EFFORTS

1. Actions on structures
2. Ultimate Limit State (ULS) and Serviceability Limit State (SLS)
3. Calculation combinations
4. Efforts/stresses on structures
5. Structural design methods

UNIT 3. BENDING, SHEARING AND BUCKLING

1. Bending, shearing and flexo-compression calculation
2. Inestability types and solutions
3. Compressive buckling
4. Lateral torsional buckling
5. Denting and reinforceable profiles. Criteria and solutions

UNIT 4. FUNDAMENTAL CONCEPTS AND APPLICATION

1. Applying structural concepts
2. Deformation calculation
3. Beam calculation
4. Pillar calculation
5. Frame calculation

MODULE 2. CONSTRUCTION MATERIALS

UNIT 1. STEEL IN CONSTRUCTION

1. Introduction. Manufacture and types
2. Steel for concrete
3. Types of structural steel
4. Galvanized steel
5. Aluminum

UNIT 2. CONCRETE IN CONSTRUCTION

1. Types of concrete. Special types
2. Mechanical properties of concrete
3. Dimensioning shallow foundations
4. Dimensioning short corbels
5. Cracking in reinforced concrete

UNIT 3. LUMBER

1. Lumber. Properties and construction products
2. Calculation of plug joints in wood (I). Nails
3. Calculation of plug joints in wood (II). Staples, bolts, pins and lag screws
4. Calculation of woodworking joints. Splices and screwless
5. Dimensioning lumber in fire scenarios

UNIT 4. OTHER MATERIALS AND SUSTAINABILITY

1. Masonry works. Bricks and blocks. Types
2. Basis for the calculation of a mansory wall
3. Glass. Types and dimensioning
4. Synthetic polymers. Types and applications
5. Structural reinforcement with fiber-made materials

MODULE 3. CIVIL ENGINEERING STRUCTURAL CALCULATION

UNIT 1. PRESTRESSED CONCRETE

1. Introduction
2. Materials
3. Prestressing force. Instantaneous losses
4. Prestressing deferred losses
5. Calculating prestressing force in hyperstatic structures

UNIT 2. UNDERPASS STRUCTURES OR BURIED WORKS

1. Underpass works (I). Types
2. Underpass works (II). Acting loads
3. Cylindrical shells. Concepts and behavior
4. Predimensioning of cylindrical shells (I). Concept and calculation
5. Predimensioning of cylindrical shells (II). Spandrels and edge beams

UNIT 3. CONCRETE TANKS

1. Concrete tank calculation elements
2. Concrete tank design elements. Principles applied to calculating rectangular reinforced concrete tanks
3. Calculating a rectangular reinforced concrete tank wall. Example
4. Principles applied to calculating cylindrical reinforced concrete tanks
5. Principles applied to analyzing a reinforced concrete tank floor slab. Example of how a rectangular reinforced concrete tank floor slab is calculated

UNIT 4. METAL TANKS

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

MODULE 4. SHALLOW FOUNDATIONS

UNIT 1. DETERMINANTS AND STUDY FAILURE MODES

1. Introduction and determinants
2. Distribution of stresses below rigid foundations
3. Verification of failure modes for ULS
4. Verification of bearing capacity
5. Correction factors

UNIT 2. ADDITIONAL NOTES ABOUT CARRYING CAPACITY

1. Bearing capacity in non-homogenous soils
2. Bearing capacity from in situ test
3. Bearing capacity in particular soils
4. Bearing capacity in rock (I)
5. Bearing capacity in rock (II)

UNIT 3. LIMIT STATES OF SERVICE

1. Definitions and concepts
2. Stress distribution in the ground
3. Settlements in granular soils
4. Settlements in cohesive soils
5. Other methods and other deformations

UNIT 4. RAFTS, WELLS, DYNAMIC ASPECTS AND OFFSHORE SCOPE

1. Rafts
2. Short rigid piers
3. Machine foundations
4. Foundation in earthquake-prone area and dynamic parameters
5. Shallow foundations in maritime and offshore sectors

MODULE 5. DEEP FOUNDATIONS

UNIT 1. BASIC CONCEPTS AND COLUMN PILES IN SOILS

1. Types of deep foundations. Terms. General rules of a deep foundation design
2. Bearing capacity of a pile in soils. Basic formulation
3. End bearing capacity in granular soils through analytical solutions
4. End bearing capacity in cohesive soils through analytical solutions

5. End bearing capacity in soils. In situ tests

UNIT 2. FLOATING PILES IN SOILS, PILES IN ROCK AND PILE GROUPS

1. Skin friction capacity in granular soils through analytical solutions
2. Skin friction capacity in cohesive soils through analytical solutions
3. Skin friction capacity in granular and cohesive soils through in situ test
4. Bearing capacity of a pile rocks
5. Bearing capacity of a group of pile

UNIT 3. WORKLOADS AND PILES SETTLEMENT

1. Safety coefficient. single pile and group of piles effect
2. Structural strength
3. Settlements in deep foundations
4. Uplift load
5. Dynamic formule for pile driving

UNIT 4. PILE SELECTION AND UNUSUAL SITUATIONS

1. Verifying safety against ground failure owing to horizontal pull or pressure
2. Negative Friction in Piles
3. Load test in piles
4. Choosing the type of pile
5. Micro-piles

MODULE 6. EARTH PRESSURES AND RETAINING STRUCTURES.

UNIT 1. THEORY

1. Classical earth pressures theory. Coulomb
2. Classical earth pressures theory. Rankine, Terzaghi
3. Classical earth pressure theory. Lateral earth pressures coefficient
4. Classical earth pressures theory. Winkler spring model
5. Other calculation methods. Numerical models and equivalent fluid theory
6. Theory. Seismic considerations

UNIT 2. RIGID WALLS

1. Rigid walls. Gravity walls
2. Rigid walls. Reinforced concrete walls
3. Rigid walls. Rock walls
4. Rigid walls. Masonry walls and segmental retaining walls

UNIT 3. FLEXIBLE CANTILEVERED WALLS

1. Flexible walls. Gabion walls and crib walls
2. Flexible walls. mechanically stabilized earth wall
3. Flexible walls. Diaphragm walls
4. Flexible walls. Pile walls

5. Anchors
6. Flexible walls. sheet pile walls, king post walls, trenches

UNIT 4. DESING CONSIDERATIONS

1. Other design considerations. construction procedures
2. Other design considerations. ground movement and monitoring
3. Other design considerations. problematic grounds
4. Other design considerations. Design sections and groundwater flow diagram

MODULE 7. SEISMICITY AND SEISMIC-RESISTANT DESIGN

UNIT 1. INTRODUCTION AND CHARACTERISTICS OF SEISMIC ACTION

1. What is an earthquake? Definition, causes, and effects. World highest seismicity regions
2. Characteristics of seismic action. The concept of PGA. Seismic levels, return periods and seismic hazard curve
3. Response spectrum, local geology, and amplification factors. Liquefaction
4. Structure classification
5. Seismic activity considerations in projects. Seismic vertical action, associated mass, and seismic action combinations

UNIT 2. ANALYSIS METHODS

1. Introduction to modal analysis
2. Seismic-resistant design methodology
3. Static linear analysis (I). Equivalent lateral force method
4. Dynamic linear analysis (II). Spectral and modal-spectral analyses
5. Nonlinear analyses. The pushover analysis and the time-history method with accelerograms

UNIT 3. SEISMIC-RESISTANT DESIGN. METHODOLOGY AND REQUIREMENTS

1. Basic design criteria in seismic areas
2. Ductility. Behavioral factor
3. Ductile design requirements for reinforced concrete
4. Ductile design requirements for metal structures
5. Displacement assessments. Seismic joints and spacing between surrounding structures
6. Gravity and containment structures. Pseudo-static analysis. Seismic design and earth pressure equations
7. Seismic-resistant design strategy. Dissipation Vs. Isolation

UNIT 4. PRACTICAL APPLICATION CASES

1. Example 1. Structural design of land retaining walls
2. Example 2. Design of reinforced concrete building. Application of Spectral-modal method
3. Bibliography. Reference regulation and guides

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

UNIT 1. DESIGN OF INDUSTRIAL WAREHOUSES (I)

1. Industrial warehouses. Components and types
2. Foundations
3. Frames (I). Types
4. Frames (II). Calculation
5. Example of a gable frame

UNIT 2. DESIGN OF INDUSTRIAL WAREHOUSES (II)

1. Bracing systems. Types
2. Roof and facade purlins. Design and calculation
3. Roof and facade bracing. Practical examples
4. Overhead crane (I). Introduction
5. Overhead crane (II). Actions and calculation

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

1. High-rise buildings. Introduction. General criteria
2. Rigid frame systems
3. Rigid core structures
4. Tubular structures
5. Stiffening systems for lateral stability

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

1. Building structural frames
2. Building seismic calculation (I). The simplified method
3. Building seismic calculation (II). Example
4. Study on wind pressure
5. Influence of axial deformations

MODULE 9. STRUCTURAL REHABILITATION

UNIT 1. FUNDAMENTAL CONCEPTS

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

UNIT 2. PATHOLOGIES IN BUILDING ELEMENTS

1. Introduction
2. Pathologies on roofs. General aspects
3. Pathology in roofs according to their typologies
4. Façade pathologies
5. Pillars and slabs pathologies

UNIT 3. BRIDGE PATHOLOGIES

1. Foundation pathologies
2. Pathologies in the substructure
3. Pathologies in the superstructure of concrete bridges
4. Pathologies in the superstructure of the arched fridge
5. Pathologies in the superstructure of steel and composite bridges

UNIT 4. REPAIRS AND REINFORCEMENTS

1. Underpinning in shallow foundations
2. Repairs to concrete structures
3. Reinforcements in concrete structures
4. Detailed design of composite pillars
5. Moisture and water leakage therapy

MODULE 10. MFP. MASTER´S DEGREE IN STRUCTURAL ANALYSIS AND CALCULATION

Did you find this information interesting?

If you still have questions, our academic advising team will be happy to answer them.

Ask us about our training method, our teachers, scholarships or even just get to know us.

Request information without commitment.

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