

## COURSE SYLLABUS 2019-20

Basic information on the course			
Course:	Adaptation to changes in physical environment		
Course code:	71052207	Plan:	Master in Sustainable use of natural resources and ecosystem services
Academic Year:	2019-2020	Undergraduate/Graduate:	Master degree
Degree Year:	1	Type:	Optional
Duration:	First term (first four-month period)		
TIME DISTRIBUTION ACCORDING TO REGULATIONS			
Credits:	6		
Total time:	150		
USE OF LEARNING PLATFORM:			
UAL E-LEARNING (“Aula Virtual” platform)			

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## OTHER IMPORTANT INFORMATION

### Content justification

Soil and water are among the world's most critical and widely abused and threatened resources at the global scale, and are being deteriorated due to increasing population. In order to reverse this trend, conservation programs that ensure a sustainable use of both soil and water are demanded. Soil controls the interchange of energy and matter between the earth and the atmosphere and can be defined as the living earth epidermis. Soil is a non-renewable and essential component of all terrestrial ecosystems and its degradation reduces its capacity to provide good and services to society, with important negative effects on human well-being. Some of the most important threats in the current global change context are soil and water degradation. Thus, during this course we will focus on the different processes/ systems that can be used as early warning indices of soil and water degradation. It is also important that students get knowledge about the concept of sustainable use of soil and water, and the different techniques that can be used in order to reduce and mitigate soil and water degradation problems as well as adaptation strategies to be applied in situations where mitigation is not possible in the short time.

<b>Courses related in Study Plan</b>
The course "Adaptation to changes in physical environment" is within the Itinerary 2 named "Adaptation techniques to Global Changes and mitigation of its effects" and is closely related to the core course "Methodologies and tools for studying physical environment changes" from Module 1 (core courses) and with other courses as "Ecosystem Services and Sustainability" and "Global Change" within this module. Moreover, this course is closely related with other optional courses from Itinerary 2; "Impact Mitigation and Adaptive Management of Biodiversity" and "Regulatory Actions and Water Restoration" from Itinerary 2.
<b>Pre-required knowledge</b>
Non-required

<b>COMPETENCES</b>
<b>Basic and general competences</b>
<p><i>Basic competences</i></p> <ul style="list-style-type: none"> <li>• Understanding and knowledge acquisition</li> <li>• Application of knowledge</li> </ul> <p><i>General competences</i></p> <ul style="list-style-type: none"> <li>• Application of knowledge: Students must to know how to apply the knowledge acquired and their ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their speciality.</li> <li>• Ability to make judgments: Students will be able to integrate knowledge and deal with the complexity of making judgments based on information that, being incomplete or limited, includes considerations on social and ethical responsibilities related to the application of their knowledge and judgments.</li> </ul>
<p><i>Key competences University of Almeria</i></p> <ul style="list-style-type: none"> <li>• Ability to solve problems</li> </ul>
<b>Specific competences</b>
<ul style="list-style-type: none"> <li>• Critical assessment of the role of human activity on the hydrological cycle and land-use changes, under a Global Change context.</li> <li>• Ability to identify and adopt the most suitable measurements aimed to avoid the soil and water degradation, and favouring their conservation.</li> </ul>

<b>LEARNING OUTCOMES</b>
<p>During the course, students will develop the skills mentioned above, so, in the end, they should be able to:</p> <ul style="list-style-type: none"> <li>- Acquire awareness of hydrological, geomorphological and edaphic risks related to ongoing global change and the need to plan measures aimed at reducing and minimizing their impacts. – Implement systems and programs to monitor and evaluate the effects of soil and water conservation measures. –Identify soil conservation practices that improve OC sequestration and promote soil biodiversity, as indicators of soil health. – Know the importance of water resources planning and management as tool for adaptation</li> </ul>

strategies to Global Change. - Know the adaptation proposals to floods and sea level rise in coastal aquifers – Be able to identify and characterize the best conservation practices of soil and water against specific threats and vulnerabilities: Knowledge and critical thinking on the new Culture of Water.

### **PLANIFICATION (list of topics)**

1. Soil degradation effects, in a context of global change: soil erosion processes; soil organic carbon loss; soil biodiversity loss; soil sealing etc.; Desertification. Evaluation and monitoring of ongoing impacts of global change and future predictions.
2. Soil conservation and restoration measures aimed at mitigating and anticipating (adaptation) the adverse effects of global change: Strategies aimed at facilitating infiltration and soil water retention, increasing soil C sequestration, fertility and biodiversity, and preventing erosion. The 2030 Agenda and Neutralization of Land Degradation.
3. The World Overview of Conservation Approaches and Technologies (WOCAT). Development of interactive and multiscale approaches.
4. Adaptation strategies for water resources. Measurements and adaptation strategies: development and implementation. Priority lines policy focused on adaptation. Adaptation ways by groundwater-dependent systems. Control and monitoring programs.
5. Adaptation strategies faced with extreme phenomena. Extreme phenomena as a risk element: swellings rivers and floods. Droughts. Adaptation approaches and disaster risk management. Early warning systems
6. Adaptation strategies in coastal areas. Qualitative and quantitative vulnerability assessment of coastal areas. Comprehensive management of coastal areas. Management of water resources in coastal aquifers.
7. Carbon dioxide capture and geological storage. CO<sub>2</sub> trapping methods and transport. CO<sub>2</sub> storage. Risks management: life cycle assessment of CO<sub>2</sub> geological storage.

### **METHODOLOGY AND ACADEMIC ACTIVITIES**

- Participative Master classes
- Practical and training activities at computer classroom
- Draft reports and their subsequent public defense
- Tutorials / Orientation
- Fieldwork activities

### **COMPETENCY ASSESSMENT**

#### **Criteria and assessment tools**

- Control of tasks (exercises, problems and practical cases)
- Assistance and participation in class activities
- Written reports (bibliographical revision and scientific, technical or practical reports)
- Oral exposition (projects, works, reports)
- Attendance to tutorials.

#### **Follow-Up Mechanisms**

- Attendance to tutorials.
- Attendance and participation in the Master classes and practical sessions
- Delivery of assignments and exercises during classes.

- Delivery of assignments and exercises through UAL E.LEARNING (“Aula Virtual” platform)

#### Functional diversity / Functional disability.

- Those students with disabilities or special educational needs can get in contact with the Delegation of the Rector for the Functional Diversity (<http://www.ual.es/discapacidad>) to receive the appropriate guidance and advice in order to facilitate their instructional, learning and training processes. Likewise, these students may request the implementation of the necessary and suitable adaptations of content, methodology and evaluation that guarantee equal opportunities in their academic development. The processing of any personal data or aggregated information regarding these aforementioned students, in fully compliance with the GDPR, is strictly confidential. Faculties and academic staff lecturing the course referenced by this guide/document will be in charge of applying the recommended adaptations approved by the Delegation of the Rector for the Functional Diversity, this fact will be, therefore, notified to the School or Faculty as well as to the coordinator of the academic course.

### COURSE MATERIALS

#### Recommended course materials

##### *Basic*

- Domingo Gómez Orea. Recuperación de espacios degradados. Mundi Prensa. 2004.
- José M. Rey Benayas, Tíscar Espigares y José M. Nicolau. Restauración de Ecosistemas Mediterráneos. Colección Aula Abierta, nº 20, Servicio de Publicaciones de la Universidad de Alcalá. . 2003.
- Andre F. Clewell. Ecological restoration: principles, values, and structure of an emerging profession. Island Press. 2013.
- Ilan Chabay, Martin Frick, Jennifer Helgeson. Land restoration: reclaiming landscapes for a sustainable future. Academic Press. 2016.
- R. Lal. Restoring Soil Quality to Mitigate Soil Degradation. Sustainability 7, 5875–5895.. 2015.
- R.P.C. Morgan. Erosión y Conservación del suelo. Mundi-prensa Libros S.A... 1997.
- Smith, J. ,Howe, C.,Hendersen, J.. Climate Change and Water : International Perspectives on Mitigation and Adaptation. American Water Works Assoc. 2008.
- Jakeman, A.J., Barreteau, O., Hunt, R.J. Rinaudo, J.D. Ross. A. Integrated Groundwater Management : Concepts, Approaches and Challenges . Springer. 2016.
- DeBarry, P.A.. Watersheds: Processes, Assessment and Management. Wiley. 2004.
- Metz, B.; Davidson, O.; Coninck, H.; Loos, M. y Meyer, L.. La captación y el almacenamiento de dióxido de carbono. Resumen para responsables de políticas. Informe del Grupo de trabajo III del IPCC. . IPCC. 2005.

##### *Complementary*

- Van Andel, J., and J. Aronson. Restoration Ecology: The New Frontier . Blackwell. 2012.
- David A. Bainbridge. A guide for desert and dryland restoration : new hope for arid lands. Island Press. 2007.
- Treidel H., Martin-Bordes .L., Gurdak, J.J.. Climate Change Effects on Groundwater Resources A Global Synthesis of Findings and Recommendations. Taylor & Francis Group. 2011.
- Cossia, J. M.. Climate Change and its Causes, Effects and Prediction: Global Warming in the 21st Century. Nova Science Publishers. 2011.

- Charlesworth, S.M Booth, C.A.. Sustainable Surface Water Management: A Handbook for SUDS. Wiley-Blackwell. 2016.

#### *Other materials*

- Costantini, E.A.C., Branquinho, C., Nunes, A., Schwilch, G., Stavi, I., Valdecantos, A., Zucca, C.. . Soil indicators to assess the effectiveness of restoration strategies in dryland ecosystems. EGU Solid Earth, 7, 397–414, 2016. 2016.
- Biswas, A. K., Tortajada, C.. Water Security, Climate Change and Sustainable Development Series: Water Resources Development and Management . Springer. 2016.
- Setegn, S. G., Donoso, M.C. Sustainability of Integrated Water Resources. Management Water Governance, Climate and Ecohydrology. Springer. 2015.
- Navarra, A., Tubiana, L.. Advances in Global Change Research. Regional Assessment of Climate Change in the Mediterranean. Volume 3: Case Studies. Springer. 2013.
- Cortina, J., Bellot, J., Vilagrosa, A., Caturla, R., Maestre, F.T., Rubio, E., Martínez, J.M., Bonet, A.. Restauración en semiárido.. In: Vallejo, R. and Alloza, J.A. (Eds.) Avances en el estudio de la gestión del monte Mediterráneo. CEAM.. 2004.
- Cortina, J., Amat, B., Castillo, V., Fuentes, D., Maestre, F.T., Padilla, F.M., Rojo, L.. The restoration of vegetation cover in the semi-arid Iberian southeast . J. Arid Environ, 75, 1377–1384.. 2011.

Couse materials available in UAL's library

Check the current bibliography in the UAL Library Management System at:

<http://almirez.ual.es/search/x?SEARCH=71052207>

#### **WEBSITE**

- [http://www.ferrovial.com/wp-content/uploads/2014/06/doc\\_libro\\_restauracion\\_ecologica.pdf](http://www.ferrovial.com/wp-content/uploads/2014/06/doc_libro_restauracion_ecologica.pdf)  
*ecológica de áreas afectadas por infraestructuras de transporte (Libro) por Fernando Valladares et al*
- <http://www.ser.org/>  
*Society for Ecological Restoration*
- <http://www.fao.org/soils-portal/soil-management/soil-conservation/en/>  
*FAO Soils portal*
- <https://www.wocat.net/>  
*World Overview of Conservation Approaches and Technologies: Red global*
- <http://www.recare-hub.eu/>  
*RECARE project: Preventing and Remediating degradation of soils in europe through land care*