Master's degree in Geotechnical Engineering

The **master's degree in Geotechnical Engineering** (**master's degree website**) provides students with the training to pursue professional and academic careers in the fields of geotechnical engineering, hydrogeology, geophysics and earthquake engineering. Students develop specialist knowledge of geophysics and earthquake engineering and acquire the skills to predict, evaluate and reduce seismic hazards.

Specialisations

- Geotechnical Engineering
- Groundwater Hydrology
- Earthquake Engineering and Geophysics

GENERAL DETAILS

Duration and start date

2 academic years, 120 ECTS credits. Starting September and February

Timetable and delivery

Mornings and afternoons. Face-to-face

Fees and grants

Approximate fees for the master's degree, excluding other costs, €3,320 (€8,300 for non-EU residents).
More information about fees and payment options
More information about grants and loans

Language of instruction

Spanish

Information on language use in the classroom and students' language rights.

Location

Barcelona School of Civil Engineering (ETSECCPB)

Official degree

Recorded in the Ministry of Education's degree register

ADMISSION

General requirements

Academic requirements for admission to master's degrees

Places

45

Pre-enrolment

Pre-enrolment period open.
Expected deadline: 03/07/2023.

How to pre-enrol

Enrolment

How to enrol

Legalisation of foreign documents

All documents issued in non-EU countries must be legalised and bear the corresponding apostille.

DOUBLE-DEGREE AGREEMENTS

Double-degree pathways with others UPC schools

Master's degree in Geotechnical Engineering + Master's degree in Mining Engineering (EPSEM)

PROFESSIONAL OPPORTUNITIES

Professional opportunities

Graduates of the master's degree are generally employed as managers or as experts working on teams in areas and activities related to geotechnical engineering.

- Management and planning of geotechnical works.
- Management and planning of water resources.
- Modelling, assessment and management of geological resources.
- Assessment and reduction of seismic risk.
- Assessment and reduction geological risk.
- Assessment and reduction of hydrogeological risk, including soil contamination.
- Land survey campaigns.
- Energy resource prospecting campaigns.
- Planning and management of waste storage solutions.
- Civil engineering, geotechnical, geological and seismic consulting.
- Hydrology and hydrogeology consulting.
- Doctoral studies in civil, geotechnical, geological and earthquake engineering.
- Doctoral studies in hydrology and hydrogeology.

Competencies

Generic competencies

Generic competencies are the skills that graduates acquire regardless of the specific course or field of study. The generic competencies established by the UPC are capacity for innovation and entrepreneurship, sustainability and social commitment, knowledge of a foreign language (preferably English), teamwork and proper use of information resources.

Specific competencies

On completion of the master's degree, graduates will be able to:
• Apply scientific and technological concepts in analysing and solving problems.
• Characterise the geological environment and its interaction with civil works.
• Interpret laboratory tests and field observations to identify the mechanisms responsible for the Earth's response.
• Plan laboratory experiment programmes.
• Make, use and interpret models in analysing and solving problems.
• Observe, interpret, quantify and mathematically model the various processes that govern the Earth's response.
• Perform, present and defend, to a university examination board, an original, individually prepared exercise consisting of a study or project in the field of geotechnical engineering that brings together the competencies acquired in their education, adopts advances and new developments in the field and contributes innovative ideas.

Specialisation in Geotechnical Engineering

If they specialise in this area, they will be able to:
• Apply their knowledge of soil and rock mechanics in the study, design, construction and operation of foundations, embankments, slopes, tunnels and other structures.
• Apply advanced scientific and advanced technological concepts in analysing and solving complex geotechnical engineering problems.
• Carry out studies of land and urban area management, including the construction of tunnels and other underground railway infrastructure.

Specialisation in Groundwater Hydrology

If they specialise in this area, they will be able to:
• Evaluate and manage the environmental impact of waste storage and soil and subsoil contamination.

• Calculate, evaluate and regulate surface water and groundwater resources.
• Plan and implement hydraulic installations, including transport, distribution and storage facilities for solids, liquids and gases and water treatment and urban, industrial and hazardous waste management plants.
• Environmentally evaluate projects, plants and facilities.
• Evaluate and manage geological resources, including groundwater and mineral and thermal springs.

Specialisation in Earthquake Engineering and Geophysics
If they specialise in this area, they will be able to:
• Apply their knowledge of soil and rock mechanics in the study, design, construction and operation of foundations, embankments, slopes, tunnels and other constructions over or through land, whatever their nature and state and whatever the purpose of the work.
• Design civil structures considering seismic loads.
• Design remedial solutions.
• Assess seismic risk. Consider and design risk reduction measures.
• Identify all types of structures and materials.
• Design, plan, implement and maintain civil structures and buildings.
• Analyse structures by applying software design and advanced structural design methods.
• Assess structural integrity.

ORGANISATION: ACADEMIC CALENDAR AND REGULATIONS

UPC school
Barcelona School of Civil Engineering (ETSECCPB)

Academic calendar
General academic calendar for bachelor's, master's and doctoral degrees courses

Academic regulations
Academic regulations for master's degree courses at the UPC

CURRICULUM

Subjects	ECTS credits	Type
FIRST SEMESTER		
Continuum Mechanics	5	Compulsory
Geology for Engineering	5	Compulsory
Groundwaves Generation and Propagation	5	Compulsory
Modelling in Geoengineering	5	Compulsory
Modelling of Flow and Transport in Porous Media	5	Compulsory
Rock Mechanics	5	Compulsory
Soils Mechanics	5	Compulsory

Subjects		ECTS credits	Type
Specialisation in (Eng) Especialitat en Enginyeria Geotècnica	Foundations and Earth Retaining Structures	5	Compulsory
	Continuum Mechanics	5	Compulsory
	Geology for Engineering	5	Compulsory
	Groundwaves Generation and Propagation	5	Compulsory
	Modelling in Geoengineering	5	Compulsory
	Modelling of Flow and Transport in Porous Media	5	Compulsory
	Rock Mechanics	5	Compulsory
	Soils Mechanics	5	Compulsory
Specialisation in (Eng) Especialitat en Enginyeria Sísmica i Geofísica	Sismology	5	Compulsory
	Continuum Mechanics	5	Compulsory
	Geology for Engineering	5	Compulsory
	Groundwaves Generation and Propagation	5	Compulsory
	Modelling in Geoengineering	5	Compulsory
	Modelling of Flow and Transport in Porous Media	5	Compulsory
	Rock Mechanics	5	Compulsory
	Soils Mechanics	5	Compulsory
Specialisation in (Eng) Especialitat en Hidrologia Subterrània	Modelling of Soil and Groundwater Contamination	5	Compulsory
	Continuum Mechanics	5	Compulsory
	Geology for Engineering	5	Compulsory
	Groundwaves Generation and Propagation	5	Compulsory
	Modelling in Geoengineering	5	Compulsory
	Modelling of Flow and Transport in Porous Media	5	Compulsory
	Rock Mechanics	5	Compulsory
	Soils Mechanics	5	Compulsory
SECOND SEMESTER			
Specialisation in (Eng) Especialitat en Enginyeria Geotècnica	Advanced Soil Mechanics	5	Compulsory
	Geomechanics of Breakage	5	Compulsory
	Modern Monitoring Techniques for Ground Movements	5	Optional
	Numerical Modelling Tool in Geoengineering	5	Optional
	Slope Stability	5	Optional
	Underground Excavations	5	Compulsory
	Unsaturated Soil Mechanics	5	Optional

Subjects		ECTS credits	Type
Specialisation in (Eng) Especialitat en Enginyeria Sísmica i Geofísica	Advanced Methods in Seismic Damage Evaluation	5	Optional
	Bridges	5	Optional
	Composite Materials Structures	5	Optional
	Earthquake Engineering	5	Compulsory
	Geophysical Prospection	5	Compulsory
	Numerical Modelling Tool in Geoengineering	5	Optional
	Seismic Risk Assessment and Reduction	5	Optional
	Static and Dynamic Structural Analysis	5	Optional
Specialisation in (Eng) Especialitat en Hidrologia Subterrània	Aquifer Mechanics	5	Compulsory
	Aquifers Balance and Recharge	5	Compulsory
	Groundwater and Environment	5	Optional
	Interaction Between Groundwater and Civil Works	5	Optional
	Numerical Modelling Tool in Geoengineering	5	Optional
	Stochastic Methods in Hydrology	5	Compulsory
THIRD SEMESTER			
Statistics Applied to Civil and Earthquake Engineering		5	Optional
Specialisation in (Eng) Especialitat en Enginyeria Geotècnica	Constitutive Equations of Materials	5	Optional
	Geographic Information Systems	5	Optional
	Geotechnical Design and Construction	5	Compulsory
	Numerical Models in Geotechnical Engineering	5	Optional
	Quaternary Geology	5	Optional
	Seminars	5	Optional
	Soil Behaviour and Advanced Modelling	5	Optional
	Statistics Applied to Civil and Earthquake Engineering	5	Optional
Specialisation in (Eng) Especialitat en Enginyeria Sísmica i Geofísica	Advanced Seismic Resistent Design	5	Optional
	Geographic Information Systems	5	Optional
	Seismic Hazard Assessment	5	Compulsory
	Seminars	5	Optional
	Sismometry	5	Compulsory
	Statistics Applied to Civil and Earthquake Engineering	5	Optional

Subjects		ECTS credits	Type
Specialisation in (Eng) Especialitat en Hidrologia Subterrània	Environmental Isotope Techniques in Groundwater Hydrology	5	Optional
	Geographic Information Systems	5	Optional
	Hydrogeochemical Modelling	5	Compulsory
	Hydrometeorological Processes and Their Interactions with the Ground	5	Optional
	Reactive Transport	5	Optional
	Seminars	5	Optional
	Stochastic Modelling of Transport in Hete	5	Optional
	Statistics Applied to Civil and Earthquake Engineering	5	Optional
FOURTH SEMESTER			
Master's Thesis		30	Project
Specialisation in (Eng) Especialitat en Enginyeria Geotècnica	Master's Thesis	30	Project
Specialisation in (Eng) Especialitat en Enginyeria Sísmica i Geofísica	Master's Thesis	30	Project
Specialisation in (Eng) Especialitat en Hidrologia Subterrània	Master's Thesis	30	Project