# Study Plan

**School:** School of Sciences and Technology
**Degree:** Bachelor
**Course:** Geology (cód. 135)

## Branch Geology

**1st Year - 1st Semester**
**Branch Geology**

| Component code | Name | Scientific Area Field | ECTS | Duration | Hours |
|---|---|---|---|---|---|
| FIS02670L | General Physics | Physics | 6 | Semester | 156 |
| GEO00749L | General Geology | Geosciences | 6 | Semester | 155 |
| MAT00933L | Mathematics I | Mathematics | 6 | Semester | 162 |
| QUI01090L | General Chemistry | Chemistry | 6 | Semester | 156 |
| BIO02671L | Introduction to Biology Studies | Biology | 3 | Semester | 78 |
| PAO02672L | Basic Ecology | Environment and Ecology Sciences | 3 | Semester | 78 |

**1st Year - 2nd Semester**
**Branch Geology**

| Component code | Name | Scientific Area Field | ECTS | Duration | Hours |
|---|---|---|---|---|---|
| GEO02673L | Field Techniques in Geosciences | Geosciences | 6 | Semester | 156 |
| GEO02674L | Paleonthology | Geosciences | 6 | Semester | 156 |
| MAT00934L | Mathematics II | Mathematics | 6 | Semester | 162 |
| GEO02675L | Geological Cartography I | Geosciences | 6 | Semester | 156 |
| GEO02676L | Mineralogy | Geosciences | 6 | Semester | 156 |

**2nd Year - 3rd Semester**
**Branch Geology**

| Component code | Name | Scientific Area Field | ECTS | Duration | Hours |
|---|---|---|---|---|---|
| GEO02677L | Igneous Petrology | Geosciences | 6 | Semester | 156 |
| GEO02678L | Sedimentology | Geosciences | 6 | Semester | 156 |
| MAT00925L | Introduction to Probability and Statistics | Mathematics | 6 | Semester | 154 |
| GEO10081L | Structural Geology | Geosciences | 6 | Semester | 160 |
| GEO10079L | Pedology | Geosciences | 6 | Semester | 156 |

**2nd Year - 4th Semester**
**Branch Geology**

| Component code | Name | Scientific Area Field | ECTS | Duration | Hours |
|---|---|---|---|---|---|
| GEO00745L | Engineering Geology | Geosciences | 6 | Semester | 159 |
| GEO02679L | Metamorphic Petrology | Geosciences | 6 | Semester | 156 |
| GEO00761L | Geochemical Systems | Geosciences | 6 | Semester | 156 |
| GEO02680L | Stratigraphy | Geosciences | 6 | Semester | 156 |
| GEO00754L | Hydrogeology | Geosciences | 6 | Semester | 156 |

**3rd Year - 5th Semester**
**Branch Geology**

| Component code | Name | Scientific Area Field | ECTS | Duration | Hours |
|---|---|---|---|---|---|
| GEO02376L | Geomorphology | Geography | 6 | Semester | 156 |
| FIS00708L | Applied Geophysics | Physics | 6 | Semester | 156 |
| GEO02682L | Mineral Resources | Geosciences | 6 | Semester | 156 |

**Group of Options**

| Component code | Name | Scientific Area Field | ECTS | Duration | Hours |
|---|---|---|---|---|---|
| GEO01448L | Geology of Portugal | Geosciences | 6 | Semester | 156 |
| GEO02684L | SIGS in Geosciences | Geosciences | 6 | Semester | 156 |

Group of Free Options

**3rd Year - 6th Semester**
**Branch Geology**

| Component code | Name | Scientific Area Field | ECTS | Duration | Hours |
|---|---|---|---|---|---|
| GEO02685L | Geodynamics and Tectonics | Geosciences | 6 | Semester | 156 |
| GEO02686L | Geological Cartography II | Geosciences | 6 | Semester | 156 |
| GEO00750L | Marine Geology | Geosciences | 6 | Semester | 156 |
| GEO01440L | Environment Geology and Regional Planning | Geosciences | 6 | Semester | 156 |
| GEO02687L | Seminar | Geosciences | 6 | Semester | 156 |

**Branch Biology and Geology**

**1st Year - 1st Semester**
**Branch Biology and Geology**

| Component code | Name | Scientific Area Field | ECTS | Duration | Hours |
|---|---|---|---|---|---|
| FIS02670L | General Physics | Physics | 6 | Semester | 156 |
| GEO00749L | General Geology | Geosciences | 6 | Semester | 155 |
| MAT00933L | Mathematics I | Mathematics | 6 | Semester | 162 |
| QUI01090L | General Chemistry | Chemistry | 6 | Semester | 156 |
| BIO02671L | Introduction to Biology Studies | Biology | 3 | Semester | 78 |
| PAO02672L | Basic Ecology | Environment and Ecology Sciences | 3 | Semester | 78 |

**1st Year - 2nd Semester**
**Branch Biology and Geology**

| Component code | Name | Scientific Area Field | ECTS | Duration | Hours |
|---|---|---|---|---|---|
| GEO02673L | Field Techniques in Geosciences | Geosciences | 6 | Semester | 156 |
| GEO02674L | Paleonthology | Geosciences | 6 | Semester | 156 |
| MAT00934L | Mathematics II | Mathematics | 6 | Semester | 162 |
| GEO02675L | Geological Cartography I | Geosciences | 6 | Semester | 156 |
| GEO02676L | Mineralogy | Geosciences | 6 | Semester | 156 |

**2nd Year - 3rd Semester**
**Branch Biology and Geology**

| Component code | Name | Scientific Area Field | ECTS | Duration | Hours |
|---|---|---|---|---|---|
| GEO02677L | Igneous Petrology | Geosciences | 6 | Semester | 156 |
| GEO02678L | Sedimentology | Geosciences | 6 | Semester | 156 |
| MAT00925L | Introduction to Probability and Statistics | Mathematics | 6 | Semester | 154 |
| GEO10081L | Structural Geology | Geosciences | 6 | Semester | 160 |
| BIO10917L | Cell Biology | Biological Sciences | 6 | Semester | 156 |

**2nd Year - 4th Semester**
**Branch Biology and Geology**

| Component code | Name | Scientific Area Field | ECTS | Duration | Hours |
|---|---|---|---|---|---|
| GEO02679L | Metamorphic Petrology | Geosciences | 6 | Semester | 156 |
| GEO00761L | Geochemical Systems | Geosciences | 6 | Semester | 156 |
| GEO02680L | Stratigraphy | Geosciences | 6 | Semester | 156 |
| BIO00408L | Microbiology | Biological Sciences | 6 | Semester | 156 |

**2nd Year - 4th Semester**
**Branch Biology and Geology**

| Component code | Name | Scientific Area Field | ECTS | Duration | Hours |
|---|---|---|---|---|---|
| BIO02681L | Invertebrate Biology | Biology | 6 | Semester | 156 |

**3rd Year - 5th Semester**
**Branch Biology and Geology**

| Component code | Name | Scientific Area Field | ECTS | Duration | Hours |
|---|---|---|---|---|---|
| GEO01448L | Geology of Portugal | Geosciences | 6 | Semester | 156 |
| GEO02682L | Mineral Resources | Geosciences | 6 | Semester | 156 |
| BIO02688L | Vertebrates Biology | Biology | 6 | Semester | 156 |
| BIO02689L | Plant Biology without Seeds | Biology | 6 | Semester | 156 |
| Group of Free Options | | | | | |

**3rd Year - 6th Semester**
**Branch Biology and Geology**

| Component code | Name | Scientific Area Field | ECTS | Duration | Hours |
|---|---|---|---|---|---|
| BIO02690L | Molecular Biology | Biology | 6 | Semester | 156 |
| BIO00301L | Human Biology | Biology | 6 | Semester | 156 |
| BIO02691L | Plant Biology with Seeds | Biology | 6 | Semester | 156 |
| GEO02687L | Seminar | Geosciences | 6 | Semester | 156 |

**Group of Options**

| Component code | Name | Scientific Area Field | ECTS | Duration | Hours |
|---|---|---|---|---|---|
| GEO02685L | Geodynamics and Tectonics | Geosciences | 6 | Semester | 156 |
| GEO00750L | Marine Geology | Geosciences | 6 | Semester | 156 |
| GEO01440L | Environment Geology and Regional Planning | Geosciences | 6 | Semester | 156 |

## Conditions for obtaining the Degree:

*** TRANSLATE ME: Geologia

Para obtenção do grau de licenciado em Geologia  Ramo em Geologia é necessário obter aprovação a 168 ECTS em unidades curriculares obrigatórias e 12 ECTS em unidades curriculares optativas, distribuídas da seguinte forma:

1º Ano

1º Semestre:

6 UC Obrigatórias num total de 30 ECTS

2º Semestre

5 UC Obrigatórias num total de 30 ECTS

2º Ano

3º Semestre

5 UC Obrigatórias num total de 30 ECTS

4º Semestre

5 UC Obrigatórias num total de 30 ECTS

3º Ano

5º Semestre

3 UC Obrigatórias num total de 18 ECTS

1 UC Optativa num total de 6 ECTS

1 UC Optativa livre num total de 6 ECTS

6º Semestre

5 UC Obrigatórias num total de 30 ECTS

Para obtenção do grau de licenciado em Geologia  Ramo em Biologia e Geologia é necessário obter aprovação a 162 ECTS em unidades curriculares obrigatórias e 18 ECTS em unidades curriculares optativas, distribuídas da seguinte forma:

1º Ano

1º Semestre:

6 UC Obrigatórias num total de 30 ECTS

2º Semestre

5 UC Obrigatórias num total de 30 ECTS

2º Ano

3º Semestre

5 UC Obrigatórias num total de 30 ECTS

4º Semestre

5 UC Obrigatórias num total de 30 ECTS

3º Ano

5º Semestre

4 UC Obrigatórias num total de 24 ECTS

1 UC Optativa livre num total de 6 ECTS

6º Semestre

4 UC Obrigatórias num total de 24 ECTS

1 UC Optativa num total de 6 ECTS ***

# Program Contents

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**General Physics (FIS02670L)**

Chapter 1. Physics as a science and Review of fundamental physics-mathematical concepts;
Chapter 2. Space and Time - motion of the particle
Chapter 3. Dynamics of particle;
Chapter 4. Work and Energy;
Chapter 5. Dynamic of particle system;
Chapter 6. Static;
Chapter 7. Deformation and elasticity;
Chapter 8. Fluids;
Chapter 9. Thermodynamics;
Chapter 10. Heat and Mass Transfer.

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**General Geology (GEO00749L)**

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**Mathematics I (MAT00933L)**

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**General Chemistry (QUI01090L)**

1. Constitution of matter
2. Periodic table
3. Chemical bonding
4. States of aggregation of matter
5. Solutions
6. Chemical thermodynamics
7. Chemical equilibrium
8. Equilibrium in heterogeneous systems
9. Ionic equilibria in homogeneous systems: acid-base
10. Electrochemistry
11. (Optional Chapter)

Chemistry of life
Chemical corrosion
Chemical kinetics

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**Introduction to Biology Studies (BIO02671L)**

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**Basic Ecology (PAO02672L)**

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**Field Techniques in Geosciences (GEO02673L)**

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**Paleonthology (GEO02674L)**

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**Mathematics II (MAT00934L)**

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**Geological Cartography I (GEO02675L)**

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**Mineralogy (GEO02676L)**

1. Introduction: History and evolution of Mineralogy.{\}newline
2. Concept of mineral: Mineral and crystal concepts. State types of matter.{\}newline
3. Elementary crystallography: 2-D Symmetry, 2-D plane lattices and plane groups. 3-D Symmetry, crystallographic systems, Bravais lattice and 3-D point groups. Introduction to 3-D space groups. Crystal morphology, Miller index and crystallographic form. Introduction to x-ray crystallography and crystal axes. Twinning.
4. Crystal-chemistry: Ionic radius, coordination number and polyhedron coordination.{\}newline
5. Physical properties of minerals: Color, luster, streak, habit, hardness, cleavage, fracture and magnetism.{\}newline
6. Crystal-optics: Optical properties of minerals in polarized light. Opaque, isotropic, uniaxial and biaxial anisotropic minerals.{\}newline
7. Systematic Mineralogy: Introduction to mineral systematic. Notions of class, family, group, specie and mineral series.
8. Non silicates systematic: Native elements, halides, sulfates, carbonates, phosphates, sulfides, oxides and hydroxides.

9.Silicates systematic: Nesosilicates, sorosilicates, cyclosilicates, single chain inosilicates, double chain inosilicates, phyllosilicates and tectosilicates.

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**Igneous Petrology (GEO02677L)**

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**Sedimentology (GEO02678L)**

· The Sedimentology in the framework of the Geology;
· The importance of the Sedimentology in the Geology, Environmental Sciences and the Industrial Exploration. Formation and systematic of the sediments and the sedimentary rocks;
· Study methods of the sediments and sedimentary rocks;
· Sedimentary structures
· Hydrodynamics and the sedimentation
· Sedimentary environments:
o Continental
§ Aeolian
§ Fluvial
§ Alluvial
§ Lacustrine
o Transitional
§ Estuarine
§ Deltaic

§ Lagoon
§ Coastal
o Marine
§ Carbonate platform
§ Siliciclastic platform
§ Pelagic sedimentation.
· Sedimentary cycles
· Diagenetic processes

Portuguese sedimentary basins through the geological time.

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**Introduction to Probability and Statistics (MAT00925L)**

Descriptive StatisticsBasic Probability NotionsConditional probabilities and independence Random Variables and VectorsMore important Discrete and Continuous distributionsStatistical Inference (parametric and non parametric)Linear Regression Analysis

Back

**Structural Geology (GEO10081L)**

Theoretical: 1 - Basic concepts of structural geology; 2 - Dynamic analysis; 3 - Kinematic analysis; 4 - Mechanical behavior of rocks, 5 - Descriptive Analysis and Classification: faults, folds, shear zones, joints and diaclases; 6 - Relationship between Structural Geology and tectonics.

Theoretical and Practical: 1. Using geometric and statistical stereographic projection in structural geology, 2. Structural interpretation of geological maps, including the identification, description and interpretation of structures at various scales, as well as understanding the processes that originate them.

Fieldwork: Study visits for consolidation of knowledge. Annually two days of field work are planned in places where the conditions of the various geological structures allow excellent observation and interpretation.

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**Pedology (GEO10079L)**

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**Engineering Geology (GEO00745L)**

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**Metamorphic Petrology (GEO02679L)**

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**Geochemical Systems (GEO00761L)**

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**Stratigraphy (GEO02680L)**

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**Hydrogeology (GEO00754L)**

Back
**Geomorphology (GEO02376L)**
INTRODUCTION: Geomorphology (structural, dynamic and climatic).
Main geomorphological features on Earth.
ROCK WEATHERING: Lithological, climatic and structural control.
FROM THE HYDROLOGICAL CYCLE TO THE FLUVIAL MODELING: Areolar versus linear erosion. Erosion and accumulation forms related with fluvial processes. Planation surfaces and river terraces.
SLOPE FORMS: From the slope evolution to its shape.
FROM COASTAL DYNAMICS TO COASTAL MODELING: Forms of coastal erosion and accumulation. Sea level variations and marine terraces.
GLACIAL EROSION SYSTEMS: Forms of modeling glacial and periglacial regions.
AEOLIAN EROSION: From wind environments to forms of wind accumulation and erosion.
STRUCTURAL RELIEF: The influence of lithology and geological structure.
PRACTICAL ACTIVITIES
Geomorphological interpretation of topographic maps: surface and profile analysis; planation surfaces characterization.
Introduction to photo interpretation and to MDT.

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**Applied Geophysics (FIS00708L)**

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**Mineral Resources (GEO02682L)**

Introduction to the geological resources: definitions; the geological context; their use;
Global economy of the geological resources;
The geology of the mineral resources in the broader context of the Earth sciences;
Mineral exploration: Geophysical methods; Geochemical methods;Geochemical anomalies;Primary halos;Secondary halos;
Energy resources: importance, types, production and consumption;
Metallic ores:Methods of study: fluid inclusions and stable isotopes.
Orthomagmatic ores;
Disseminated and stockwork deposits;
Skarns;
Vein ores;
Massive sulphides;
Sedimentary ores;
Portuguese examples;
Marine mineral resources:Abyssal plains; Continental platform.

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**Geology of Portugal (GEO01448L)**

Back

**SIGS in Geosciences (GEO02684L)**

GIS and the sciences.
Graphical representations; Projection Systems; Georeferencing; Scanning information.
. Computer georeferenced data.
. Symbols and Labels in GIS.
. Creation of Layouts.
. Scanning of points and lines.
. Creating and editing symbols.
. Layer Files type.
. Georeferencing.
. Digitizing polygons.
. Creating layouts.
. Information search the tools and basic SQL Databases.
. Rules for creating maps.
. Small GIS project.

NOTE: The theoretical and practical work will make use of practical examples ranging from applications to the study of the territory, the characterization of the terrain, geology and natural resources of a region.

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**Geodynamics and Tectonics (GEO02685L)**

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**Geological Cartography II (GEO02686L)**

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**Marine Geology (GEO00750L)**

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**Environment Geology and Regional Planning (GEO01440L)**

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**Seminar (GEO02687L)**

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**Cell Biology (BIO10917L)**

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**Microbiology (BIO00408L)**
Theoretical:
1. Historical context and Ubiquity
2. Diversity of the Microbial World
3. Microbial Growth and Death
4. Metabolism
5. Basics of Molecular Microbiology: Microbial genetics, Virology, Immunology
6. Microbes and disease; Normal flora, Pathology, infection and disease, Mechanisms of pathogenicity, Principles of epidemiology
7. Food microbiology: Hygiene and concept of indicator. Processing and storage of food. Foodborne diseases
8. Ecology and environmental microbiology: Soil and water, Biogeochemical cycles, Agricultural applications, Wastewater treatment, Biotechnology applications

Lab Practice:
Aseptic practice
Observation of bacteria, fungi and protists.
Demonstration of Ubiquity
Preparation and sterilization of culture media.
Isolation of pure culture.
Colonial and cellular morphology. Staining methods
Microbial counts
Environmental conditions for growth (pH, temp., O2)
Anaerobic Culture
Antibiograms
Microbial spreading simulation
Water and milk analises
Plant symbiosis.

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**Invertebrate Biology (BIO02681L)**

With the first six lectures aim to achieve the following objectives: (1) Set some basic terminology, (2) introduce some new concepts, (3) To present some of the subjects will develop over the course. In other classes, these issues continue to be present, but now, in a comparative inter-and intra fee. The laboratory practical classes and their sequence, follow the thematic development of the program of lectures, reinforcing and complementing the learning process on the morphology and functional anatomy of the major invertebrate taxa. The first eight practical lessons will be dedicated to the study of morphology and functional anatomy of: Protozoa, sponges, cnidarians, flatworms, pseudocoelomate (nematodes and rotifers), annelids and arthropods (Queliceriformes, Myriapoda and insects). In the remaining laboratory classes will be studied the: Arthropods (Crustaceans - barnacles and Decapods), molluscs (Gastropoda Prosobrânquios, bivalves and cephalopods) and Echinodermata.

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**Vertebrates Biology (BIO02688L)**

1. Levels of organization, morphological and functional characteristics, classification and general characteristics of the vertebrates.
2. Classification and phylogeny of the Agnatha.
3. Definition and classification of the Chondrichthyes.
4. Definition, classification, evolutionary history and diversity of the Osteichthyes.
5. Origin, classification and phylogeny of Amphibia.
6. Origin and Adaptive Radiation of Reptilian Groups.
7. Definition and classification of the birds.
8. Definition and classification of the mammals.

Back

**Plant Biology without Seeds (BIO02689L)**

1.The evolution in the plant kingdom - Diversity and characteristics of major groups. Understanding plant taxonomy.
2. Cyanophyta - blue-green algae.
3. Protists: Euglenophyta, Rhodophyta, Dinophyta, and Myxomycota Protista II: Chlorophyta, Bacillariophyta, Phaeophyta, and Chrysophyta Oomycota.
4. Fungi: Ascomycota, Basidiomycota, Zygomycota and Deuteromycota.
5. Colonization of Earth. Comparison between aquatic and terrestria.l
6. Antocerophyta, and Bryophyta Hepatophyta.
7. Evolution of Tracheophyta. Fossil records.
8. Psilotophyta, lycophyte, Sphenophyta and Pteridophyta.

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**Molecular Biology (BIO02690L)**

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**Human Biology (BIO00301L)**

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**Plant Biology with Seeds (BIO02691L)**

LECTURES: 1. Morphofunctional organization of the seed plant body; 2. Adaptations to different environments; 3. Taxonomy and evolution of seed plants; 4. Principles of phytogeography.
LAB: 1. Comparative study of seed plant adaptations; 2. Collecting, pressing, drying and mounting plant specimens; 3. Recognition of flowering plant families; 3. Application of methodologies and cases study.