

28904 - Geology, soil science and climatology

Información del Plan Docente

Academic Year	2016/17
Academic center	201 - Escuela Politécnica Superior
Degree	437 - Degree in Rural and Agri-Food Engineering
ECTS	6.0
Course	1
Period	Half-yearly
Subject Type	Basic Education
Module	---

1. Basic info

1.1. Recommendations to take this course

1.2. Activities and key dates for the course

2. Initiation

2.1. Learning outcomes that define the subject

2.2. Introduction

3. Context and competences

3.1. Goals

3.2. Context and meaning of the subject in the degree

3.3. Competences

3.4. Importance of learning outcomes

4. Evaluation

5. Activities and resources

5.1. General methodological presentation

Learning methodology is based on a close relationship between the teachers and students. The teacher will explain the basic principles of geology and edaphology taking into account the level of students participation in the lecture. When participation is lower than required, the teacher will encourage it asking the students.

28904 - Geology, soil science and climatology

5.2.Learning activities

Learning activities are divided into the following ones:

1. Theoretical lectures. The teacher will explain the basics of geology, edaphology and climatology.
2. Practical sessions related with the theoretical lectures and with the aim of consolidate the explained content.
3. Fieldwork in the surroundings of Huesca to put into practice the acquired knowledge to solve case studies.
4. Own working reports and learning
5. Cooperative learning by the development of a group report.

5.3.Program

The subject is divided into two clearly thematic blocks: (1) Geology and (2) Edaphology/Climatology. The subject programme follows this division.

THEORETICAL PROGRAMME

Geology

UNIT I. - INTRODUCTION

1. The Earth sciences.
2. The importance of geology to Food and Agricultural Engineering.
3. Geology as a science.
4. Stratigraphy (strata, fossils, evolution, historical geology).
5. Geological time.

28904 - Geology, soil science and climatology

UNIT 2. - INTERNAL GEODYNAMICS AND PLATE TECTONICS

1. Geochemical structure and the composition of the Earth.
2. Plate tectonics.
3. Deformation of the crust: folds, faults, joints.

UNIT 3. - MINERALOGY.

1. Concepts of mineral and crystal.
2. Properties of minerals.
3. Classification of minerals.
4. Descriptive mineralogy.

UNIT 4. - PETROLOGY.

1. Concept of rock. Processes of rock formation.
2. Igneous rocks. Bowen's series. The most important igneous rocks.
3. Metamorphic rock. Metamorphic facies The most important metamorphic rocks.
4. Sedimentary rocks and their classification. The most important sedimentary rocks.

UNIT 5. - HYDROGEOLOGY

1. The water cycle.
2. Surface waters.
3. Underground waters.
4. Aquifers, Types. Hydraulic Conductivity. Transmissivity.
5. Darcy's law.
6. Water extraction methods.

Edaphology

UNIT 1. - Introduction to Edaphology

1. The soil: concept and definition
2. Components of the soil
3. Factors of formation
4. Concern of the study of the soil
5. Edaphology as a science

UNIT 2. - The soil profile

1. Basic concepts: profile, horizon, pedión , polipedión
2. The pedion and the genetic horizons
3. Nomenclature of the genetic horizons.

UNIT 3. - Mineral components of the soil

1. The mineral fraction
2. Minerals of the soil
3. Silicated minerals
 1. Phyllosilicates: the clays
4. Non-silicated minerals
5. Stability of the minerals in the soil
 1. Factors which affect stability
6. Origin of the minerals
7. Granulometric fractions

28904 - Geology, soil science and climatology

UNIT 4. - ORGANIC COMPONENTS OF THE SOIL

1. The organic matter of the soil: components
2. Organic content of the soil
3. Evolution of the organic matter in the soil
4. Properties of the organic matter in the soil
5. Humic substances
6. Types of humus
7. Organ-mineral compounds

UNIT 5. - PHYSICAL PROPERTIES OF THE SOIL

1. Texture
2. Structure
3. Porosity
4. Density
5. Consistency
6. Colour
7. Depth of soil
8. Water retention capacity
9. Movement of water in the soil

UNIT 6. - SOIL CHEMICAL PROPRIETIES

1. Soil chemistry
2. Ion exchange capacity

28904 - Geology, soil science and climatology

3. Ions in soil solution. Base saturation theory

4. Soil reaction

Climatology

UNIT 1. - Fundamentals of climatology

1. The Earth in space
2. Reception and emission of radiant energy
3. Distribution of the energy
4. The atmosphere

PRACTICAL PROGRAMME

Geology practicals

Practical 1. - Visual recognition of minerals.

Practical 2. - Visual recognition of igneous, sedimentary and metamorphic rocks.

Practical 3. - Geological mapping. Dip and strike. Thickness.

Practical 4-8. - Development of geological cross-sections in horizontal, dipping and folded strata.

Edaphology Practicals

Practical 1: Taking field samples.

Practical 2: Sample preparation. Sieved, calculation of fine and thick fractions.

Practical 3: Effects of the structure of the soil.

Practical 4: Soli colour.

28904 - Geology, soil science and climatology

Practical 5: Soil texture

Practical 6: Soil chemical test on structural stability

Practical 7-8: Open laboratory for group work in the examination and determination of soil core samples

Climatology Practical

- Practical 1: Consequences of atmospheric dynamics, information and prediction.

FIELDWORK

During the first or second week of December, it is compulsory to attend to a full-day fieldtrip in the surroundings of Huesca. The final date of fieldtrip will be communicated to the students during the theoretical lectures and in the digital Moodle Platform. The first part deals with hydrogeological problems that may arise on farming activities while the second part is focused on the identification, description and classification of soils.

ONLINE COURSE

During October, the student is asked to carry out a Bibliography search online course in collaboration with the library staff.

GROUP REPORT

The students in groups of two/three people must study a soil cut, describing its main properties and identifying horizons.

5.4.Planning and scheduling

Activity / Week	1	2	3	4	5	6	7	8	9	10	11
Classroom teaching											
Lectures	2	2	2	2	2	2	2	2	2	2	2
Practical sessions				2	2	2				2	2
Laboratory		2	2					2	2		

28904 - Geology, soil science and climatology

sessions												
Group work												
Tutorials												
Evaluation											4	
Own-Working activities												
Individual working					4	4	4	4	4	4	4	3
Group report											2	2
TOTAL	2	4	4	4	8	8	6	8	8	14	9	

Activity/Week	12	13	14	15	16	17	18	19	20	Total
Classroom teaching										60
Lectures	2	2			2	2				30
Practical sessions	2									12
Laboratory sessions										8
Group work										0
Tutorials										0
Evaluation		2					4			10
Own-working activities										90
Individual working	3	4	8	8	4	4	4	8		70
Group report	2	4	4	4	2					20
TOTAL	9	12	12	12	8	6	8	8		150

5.5. Bibliography and recommended resources

Basic Bibliography

- Tarbuck, Edward J.. Ciencias de la tierra : una introducción a la geología física / Edward J. Tarbuck, Frederick K. Lutgens ; ilustrado por, Dennis Tasa; traducción AMR Traducciones científicas; revisión técnica y adaptación, Manuel Pozo Rodríguez, José Manuel González Casado . 8ª ed. Madrid : Prentice Hall, D.L. 2005
- Understanding earth / Frank Press ... [et al.] . 4th ed New York : W.H. Freeman, [2003]
- Wicander, Reed. Fundamentos de geología / Reed Wicander & James S. Monroe ; [traducción, Enrique Palos ; revisión técnica, Javier Arellano Gil] . 2a. ed. México [etc.] : International Thomson Editores, 2000
- Brady, Nyle C.. Elements of the nature and properties of soils / Nyle C. Brady, Ray R. Weil . 3rd ed. Upper Saddle River, NJ : Prentice Hall, cop. 2010
- Porta Casanellas, Jaime. Introducción a la edafología : uso y protección del suelo / Jaume Porta Casanellas, Marta López-Acevedo Reguerín, Rosa M. Poch Claret Madrid, [etc.] : Mundi-Prensa, 2008
- Breemen, Nico van.. Soil formation / by Nico van Breemen and Peter Buurman. . 2nd ed. Dordrecht ; London : Kluwer Academic, cop. 2002.

28904 - Geology, soil science and climatology

Complementary Bibliography

- Pedraza Gilsanz, Javier de. Geomorfología : principios, métodos y aplicaciones / Javier de Pedraza Gilsanz ; colaboradores Rosa María Carrasco González...[et al.] . Alcorcón, Madrid : Rueda, D.L. 1996
- Duchaufour, Philippe. Atlas ecológico de los suelos del mundo / por Philippe Duchaufour ; con la colaboración de Pierre Faivre, Michel Gury ; versión castellana de Ma. Tarsy Carballas Fernández. Barcelona : Toray-Masson, 1977
- Gutiérrez Elorza, Mateo. Geomorfología climática / Mateo Gutiérrez Elorza . Barcelona : Omega, 2001
- Pedraza Gilsanz, Javier de. Geomorfología : principios, métodos y aplicaciones / Javier de Pedraza Gilsanz ; colaboradores Rosa María Carrasco González...[et al.] . Alcorcón, Madrid : Rueda, D.L. 1996
- Anguita Virella, Francisco. Origen e historia de la Tierra / Francisco Anguita Virella . Alcorcón, Madrid : Rueda, D.L. 1988
- Anguita Virella, Francisco. Biografía de la tierra : historia de un planeta singular / Francisco Anguita . 1a. ed. Madrid : Aguilar, 2002
- Bloom, Arthur L.. La superficie de la tierra / Arthur L. Bloom ; [traducido por Juan Carlos M. Turner] . [2a. ed.] Barcelona : Omega, D.L. 1981
- Aubert, Georges. La edafología : el suelo en el que vivimos / Georges Aubert, Jean Boulaine . Barcelona : Orbis, D.L.1986
- Duchaufour, Philippe. Edafología. Vol.1, Edafogénesis y clasificación / por Philippe Duchaufour; versión española de los doctores M^a Tarsy Carballas Fernández y Modesto Carballas Fernández . Barcelona : Masson, 1984
- Duchaufour, Philippe. Manual de edafología / por Philippe Duchaufour ; versión española de los doctores Ma. Tarsy Carballas Fernández y Modesto Carballas Fernández . Barcelona [etc.] : Masson, 1987
- FitzPatrick, E. A.. Suelos : su formación, clasificación y distribución / E.A. FitzPatrick ; [traducido por Antonio Marino Ambrosio] . [1a. ed., 3a. reimp.] México : Compañía Editorial Continental, 1987
- López Ritas, Julio. El diagnóstico de suelos y plantas : (métodos de campo y laboratorio) / por Julio López Ritas y Julio López Melida. 4^a ed., rev. y amp. Madrid : Mundi-Prensa, 1990
- Cobertera Laguna, Eugenio. Edafología aplicada : Suelos, producción agraria, planificación territorial e impactos ambientales / Eugenio Cobertera Laguna . Madrid : Cátedra, 1993
- Ferreras Chasco, Casildo. Biogeografía y edafogeografía / C. Ferreras Chasco, C. Fidalgo Hijano . [3^a reimp.] Madrid : Síntesis, D.L. 1991 (reimp. 2009)
- Kononova, M. M.. Materia orgánica del suelo : su naturaleza, propiedades y métodos de investigación / M. M. Kononova ; [traducción castellana de Enriqueta Bordas de Muntan] . Barcelona : Oikos-Tau, D.L. 1981
- Kubiëna, Walter L.. Claves sistemáticas de suelos : diagnóstico y sistemática ilustrados de los suelos más importantes de Europa con sus sinónimos más usuales / por W. L. Kubiëna ; traducido al español por Ángel Hoyos de Castro . Madrid : Consejo Superior de Investigaciones Científicas, 1952
- Dingus, Del. Introductory soil science : laboratory manual / Del Dingus . Upper Saddle River : Prentice Hall, cop. 1999
- Rice, Roger John. Fundamentos de geomorfología / R.J. Rice ; [traducido por Guillermo Meléndez Hevia, María Pilar Villar Saldaña ; revisado por Mateo Gutierrez Elorza] . Madrid : Paraninfo, 1983
- Robinson, Gilbert Wooding. Los suelos : su origen, constitución y clasificación, introducción a la edafología / Gilbert Wooding Robinson ; traducción de la tercera edición inglesa por José Luis Amorós . 2^a ed. Barcelona : Omega, 1967
- Seibold, Eugen. The sea floor : an introduction to marine geology / E. Seibold, W.H. Berger. . 3rd edition. Berlin [etc.] : Springer-Verlag, cop. 1996
- Selby, M.J.. Earth's changing surface : an introduction to geomorphology / M.J. Selby . Oxford : Clarendon Press, 1985
- Buckman, Harry O.. Naturaleza y propiedades de los suelos : texto de edafología para enseñanza / Harry O. Buckman y Nyle c. Brady ; traduccido por R. Salord Barceló ; texto revisado por José M^a Vives de Quadras . Barcelona [etc.] : UTEHA, D.L. 1965
- Soil genesis and classification / S.W. Buol ... [et al.] . 5th. ed. Ames, Iowa : Iowa State Press, 2003
- Tan, K.H. (2009). Environmental soil science. Boca Raton: CRC Press
- Kohnke, H. (1995). Soil science simplified. Illinois: Waveland Press
- Porta Casanellas, Jaime. Edafología para la agricultura y el medio ambiente / Jaime Porta Casanellas, Marta López-Acevedo Reguerín, Carlos Roquero de Laburu . - 3^a ed., rev. y amp. Madrid [etc.] : Mundi-Prensa, 2003
- Strahler, Arthur N.. Geografía física / Arthur n. Strahler, Alan H. Strahler ; [trad. por Marta Barrutia y Pere Sunyer] . - 3^a ed., 4^a reimp. Barcelona : Omega, cop. 1989 (reimp. 2005)
- Palmer, Robert G.. Introductory soil science : laboratory manual / Robert G. Palmer, Frederick R. Troeh . 3rd ed.

28904 - Geology, soil science and climatology

New York [etc.] : Oxford University Press, 1995

- Porta Casanellas, Jaime. Agenda de campo de suelos : información de suelos para la agricultura y el medio ambiente / Jaime Porta Casanellas, Marta López-Acevedo Reguerín . Madrid : Mundi-Prensa, 2005
- Brady, Nyle C.. The Nature and properties of soils / Nyle C. Brady, Ray R. Weil . Rev. 14th ed. Upper Saddle River, N.J. : Pearson/Prentice Hall, cop. 2008