SUBJECT GUIDE

TECHNIQUES OF EVALUATION, MANAGEMENT, SOIL CONSERVATION AND RECOVERY

Academic year 2016/2017

(Approved at the Department Council on June 24, 2016)

MODULE	CONTENT	YEAR	TERM	CREDITS	TYPE
ENVIRONMENTAL TECHNOLOGY		3º	1º	6	Obligatory

LECTURER(S)	Postal address, telephone nº, e-mail address
Francisco José Martín Peinado Tel.: +34 958 241000 ext:20058; e-mail: fjmartin@ugr.es Manuel Sierra Aragon Tel.: +34 958 241734; e-mail: msierra@ugr.es	Dpto. Edafología y Química Agrícola, Facultad de Ciencias, Campus Fuentenueva s/n, 18002 **TUTORING SCHEDULE** F.J. Martín: J y V de 12 a 14h; J de 17 a 19h. M. Sierra: L, M y X de 10 a 12h.
DEGREE WITHIN WHICH THE SUBJECT IS TAUGHT	**OTHER DEGREES WHICH COULD BE OFFERED**
Degree in Environmental Sciences	

PREREQUISITES and/or RECOMMENDATIONS (if necessary)

- To have taken the subject of Edafología included in the Basic Content Module.

BRIEF ACCOUNT OF THE SUBJECT PROGRAMME (ACCORDING TO THE DEGREE REQUIREMENTS)

- Basic Principles of Soil Evaluation.
- Knowledge of soil erosion processes, factors affecting them, quantification systems and control mechanisms.
- Study of the types of pollutants and their behavior in soils; remediation mechanism for contaminated soils.
- Soil management and conservation principles and techniques.

GENERAL AND PARTICULAR ABILITIES

General

- CT1. Understand the scientific method. Ability to analyze, synthesize and solve problems.
- CT2. Critical thinking and autonomous learning.
- CT4. Ability to organize and planning.
- CT5. Oral and written communication.
- CT6. Ability to manage information.
- CT7. Teamwork.

Particular

- CE16. Knowledge and assessment of data sources and techniques for territorial analysis for sustainability.
- CE17. Integrated understanding of natural and anthropic environments.
- CE23. Ability to assess soil contamination and to apply contaminated soil treatment techniques.
- CE24. Dominion of the principles and techniques of restoration and rehabilitation of the natural environment.
- CE32. Planning, management, use and conservation of natural resources and biodiversity.
- CE35. Planning and integrated land management.

OBJECTIVES (EXPRESSED IN TERMS OF EXPECTED RESULTS OF THE TEACHING PROGRAMME)

- Capacity for soil evaluation through the application of general and specific methods.
- Knowledge of methods for quantification of soil erosion and control techniques.
- Cartographic representation of the results of the application of evaluation methods and soil erosion.
- Ability to identify contaminated soils; knowledge of analytical techniques and behavior of pollutants in soil; knowledge of contaminated soil remediation techniques.

DETAILED SUBJECT SYLLABUS

THEORETICAL TOPICS:

- **Topic 1. Soil degradation.** General introduction. Types of degradations. Consequences in the soil. Evaluation of degradation. Importance and current status of soil degradation.
- **Topic 2. Soil evaluation.** Introduction and general principles. Evaluation parameters. Evaluation systems. General evaluation of soils.
- **Topic 3. Evaluation systems of categorical use capacities.** Agrological classes USDA. Soil Fertility Capability Classification (FCC).
- **Topic 4. Parametric evaluation systems for soil use capacities.** Storie Index. Riquier system.
- **Topic 5. Soil evaluation.** Evaluations for specific purposes. FAO Evaluation Scheme. Evaluation for irrigation USBR..
- **Topic 6. Water Erosion:** Concepts, importance, causes, stages, erosion forms.
- **Topic 7. Water Erosion:** Factors, rain, soil, topography, vegetation and use.
- **Topic 8. Water Erosion:** Evaluation, field methods, field methods and cabinet methods.
- **Topic 9. Water Erosion:** USLE, evaluation parameters, their use in environmental planning.
- **Topic 10. Water Erosion:** Expression of results, cartographic methodologies, study cases. Soil conservation, objectives, remedial measures.
- **Topic 11. Wind erosion:** Concept, causes, mechanisms, factors, evaluation and control.
- **Topic 12. Contamination**: Concept, historical development, pollutants and origin, processes responsible for redistribution and accumulation.
- **Topic 13. Soil salinity**. Nature of soluble salts. Causes of salinity. Effects of salinity and sodicity on crops. Evaluation. Management of saline soils. Recovery of saline and sodium soils.
- **Topic 14. Heavy metal contamination:** Definition, origin, dynamics in the soil, speciation, factors that affect its presence and availability. Study cases.

- **Topic 15. Contamination by organic compounds:** Factors and properties, evolution in the soil, processes, types of contaminants and origin.
- **Topic 16. Soil protection:** Vulnerability and self-depuration, the soil as a chemical time bomb. Legal aspects.
- **Topic 17. Soil decontamination:** Planning, treatments and decontamination techniques.
- **Topic 18. Rehabilitation of mining areas:** Impacts, limiting factors, recovery plan. Study cases.
- **Topic 19. Conservation agriculture:** Traditional systems, characteristics of the CA, advantages and problems, evolution and current state. The CA in Spain. The cultivation of the olive grove with vegetable covers.
- **Topic 20. Soil as moderator of climate change:** Carbon reservoirs and transfers. Carbon sequestration by the soil: technological options.

PRACTICAL TOPICS:
Seminars/Workshops

- *Seminar 1.* **Riquier, Bramao y Cornet (FAO) Evaluation system.** Study case.
- *Seminar 2.* **Evaluation system for specific purposes.** Study cases.
- *Seminar 3.* **Application of the USLE model.** Study case.
- *Seminar 4.* **Impact of acid rain.** Study case.
- *Seminar 5.* **Decontamination of soils.** Study cases from the United States Environmental Protection Agency (https://www.epa.gov/superfund).
- *Seminar 6.* **The Guadiamar Green Corridor: An unfinished remediation.** Study of a real case.

Computer Practices

Practice 1. Soil Evaluation: USDA Agrological classes.
Practice 2. Soil Evaluation: Riquier system.
Practice 3. Soil Evaluation for specific purposes.

Field Practices

Practice 1. Visit to the recovery work of the gypsum quarry of Escúzar (Granada).

REFERENCES

MAIN REFERENCES:

- ASSINK, J.W.; BRINK, W.J. Contamined Soil. Martinus Nijhoff Publ. 1986.
- AGUILAR, J.; MARTINEZ, A.; ROCA, A. Evaluación y manejo de suelos. Univ. de Granada. 1996.
- C.E.O.T.M.A. Guía para la elaboración de estudios del medio físico: contenido y metodología. Manuales. C.E.O.T.M.A. Madrid. 1996.
- FAO. Metodología provisional para la evaluación de la degradación de los suelos Roma. 1980.
- FAO. Esquema para la evaluación de tierras. v. 32. Roma. 1976.
- HUDSON, N. Soil Conservation. 3nd ed. Bastord, London. 1995
- KHAN, S.U. Pesticides in the soil environment. Elsevier. Amsterdam. 1980.
- KIRBY, M. J. y MORGAN R. P. C. Erosión de suelos. Limusa. México. 1984.
- MORGAN R.P.C .Soil Erosion and Conservation. 2nd ed. Longman Sci. and Tech., Harlow. 1995

COMPLEMENTARY REFERENCES:

- MOREIRAS, J. M. Capacidad de uso y erosión de suelos. Una aproximación a la evaluación de las tierras de Andalucía. Junta de Andalucía. Agencia de Medio Ambiente. Sevilla. 1991.
- PIERZYNSKY, G.M.; SIMS, J.T.; VANCE, G.F. 2000. Soils and Enviromental Quality. CRC Press. Boca Raton. USA.
- PORTA, J. y otros. Edafología para la agricultura y el medio ambiente. Ediciones Mundi-Prensa. Madrid. 1994.
- QUIRANTES, J. Métodos para el estudio de la erosión hídrica. Geoforma. 1991.
- ROSA, DE LA, D, y MOREIRA, J.M. Evaluación ecológica de recursos naturales de Andalucía. Junta de Andalucía. Agencia de Medio Ambiente. Sevilla. 1987.
- SEOANEZ, M. Contaminación del suelo. Mundi Prensa. Madrid. 1999.
- TOHARIA, M. El desierto invade España. Inst. Estudios Financieros. Madrid. 1988.

RECOMMENDED INTERNET LINKS

Degradation

- LAND DEGRADATION: AN OVERVIEW. USDA. NRCS (http://soils.usda.gov/use/worldsoils/papers/landdegradation-overview.html)
- EUROPE'S ENVIRONMENT - THE DOBRIS ASSESSMENT. CAP 7: SOILS (http://reports.eea.eu.int/92-826-5409-5/en/page007new.html)
- ENVIRONMENTAL SIGNALS 2002: BENCHMARKING THE ENVIRONMENT. Agencia Europa de Medioambiente. (http://www.eea.europa.eu/pressroom/speeches/Brussels_23_may□)
- UPDATE ON THE ENVIRONMENTAL DIMENSION OF THE EU SUSTAINABLE DEVELOPMENT STRATEGY FROM ENVIRONMENTAL SIGNALS 2002. Agencia Europea de Medioambiente. (http://www.eea.europa.eu/pressroom/speeches/speech_march_04)
- INFORMACIÓN PARA MEJORAR EL MEDIO AMBIENTE EN EUROPA. Agencia Europea de Medioambiente. http://www.eea.europa.eu/documents/brochure/brochure_index.html-es)
- ANNUAL REPORTS. Agencia Europea de Medioambiente. (http://www.eea.europa.eu/documents/index_html)

GLOBAL ENVIROMENTAL OUTLOOK Programa de las Naciones Unidas para el Medioambiente. (http://www.unep.org/geo/)

Erosion

- MEDICIÓN SOBRE EL TERRENO DE LA EROSIÓN DEL SUELO Y DE LA ESCORRENTÍA. Boletín de Suelos de la FAO. Nº68. (http://www.fao.org/docrep/T0848S/T0848S00.htm)
- GLOBAL DIMENSIONS OF VULNERABILITY TO WIND AND WATER EROSION (http://soils.usda.gov/use/worldsoils/landdeg/papers/ersnpaper.html)

Contamination

- CURSO DE CONTAMINACIÓN DEL SUELO (http://edafologia.ugr.es)
- REPORTS ON SOIL. AGENCIA EUROPEA DE MEDIOAMBIENTE. (http://www.eea.europa.eu/themes/soil/listfeed?feed=reports_soil)
- INDICATORS ON SOIL CONTAMINATION. AGENCIA EUROPEA DE MEDIOAMBIENTE. (http://www.eea.europa.eu/themes/soil/indicators)
-SOIL SCREENING GUIDANCE. USA Environmental Protection Agengy. (http://www.epa.gov/superfund/health/conmedia/soil/index.htm)
- IHOBE. SUELOS CONTAMINADOS. Sociedad Pública de Gestión Ambiental. Consejería de Ordenación del Territorio y Medio Ambiente. (http://www.ihobe.es/Pags/AP/Ap_publicaciones/index.asp?Cod=22D00942-87EA-4D23-BF89-874E182F271F)

Evaluation

- CURSO DE EVALUACIÓN DE SUELOS (http://edafologia.ugr.es)
- FESLM: AN INTERNATIONAL FRAMEWORK FOR EVALUATING SUSTAINABLE LAND MANAGEMENT. FAO. World Soil Resources Report. Nº 73 (http://www.fao.org/docrep/T1079E/T1079E00.htm)

- A FRAMEWORK FOR LAND EVALUATION. FAO Soils Bulletin 32. (http://www.fao.org/docrep/X5310E/x5310e00.htm)
- LAND EVALUATION FOR DEVELOPMENT. FAO. (http://www.fao.org/docrep/U1980E/u1980e00.htm)
- GUIDELINES: LAND EVALUATION FOR IRRIGATED AGRICULTURE. FAO Soils Bulletin 55 (http://www.fao.org/docrep/X5648E/X5648E00.htm)
- LAND EVALUATION LECTURES NOTES http://www.itc.nl/~rossiter/teach/le/s494toc.htm).
- Software: MICROLEIS. Sistema Integrado para la Transferencia de Datos y Evaluación Agro-ecológica de Tierras (http://leu.irnase.csic.es/microlei/microlei2.htm)

Sustainable development / Conservation agriculture

- SUSTAINABLE DRYLAND CROPPING IN RELATION TO SOIL PRODUCTIVITY - FAO Soils Bulletin 72. (http://www.fao.org/docrep/V9926E/V9926E00.htm)
- DESARROLLO SOSTENIBLE DE TIERRAS ÁRIDAS Y LUCHA CONTRA LA DESERTIFICACIÓN. Fomento de tierras y aguas. FAO. 1993. (http://www.fao.org/docrep/V0265S/V0265S00.htm)
- EL FUTURO DE NUESTRA TIERRA. ENFRENTANDO EL DESAFÍO. GUÍAS PARA LA PLANIFICACIÓN INTEGRADA PARA EL DESARROLLO SOSTENIBLE DE LOS RECURSOS DE LA TIERRA. Fomento de tierras y aguas. FAO y PNUMA 1999. (http://www.fao.org/DOCREP/004/X3810S/X3810S00.HTM)
- CONSERVATION AGRICULTURE CASE STUDIES IN LATIN AMERICA AND AFRICA. Boletín Suelos FAO 78. (http://www.fao.org/DOCREP/003/Y1730E/y1730e00.htm#P-1_0)
- THE BRIDGE TO SUSTAINABILITY. Agencia Europea de Medio Ambiente. (http://www.eea.europa.eu/pressroom/speeches/Speech_111001_rev2)
- THE EU ENVIRONMENT — SITUATION AND PROSPECTS UNDER AN EU STRATEGY FOR SUSTAINABLE DEVELOPMENT. Agencia Europea de Medio Ambiente (http://www.eea.europa.eu/pressroom/speeches/stockholm_2001).
- WEB DE LA FAO SOBRE AGRICULTURA DE CONSERVACION. (http://www.fao.org/ag/ca/es/index.html)
- CONCEPTOS DE AGRICULTURA DE CONSERVACIÓN. FAO. (http://www.fao.org/waicent/faoinfo/agricult/ags/AGSE/agse_s/2do/cons1.htm)
- SITIO WEB DE LA FEDERACIÓN EUROPEA DE AGRICULTURA DE CONSERVACIÓN. (http://www.ecaf.org/Espana/espana.htm)

TEACHING METHODOLOGY

- Participatory master classes.
- Seminars: practical exercises and discussion of study cases.
- Tutoring.
- Computer practical.
- Field trip to area of interest.
- Realization of group work and preparation of final report.

EVALUATION (INSTRUMENTS, CRITERIA AND PERCENTAGE ON FINAL RATING, ETC.)

- In order to pass the subject, students must demonstrate that have acquired the knowledge and skills indicated in this Teaching Guide. The students will have the right of two calls for evaluation, one ordinary and one extraordinary. The ordinary call may be made by one of the following evaluation systems:

1. Continuous evaluation. This evaluation will be based on the assessment of the work of the different blocks of the subject developed in the seminars and practical activities (evaluation, erosion and contamination of soils), and of the exams in which the students will have to demonstrate the competences acquired both theoretical and practical. Overcoming any of the tests will not be achieved without a uniform and balanced knowledge of all matter. The evaluation of the different blocks will be

done according to the following scale:

- Partial exams (50%):
  - *Test 1: Evaluation and Contamination Blocks (25%), Practical exercise (5%)*
  - *Test 2: Erosion and Soil and Society Blocks (15%), Practical exercise (5%)*
- Computer practical (20%)
- Field trip (5%)
- Group work report(25%)

2. Single exam. The single final evaluation may be made by students who cannot comply with the continuous evaluation method for reasons of work, health status, disability, mobility programs or any other duly justified cause that prevents them from following the continuous evaluation regime. In order to be able to perform the single exam, the student, in the first two weeks of the course, or within two weeks of enrollment if this has occurred after the beginning of the course, will request it through the web procedure to the Director of the Department, claiming and accrediting the reasons for not being able to follow the continuous evaluation system. After the period of 10 days without the student having received an express written response, the request shall be considered as estimated.
The single exam will consist of those tests necessary to prove that the student has acquired all of the competencies described in the Teaching Guide.

Students who have not passed the subject in the ordinary call will have an **extraordinary call**. It will be able to attend all the students, regardless of whether or not followed a process of continuous evaluation. The qualification of students in the extraordinary call will be in accordance with the rules established in the Teaching Guide of the subject, guaranteeing, in any case, the possibility of obtaining 100% of the final score.

The Evaluation and Qualification Regulations can be consulted in the BOUGR núm. 112, de 9 de noviembre de 2016 (http://secretariageneral.ugr.es/bougr/pages/bougr112/_doc/examenes%21)

ADDITIONAL INFORMATION