Course syllabus

Subject	Forest soils and carbon sequestration		
Qualification	Degree in Forest Engineering and Natural Environment		
Plan	903	**Code**	75030
Period	Second semester	**Type/Nature**	Optional
Level	Degree	**Year**	2º
ECTS	3		
Language	English		
Lecturers	María Belén Turrión and Francisco Lafuente Álvarez , Marina Getino Álvarez and Ruth C. Martín Sanz		
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Department	*Ciencias Agroforestales (Área de Edafología y Química Agrícola)* Agroforestry Sciences (Soil Science and Agricultural Chemistry)		

1. General scope

1.1 Scope

In the current global climate change context, soils play a vital role in the carbon cycle. Understanding factors that control soil carbon sequestration and evaluating management techniques for mitigation and adaptation to climate change, related to soil fixation, are useful tools for forestry and environmental engineers.

Quantification and evaluation of soil organic carbon stocks under different land-use systems will be carried out through laboratory and field practices.

1.2 Relationship with Academic Program

This subject provides a technical and environmental view of soil organic carbon that is one of the principal factors of soil fertility and global carbon cycle.

1.3 Pre-requisites

Basic concepts of Chemistry, Biology, Soil science and Climatology are needed, as well as Agricultural and Forestry engineering concepts.
English language skills for reading, speaking and writing are needed.

2. General skills

G3: Be able to analyse and synthesise

G5: Be able to communicate effectively, orally and in writing, in specialized meetings as well as for non-expert people

G12: Ability to work in teams

G15: To show critical reasoning

G17 Learning autonomously both individually and cooperatively

3. Course Objectives and Student Learning Outcomes

By the end of the course, students should be able to:

- Understand the role of forest soils on carbon fixation and how the different forestry activities affect this fixation.
- Explain the process of soil carbon stabilization and its management.
- Quantify and evaluate the carbon fixation in soils.
- Explain the structural properties, functions and process of soil organic matter.

4. General Outline of Topics Covered

Topics

1. Climate change and carbon sequestration.
2. Carbon cycle and organic matter dynamics.
3. Factors influencing soil carbon sequestration.
4. Characterization and modelling of soil organic matter.
5. Soil carbon quantification.
6. Sampling techniques and results analysis.

Recommended readings

- Heath L.S., Birdsey R.A., Williams D.W. (2002) Methodology for estimating soil carbon for the forest carbon budget model of the United States, 2001. Environ. Pollut., 116: 373-380
- Lal, R. Ed. 2001. Soil Carbon Sequestration and the Greenhouse Effect. Soil Science Society of America. SSSA Special Publication Nb. 57. 236 p.
- Lal, R. 2010. *Managing soils and ecosystems for mitigating anthropogenic carbon emissions and advancing global food security. Bioscience 60:708–721.doi:10.1525/bio.2010.60.9.8*
- Ussiri D.A.N., Lal R. 2017. Carbon Sequestration for Climate Change. Mitigation and Adaptation. Springer International Publishing AG 2017ISBN 978-3-319-53843-3 ISBN 978-3-319-53845-7 (eBook) DOI 10.1007/978-3-319-53845-7
- Lefèvre, C.; Rekik, F.; Alcantara, V.; Wiese, L. (2017) Soil organic carbon: the hidden potential. FAO, ONU. Roma. http://www.fao.org/3/a-i6937e.pdf

5. Methods of Instruction

This subject consists mainly on practical activities practical activities, with 14 h of theoretical lessons and seminars, and 16 h of different practical lessons.

• **Theoretical lessons (8h): 4 sessions of 2h each one.** These sessions include explanations by the lecturers, and more participatory activities such as discussions and debates about doubts and programmed readings.

• **Seminars (4h): 2 sessions of 2h.** In which students will solve problems and questions with the lecturers' help and will present individual and team activities.

• **Field work (4h): 1 session of 4h.**

• **Lab practices (12h):** In **6 sessions of 2h** students will follow lab protocols for soil analysis. They will determine quantity and quality of soil carbon in specific samples and other soil properties in order to find relationships among soil carbon and soil properties. Soils under different land-use and management will be analysed. The effect of land-use change on soil organic carbon stock will be quantified. Finally, students will elaborate a report and will give an oral presentation as part of the subject grading.

• **Oral presentation (2h): 1 session of 2h.**

The Moodle platform in the electronic campus (UVa virtual campus) will be used to deliver documents, and to propose and deliver tasks, to carry out learning activities both individually and in teams, and as a communication channel between lecturers and students and among students.

Objectives, material with topic contents questions, practical exercises and bibliography will be offered by lecturers for every topic. Solutions to the questions will be elaborated as a part of the subject grading.

A detailed timetable will be delivered for the activities of the subject.

Different individual assignments will be requested throughout the course, as well as reports about the laboratory practices. Assignments should be sent by email or Moodle (lecturer will indicate the preferred method).

The mandatory laboratory reports must follow the indicated format (an example will be given in class) and its submission will be mandatory in order to pass the course.

The final report is also mandatory (following the format that will be delivered in class), as well as its defense through an oral presentation of about 10-15 minutes with visual support in PowerPoint or similar software. Instructions will be provided throughout the course.

6. Student Dedication to the Course

Lessons	Hours	Outside Class	Hours
Lectures	8	Individual study and assignments	15
Field work	4	Assignment	1
Laboratory	12	Working in group	10
Seminars and Oral presentation	6	Preparation of assignments and oral presentation	19
Total	**30**	**Total**	**45**

7. Grading Criteria

Student Evaluation	Percentage of final grade	Type of activity	Comments
Lab work Lab report	10 % 20 %	Group activity Individual activity	Mandatory assignments
Assignments and participation in lessons	20 %	Individual activity	
Final report	30 %	Group activity	Mandatory assignment
Oral presentation	20 %	Group activity	Mandatory assignment

Students who do not reach the required minimum class attendance (**80% attendance**), who do not attend the field and laboratory practices, or who do not submit the compulsory assignments, must take an exam to pass the subject.

8. Final considerations

General competences considered in this subject will be **evaluated** as follows:

- G3 *Be able to analyse and synthesise,* with short questions throughout the course and written assignment.
- G5: *Be able to communicate effectively, orally and in writing, in specialized meetings as well as for non-expert people,* with the written assignment and the oral presentation.
- G12 *Ability to work in teams* in the lab sessions and its assignments, with teams monitoring.
- G15 *To show critical reasoning* with the written assignment and comments of the results in lab sessions.

Course Policies
· **Attendance:** Lessons and laboratory work form a core component of this course. Students must ensure that they are available to attend lessons and arrive with punctuality. They should pay close attention to the class schedule and read the material prior to each lesson. They are welcome to share new ideas during class and are encouraged to read related papers. **Attendance at 80% of teaching hours is mandatory.** · **Technology in the classroom:** Mobile phones are not allowed, as long as the lecturer does not indicate otherwise. Please, turn-off your cell phone prior to the start of class. You will be asked to leave the lesson if you are using your phone. · **Policy on Academic Ethics and Honesty:** The University of Valladolid (UVa) regards plagiarism, or cheating, as a serious academic offence. Anyone caught cheating will automatically receive a 0/10 for the quiz/exam/assignment. Your responsibility, besides maintaining a high standard of personal honesty, includes taking precautions to prevent others from copying your work. A student's assessed work may be reviewed with plagiarisms detection computer software. The use of other authors' work in your assignments must be properly referred and/or acknowledged.