25218 - Soil degradation and pollution

Información del Plan Docente

Academic Year	2017/18
Faculty / School	201 - Escuela Politécnica Superior
Degree	277 - Degree in Environmental Sciences 571 - Degree in Environmental Sciences
ECTS	6.0
Year	2
Semester	Second Four-month period
Subject Type	Compulsory
Module	---

1.General information

1.1.Introduction

1.2.Recommendations to take this course

This subject is offered in the English Friendly form

1.3.Context and importance of this course in the degree

1.4.Activities and key dates

2.Learning goals

2.1.Learning goals

2.2.Importance of learning goals

3.Aims of the course and competences

3.1.Aims of the course

3.2.Competences

4.Assessment (1st and 2nd call)

4.1.Assessment tasks (description of tasks, marking system and assessment criteria)

5.Methodology, learning tasks, syllabus and resources

5.1.Methodological overview

The preferred methodology in the theoretical and practical classes will be affirmative, combining an expositive and a demonstrative method. The expositive method, which is characterized by the communication of concepts, will be used when students do not have prior knowledge that allow participatory debate, or in the case of concepts or relationships

requiring a formal precision. The demonstrative method is marked by demonstrating a task or a procedure, and will be used in practice tasks.

For the students, it is recommended as learning methods the interrogative method, by asking the teacher or trying to find answers to his questions, and the active method, becoming the agent of his own formation through personal research, direct contact with reality and experience with the working group in which he is incorporated.

5.2.Learning tasks

1. Theoretical sessions. Expositive and participatory lectures that will be followed by exercises and discussion topics.

2. Seminars and laboratory practices. Demonstrative and interrogative activities essentially aimed to dominate laboratory and field procedures.

3. Field task. Field work carried out during the second half of the course, and focused to the consolidation and expansion of concepts.

4. Non contact activities. Study and application of the topics covered by the schedule, preparation of practices' reports, conduct of a group work, preparation of exams...

5.3.Syllabus

Theory programme

Block 1. Introduction

1. Types of soil degradation (physical, chemical and biological) and its effects on ecosistemic services. Diagnostic properties of soil vulnerability and auto-depuration. Legal regulation on soil protection, pollution and remediation.

Block 2. Soil degradation processes

2. Water erosion. Rainfall erosivity and soil erodibility. Methods of study of water erosion. Available techniques of erosion prevention and control.

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3. Degradation of the soil structure by compaction and surface crusting. Prevention methods. Correction technologies. Prime farmlands and soil sealing.

4. Management of organic matter and carbon sequestration. Recycling of organic waste through agricultural soils and Tecnosols. Carbon stock and transfer. Technical options for carbon sequestration in soil.

5. Contamination by over-fertilization and agrochemicals. Dynamics of nutrients in the soil. Good practices in relation to nitrogen and phosphate fertilization. Characteristics of agrochemicals: persistence and evolution in the soil. Factors and mechanisms of degradation.

6. Contamination by heavy metals. Definition, origin, dynamics in soil, especiation, factors controlling presence and bioavailability. Generic reference values and their interpretation. Legal regulation of heavy metals in soils. Phytoremediation.

7. Organic pollutants. Characteristics and properties. Evolution in soils, processes, types and origin.

8. Rehabilitation or sanitation of contaminated soils. Planning and treatments: 1) physical, chemical and biological; 2) "in situ", "on site" and "off site" treatments. Monitoring of rehabilitation: Ecotoxicology, key concentrations (PNEC and PEC).

Block 3. Soil restoration. Case studies in Aragon

9. Restoration, rehabilitation and reclamation. Fundamentals and main goals. Basic methodological aspects. Spatial and temporal planning. Soil quality indicators.

10. Erosion of badlands in marls. Properties and management of soils developed on marls. Bioengineering applied to the control of erosion.

11. Soils affected by wildland fires. Effects of fire on soil properties. Evolution of plant cover after fire. Soil erosion control and plant recovery techniques.

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12. Soils affected by opencast mining. Technosols. Impacts, factors limiting reclamation. Restoration programme.

13. Saline soils. Effects of salts and sodium on plants and soils. Management of saline and sodic soils. Restoration of agricultural saline soils.

14. Conservation agriculture: characteristics, advantages and problems regarding traditional agriculture, evolution and current status. Conservation agriculture vs. traditional agriculture in Spain. Cultivation of olive and vineyard with plant covers.

15. Soils affected by pesticides. The case of lindane. Origin, redistribution and accumulation. Treatment and remediation.

Practice tasks programme

1. Scientific documentation (with the collaboration of the School library)
2. Effect of soil physical attributes on seed germination and growth.
3. Microbial reduction of soils.
4. Soil organic matter mineralization in aerobic conditions.
5. Soil pH regulation and management.
6. Structural stability of soil aggregates.
7. Soil erodibility (rainfall simulation).
8. Soil salinity.
9. Transport of fluid pollutants through soil.
10. Field trip. Soil conservation and degradation processes in Aragón.

5.4.Course planning and calendar

It is estimated that an average student should devote to this subject, 6 ECTS, a total of 150 hours. This time must include both classroom and non-attendance activities. The student must ensure that the dedication is distributed evenly throughout the quarter.

The basic pattern for classroom and laboratory activities is composed by four weekly hours. Nevertheless, this pattern should be modified by non school days, field trips or by other academic activities. These changes will be announced in classroom and also through the moodle e-learning campus.

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Type of activity / Week	1 5-11 feb	2 12-18 feb	3 19-25 feb	4 26 feb-4 mar	5 5-11 mar	6 12-18 mar	7 19-25 mar	8 26 mar-1 abr	9 2-8 abr	10 9-15 abr	11 16 abr*	12 23-29 abr	13 30 abr-6 may	14 7-13 may	15 14-20 may	16 21-27 may	17 28 may-3 jun	18 4-10 jun	19 11-17 jun	20 18-24 jun	21 25 jun-1 jul	Total
	Comienzo 2º sem 7 (mie)							Festivo UZ 28 mar (lun) Vacabr SS (dom) Comienzo 29 mar (jue)	Fin vac SS (mie)			Festivo 23 (lun)	No lectivo 30 abr (lun) (Festivo 1 (mar)				Fin periodo clases: 30 may (mie) Comienzo exam 1 jun (vie)				Fin exam 29 jun (vie)	
Onsite activity																						60
Theory	2	2	2	2	2	2	2	1		2	2	1	1	2	2	2	2					28
Problem-solving				2									1	2								5
Laboratory practice	2	2			2	2				2	2	2	1									15
Group working																						0
Field trip															5							5
Face-to-face tutorial					1											1						2
Assessment																1			4			5
Off-site activities																						90
Individual working	4	4	4	4	5	4	4	7	6	4	4	3	5	3	1	4	6	8	4			87
Group working												2		1								3
TOTAL	8	8	8	8	8	8	8	8	6	8	8	8	8	8	8	8	8	8	8			150

5.5.Bibliography and recommended resources

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BB 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

BB Palmer, Robert G.. Introductory soil science : laboratory manual / Robert G. Palmer, Frederick R. Troeh . - 3rd ed. New York [etc.] : Oxford University Press, 1995

BB Porta Casanellas, Jaime. Edafología para la agricultura y el medio ambiente / Jaime Porta Casanellas, Marta López-Acevedo Reguerín, Carlos Roquero de Laburu . 3ª

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	ed., rev. y amp. Madrid [etc.] : Mundi-Prensa, 2003
BC	Agassi, M. (1996). Soil erosion, conservation and rehabilitation. New York: Marcel Dekker
BC	Aubert, Georges. La edafología : el suelo en el que vivimos / Georges Aubert, Jean Boulaine . Barcelona : Orbis, D.L.1986
BC	Breemen, Nico van.. Soil formation / by Nico van Breemen and Peter Buurman. . 2nd ed. Dordrecht ; London : Kluwer Academic, cop. 2002
BC	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 Mª Vives de Quadras . Barcelona [etc.] : UTEHA, D.L. 1965
BC	Cobertera Laguna, Eugenio. Edafología aplicada : Suelos, producción agraria, planificación territorial e impactos ambientales / Eugenio Cobertera Laguna . Madrid : Cátedra, 1993
BC	Dingus, Del. Introductory soil science : laboratory manual / Del Dingus . Upper Saddle River : Prentice Hall, cop. 1999
BC	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
BC	Duchaufour, Philippe. Edafología. Vol.1, Edafogénesis y clasificación / por Philippe Duchaufour; versión española de los doctores Mª Tarsy Carballas Fernández y Modesto Carballas Fernández . Barcelona : Masson, 1984
BC	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
BC	Ferreras Chasco, Casildo. Biogeografía y edafogeografía / C. Ferreras Chasco, C. Fidalgo Hijano . [3ª reimp.] Madrid : Sintesis, D.L. 1991 (reimp. 2009)
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BC	Gómez Orea, Domingo. Recuperación de espacios degradados / Domingo Gómez Orea . Madrid : Ediciones Mundi-prensa,

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2004

BC Honorato, R. (2000). Manual de edafología. Mexico: Alfaomega

BC Kohnke , H., Franzmeier, D.P. (1995). Soil science simplified. Waveland Press

BC 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

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BC Lal, R., Blum, W.E.H. (1998). Methods for Assessment of Soil Degradation (Advances in Soil Science). New York: CRC Press

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LISTADO DE URLs:

Assessing soil contamination. A reference manual
[http://www.fao.org/docrep/003/x2570e/X2570E00.HTM]
Clave para las Unidades de suelos de la FAO (1974)
[http://www.fao.org/soils-portal/levantamiento-de-suelos/clasificacion-de-suelos/le
Fotografías de perfiles de suelos
[http://jorgemataix.carbonmade.com/projects/47854#1]
International Union of Soil Sciences, IUSS
[http://www.iuss.org/]
Página de la USDA para usar y aprender su taxonomía (inglés)
[http://soils.usda.gov/]
Páginas de la Universidad de Granada con conceptos muy claros y sencillos y buenas fotos que los ejemplifican y aclaran
[http://edafologia.ugr.es/index.htm]
Sabroso, M.C., Pastor, A. (2004). Guía sobre suelos contaminados. Zaragoza: Gobierno de Aragón
[http://www.conectapyme.com/files/medio/guia_suelos_contaminados.pdf]
Se explican e ilustran suelos difíciles de encontrar en nuestro entorno
[http://www.eweb.unex.es/eweb/edafo/]
Sociedad Española de la Ciencia del Suelo
[http://www.secs.com.es/]
World Soil Information
[http://www.isric.org/]

The updated recommended bibliography can be consulted in:
http://psfunizar7.unizar.es/br13/egAsignaturas.php?id=10976