Structuralia
Engineering eLearning

UNIVERSIDAD
NEBRIJA

Master´s Degree in Geotechnical Engineering and Foundations + 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 Geotechnical Engineering and Foundations + 60 ECTS Credits



LENGHT
1500 horas



MODE
ONLINE



ASSISTANCE
PERSONALIZED



CREDIT
60 ECTS

Certificacion

Master´s Degree in Geotechnical Engineering and Foundations 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 Geotechnical Engineering and Foundations at Structuralia aims at strengthening, increasing and consolidating the knowledge and skills of construction, geology and civil engineering professionals in the field of Geotechnical Engineering through a total of 9 modules.

Goals

The students who successfully complete the Master’s degree in Geotechnical Engineering and Foundations will have knowledge and skills to perform specialized tasks and develop their professional career in the field of geotechnical engineering in civil engineering and construction companies, as well as in architecture firms. - Strengthen and increase the student’s knowledge of geotechnical engineering. - Provide solid theoretical and practical foundations for geotechnical engineering tasks. - Provide indispensable tools for further professional and/or academic development in geotechnical engineering. - Initiate students into numerical modeling and advanced constitutive models for soils and rocks in geotechnical engineering

What does it prepare you for?

- Civil engineering and construction professionals - Civil engineers (Roads, ports and canals) - Geologists - Geological engineers - Mining engineers - Industrial engineers (specialized in construction) - Architects

Who is the target audience?

In addition to the main general concepts, the program focuses special attention on numerical modeling applications by means of a solid theoretical framework and practical exercises.

Job opportunities

- Project Consultant Engineer - Project Manager in engineering consulting - Project and Research Engineer in construction companies. - Project and Research Manager in construction companies. - Numerical Modelling Experts

List of subjects

MODULE 1. INTRODUCTION TO GEOTECHNICS. SOIL AND ROCKS

UNIT 1. DESCRIPTION OF SOILS

1. Soil - Concept and Formation
2. Soil - Types of soil and sedimentary deposits
3. Granular Soils - Gravels and Sands
4. Cohesive Soils - Silts and Clays
5. Cohesive Soils - Structure, Types and Properties of clays

UNIT 2. PROPERTIES AND CLASSIFICATION OF SOILS

1. Basic Properties - Volume and Weight
2. Basic Properties - Granular Soils
3. Basic Properties - Cohesive Soils
4. Unified Soil Classification System (USCs)
5. AASHTO Soil Classification System

UNIT 3. DESCRIPTION OF ROCKS

1. The Rock Cycle. Plate Tectonics and Deformations of the Earth’s Crust.
2. Igneous Rocks
3. Sedimentary Rocks
4. Metamorphic Rocks
5. Rock, Rock Matrix and Rock Mass

UNIT 4. PROPERTIES AND CLASSIFICATION OF ROCKS

1. Properties of the Rock Matrix
2. Properties of The Rock Mass. Discontinuities
3. Geomechanical Classifications - RMR (ROCK MASS RATING)
4. Geomechanical Classifications - The Q Index
5. The GSI Index - Geological Strength Index

MODULE 2. GROUNDWATER. EFFECTS ON SOILS AND ROCKS.

UNIT 1. FLUID FLOW IN POROUS MEDIA.

1. Groundwater. Aquifer Types.
2. Darcy's Law. Hydraulic Head and Hydraulic Gradient. Permeability.
3. Mechanics and Theory of Fluid Flow in Porous Media.
4. Flow Nets.
5. The Method of Fragments.

UNIT 2. EFFECTIVE STRESS AND PORE PRESSURES. WATER EFFECTS ON SOIL AND ROCKS.

1. The Effective Stress Principle. Application in Soil and Rocks.
2. Stress Distribution in the Ground.
3. Hydraulic heave, uplift, internal erosion and piping.
4. Filters. Concept, Use and Preliminary Design.
5. Water Effects on the Rock Matrix and the Rock Mass.

UNIT 3. SOIL CONSOLIDATION.

1. Introduction.
2. The Magnitude of the Consolidation Settlement.
3. The Evolution of the Consolidation Settlement.
4. The Parabolic Isochrones Theory.
5. Preloading and Mixed and Radial Consolidation

UNIT 4. WELLS AND PUMPING SYSTEMS.

1. Construction of Wells.
2. Design of Wells. Analytical Solutions for Individual Wells.
3. Design of Groups of Wells. Analytical Solutions for groupd of wells.
4. Construction of Wellpoints.
5. Design of Wellpoints.

MODULE 3. GROUND CHARACTERIZATION AND INSTRUMENTATION AND MONITORING.

UNIT 1. GEOTECHNICAL AND GROUND INVESTIGATION CAMPAIGNS

1. Preliminary Works
2. Design and Planning of Ground Investigation
3. Ground Investigation and Preliminary Research
4. Drilling Techniques [2] and Sampling methods
5. In Situ Testing for Soils and Rock Masses

UNIT 2. LABORATORY TESTS IN GEOTECHNICAL ENGINEERING (I)

1. Identification and State Tests (I)
2. Identification and State Tests (II)
3. Resistance Tests (I)
4. Resistance Tests (II)
5. Interpretation of Triaxial Shear Tests

UNIT 3. LABORATORY TESTS IN GEOTECHNICAL ENGINEERING (II)

1. Deformability Tests
2. Interpretation of Oedometer Tests
3. Compaction and Reuse Tests
4. Rocks Tests (I)
5. Rocks Tests (II)

UNIT 4. INSTRUMENTATION AND MONITORING (I&M)

1. Introduction to Instrumentation and Monitoring
2. Instrumentation Equipment I
3. Instrumentation Equipment II
4. Instrumentation Equipment III
5. Real case studies

MODULE 4. CONTINUUM MECHANICS AND CONSTITUTIVE MODELS. APPLICATION TO SOILS AND ROCKS.

UNIT 1. ELASTICITY AND CONTINUUM MECHANICS.

1. The Stress Tensor. Total, Effective and Pore Stresses. Mohr's Circle for Stresses.
2. Strain Tensor. Mohr's Circle for strains.
3. Continuum mechanics. Definition of the mathematical problem..
4. Elasticity Equations and Parameters.
5. Main Elastic Solutions in Soil and Rock Mechanics.

UNIT 2. PLASTICITY THEORY.

1. Introduction to Plasticity.
2. Yield Criterion. Types of Plastic Behavior.
3. Plastic Flow and Plastic Potential.
4. Main Theorems and Postulates of the Theory of Plasticity.
5. The Mohr-Coulomb Elastoplastic Model.

UNIT 3. CONSTITUTIVE MODELS FOR SOILS.

1. Rheological Models.
2. The Hardening Soil Model.
3. The Hardening Soil Small Model.
4. The Cam-Clay Model.

UNIT 4. CONSTITUTIVE MODELS FOR ROCKS.

1. The Hoek and Brown Constitutive Model.
2. The Barton-Choubey Constitutive Model for Joints and Discontinuities.
3. Viscosity, Viscoelasticity and Viscoplasticity.
4. Extension of Rheological Models.
5. Viscoelastic Constitutive Models.

MODULE 5. 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 6. SLOPE STABILITY ANALYSES

UNIT 1. SLOPE STABILITY ANALYSIS

1. Landslides classification
2. Geotechnical concepts to address a slope stability problem
3. Slope stability in soils
4. Slope stability in rock masses
5. Rock slope stability based on geomechanical indices

UNIT 2. SOIL SLOPE STABILITY

1. Soil slope stability analysis by classic methods
2. Soil slope stability analysis using charts
3. The method of slices
4. Corrective measures for soil slope stability
5. Finite element analysis of soil slopes

UNIT 3. ROCK SLOPE KINMATIC ANALYSES

1. The stereographic projection
2. Planar failure kinematic analysis
3. Wedge failure kinematic analysis
4. Toppling kinematic analysis
5. Slope kinematic analyses in a rock mass

UNIT 4. SOIL SLOPE STABILITY

1. Planar failure safety factor calculation
2. Wedge failure safety factor calculation
3. Toppling safety factor calculation
4. Corrective measures for rock slope stability
5. Finite element analysis of rock slopes

MODULE 7. 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 8. 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 9. NUMERICAL MODELLING IN GEOTECHNICS. APPLICATIONS WITH PLAXIS 2D.

UNIT 1. NUMERIC MODELLING AND ITS APPLICATION IN GEOTECHNICS. INTRODUCTION TO PLAXIS 2D.

1. Introduction to Numerical Modeling.
2. The Finite Element Method.
3. Numerical Modelling in Geotechnics.
4. Introduction to Plaxis 2D. Basic Concepts.
5. Plaxis 2D. Organization and Structure. User Interface.

UNIT 2. BUILDING THE GEOMETRY AND THE FINITE ELEMENT MESH

1. Definition of Ground Geometry and Structure.
2. Geometrical Elements, Loads and Movements Imposed on Plaxis 2D.
3. Soil behavior and constitutive models
4. Structural and hydraulic elements in Plaxis 2D
5. Definition of the mesh of finite elements

UNIT 3. CALCULATION, WATER AND RESULT ANALYSIS.

1. Definition of Calculation Phases.
2. Plaxis 2D calculation types
3. Water in Plaxis 2D.
4. Calculation Scheme and Control Parameters.
5. Result visualization and Analysis.

UNIT 4. APPLICATIONS WITH PLAXIS 2D - PRACTICAL CASES.

1. Study of a superficial Foundation.
2. Analysis of a slope´s stability
3. A modelling case. an excavation between retainign walls
4. Embankment construction and consolidation
5. Modelling of a tunnel. Builder/wizard tunnel

MODULE 10. MFP. MASTER´S DEGREE IN GEOTECHNICAL ENGINEERING AND FOUNDATIONS

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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