Teaching Guide				
Identifying Data				2023/24
Subject (*)	Edaphology		Code	610G02045
Study programme	Grao en Bioloxía			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	2nd four-month period	Fourth	Optional	6
Language	English			
Teaching method	Face-to-face			
Prerequisites				
Department	Física e Ciencias da Terra			
Coordinador	Vidal Vázquez, Eva	E-mail	eva.vidal.vazquez@udc.es	
Lecturers	Lado Liñares, Marcos Vidal Vázquez, Eva	E-mail	marcos.lado@udc.es eva.vidal.vazquez@udc.es	
Web				
General description	The program of Soil Science focuses on: a) the study of the organic and mineral soil composition, b) soil physical and chemical and biological properties, c) ecological relevance of soil functions.			

Study programme competences / results	
Code	Study programme competences / results
A6	Catalogar, avaliar e xestionar recursos naturais.
A20	Muestrear, caracterizar e manexar poboacións e comunidades.
A21	Deseñar modelos de procesos biolóxicos.
A22	Describir, analizar, avaliar e planificar o medio físico.
A23	Avaliar o impacto ambiental. Diagnosticar e solucionar problemas ambientais.
A24	Xestionar, conservar e restaurar poboacións e ecosistemas.
A26	Deseñar experimentos, obter información e interpretar os resultados.
A27	Dirixir, redactar e executar proxectos en Bioloxía.
A28	Desenvolver e implantar sistemas de xestión relacionados coa Bioloxía.
A30	Manexar adecuadamente instrumentación científica.
A31	Desenvolverse con seguridade nun laboratorio.
A32	Desenvolverse con seguridade no traballo de campo.
B1	Aprender a aprender.
B2	Resolver problemas de forma efectiva.
B3	Aplicar un pensamento crítico, lóxico e creativo.
B6	Organizar e planificar o traballo.
B7	Comunicarse de maneira efectiva nunha contorna de traballo.
B8	Sintetizar a información.
B9	Formarse unha opinión propia.
B10	Exercer a crítica científica.
B11	Debater en público.
B12	Adaptarse a novas situacións.

Learning outcomes			
Learning outcomes	Study programme competences / results		
The scientific study of the soil is important for Biologists, mainly from an ecological perspective. Soil is essential in environmental studies and soil science contributes to understand important processes such as biogeochemical cycles, the structure ecosystems and factors from which primary production depends.	A21 A22 A30	B2	

Assessment of environmental impact taken into account soil diversity. Evaluation of soil contamination and techniques for soil restoration.	A6 A21 A26	B1 B3	
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The course of Soil Science is designed to provide an overview of the fundamental: Physical processes, Chemical processes, Fertility, Biology, and Land Use. Both theoretical and practical contents in Soil Science should contribute to enhance the skills of Biology students at the UDC in the use of several instrumental techniques.	A22 A24 A28 A30 A32	B11	
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Soils act as substrates for vegetal communities and also as adsorbent and absorbent for nutritive, and allow life of many animal and vegetal organisms. Therefore our program pays particular attention to the ?edaphosphere? as a complex dynamic and organised site, located in the interface between biosphere, lithosphere, hydrosphere and atmosphere. Soil is also the support of man-made spaces or sites influenced by man activity, such as urban-industrial areas and transport infrastructures.	A27 A30 A31	B8 B10	
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Because of the role of the soil for terrestrial ecosystems, Edaphology has a particular interest in Environmental Biology. The soil food chain describes a complex living system and how it interacts with the environment, plants, and animals. The nature of soil makes direct observation of food webs difficult. Soil microbial communities are characterized in many different ways. The activity of microbes can be measured by their respiration and carbon dioxide release. The cellular components of microbes can be extracted from soil and genetically profiled, or microbial biomass can be calculated by weighing the soil before and after fumigation.	A24 A28 A31	B1	
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Contents	
Topic	**Sub-topic**
I PRELIMINARY CONCEPTS Lesson 1.- History of Soil Science.	Origin and development of Soils Science. Main topics in Soil Science.
Lesson 2.- Soil descripton in field conditions. Laboratory techniques for soil studies.	Profile and horizons. Physical, Chemical and Bioñogical methods of soil analysis.
II SOIL COMPOSITION Lesson 3.- Soil mineral composition. Soil clays.	Soil texture. Specific surface. Soil mineralogy. Soil clays. Structure and properties of most common soil clays. Oxyhydroxides.
Lesson 4.- Soil organic matter.	Soil organic compounds. Humus. Organo-mineral associations. Organic matter and ecosystems: biogeochemical cycles.

III SOIL PROPERTIES Lesson 5.- Soil physical properties and soil structure. Lesson 6.- Soil water retention and water dynamics. Lesson 7.- Soil temperature and aeration. Lesson 8.- Soil pH and cation exchange capacity. Lesson 9.- Soil biology. Lesson 10. Soil fertility	Bulk density and solid density. Soil porosity. Pore-size distribution. Aggregate dynamics in soils. Structural stability. Soil moisture content and soil potential. Soil water measurement. Soil moisture characteristic curve. Soil water retention and soil water dynamics. Soil water and water requirements of vegetation. Soil thermal properties. Soil temperature management. Composition of the soil atmosphere. Soil and gases of greenhouse effect. Soil pH and soil acidity. Soil acidity effects. Acidity amendment. Exchange complex of soils. Cation exchange capacity. Soil organisms. Soil enzymatic activity. Nucleic acids in soil. Soil organism and soil properties as indicators of soil quality. Macronutrients and micronutrients. Nitrogen , phosphorus and potassium cycles. Calcium and magnesium. Iron, cupper, zinc, boron and molybdenum. Other oligoelements
IV FACTORS AND PROCESSES OF SOIL FORMATION Lesson 11.- Factors of soil formation. Lesson 12.- Processes of soil formation.	Parent material. Climate. Topography. Times Vegetations and organisms. Anthropogenic factors. Soil profile differentiation. Clay accumulation. Podzolization. Salinization. Calcification. Hydromorphic processes. Ferralitic alteration.
V SOIL SYSTEMATICS AND CLASSIFICATION Lesson 13.- Soil Systematics. Lesson 14.- Introduction to Soil Taxonomy. Lesson 15.- World Reference Base for Soil Resources. Lesson 16.- Spanish and Galician Soils.	Genesic and diagnostic horizons. Soil profile. Horizon nomenclature. Modern Soil Classifications. Soil Taxonomy. World Reference Base for Soil Resources. Characteristics for soil diagnosis. Moisture and temperature regimes. Oreders, suborders, great groups, subgroups, families, and series. Organic soil. Soil with anthropic influences. Soils conditioned by topography and by time. Soils conditioned by cold, temperate, steppe, arid or semiarid and tropical or subtropical climates. Soil under Atlantic climate. Soils under Mediterranean climate. Galician soils: parent material, climate, topography and vegetation effects.
VI APPLIED SOIL SCIENCE Lesson 17.- Applications of Soil Science.	Soil cartography. Interactions soil-landscape. Soil functions and society. Soil and environment. Soil contamination. Recovery of contaminated soils. Soil Use and Management.

PRACTICAL ACTIVITIES Laboratory work Field studies	Textural analysis Bulk density and solid density, porosity Aggregate stability Soil pH Organic carbon Cation exchange capacity Soil extractable phosphorus Biological activity Case studies: Umbrisols, Cambisols, Fluvisols, and Gleysols

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A6 A21 A22 A23 A24 A27 A28 A31 B2 B7 B8 B9 B11	21	40	61
Field trip	A20 A23 A32 B3 B6	4	10	14
Problem solving	A26 B1 B2 B3 B8 B11	7	16	23
Laboratory practice	A6 A20 A21 A30 B8 B10 B12	14	28	42
Personalized attention		10	0	10
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	Description
Guest lecture / keynote speech	The contents of soil science will be developed. The used audiovisual materials will be provided to students.
Field trip	The main soil types in Galicia will be observed.
Problem solving	In the classroom, problem-solving sessions will be carried out with real soil data. Review of different techniques applicable to the study of soils.
Laboratory practice	Asessement of main physical, chemical and biological properties of soils

Personalized attention	
Methodologies	Description
Laboratory practice Field trip Problem solving	Personalized attention will be provided by individual meetings in dates previously selected.

Assessment			
Methodologies	Competencies / Results	Description	Qualification
Laboratory practice	A6 A20 A21 A30 B8 B10 B12	Continuous assessment and practical work.	15
Field trip	A20 A23 A32 B3 B6	Assessment of field activities and reports of filed work.	5
Guest lecture / keynote speech	A6 A21 A22 A23 A24 A27 A28 A31 B2 B7 B8 B9 B11	Short questions and tests about the keynote speech. Final examination and also partial examinations, if requested.	65
Problem solving	A26 B1 B2 B3 B8 B11	Attendance at small group classes is positively valued, as well as the delivery of newsletters/activities requested by the teachers.	15

Assessment comments
Soil Science global grade can be assessed by continuous evaluation following the Bologna criteria. Evaluations may be performed not only in English, but also in Galician or Spanish, if requested by the students.

Sources of information	
Basic	LAL, R. 2002. Encyclopedia of Soil Science. Marcel Dekker.PORTACASANELLAS, J. LÓPEZ AVEVEDO, M y ROQUERO, C. 2003. Edafología para la agricultura y el medio ambiente. Ediciones Mundi-Prensa.960 pp.PORTACASANELLAS, J. LÓPEZ AVEVEDO, M y POCH, R.M. 2008. Introducción a la Edafología: uso y protección del suelo. Ediciones Mundi-Prensa. 451 pp. WRB. 2006. World Referente Base for Soil Resources. Wageningen/Roma.
Complementary	Recursos web:www.iuss.orgwww.edafologia.ugr.eswww.soilerosion.netRecursos web:www.iuss.orgwww.edafologia.ugr.eswww.soilerosion.net

Recommendations
Subjects that it is recommended to have taken before
Geology/610G02004 Physical Geography/610G02006
Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus
Other comments
Gender perspectiveAs stated in the transversal skills of the degree (C4), the development of a critical, open and respectful citizenship with diversity in our society will be encouraged, emphasizing the equal rights of students without discrimination based on gender or sexual status. An inclusive language will be used in the material and in the development of the sessions. Work will be done to identify and modify prejudices and sexist attitudes and influence the environment to modify them and promote values of respect and equality.