UNIVERSIDAD DE CASTILLA - LA MANCHA

GUÍA DOCENTE

1. General information

Course: THE EARTH SYSTEM: PROCESSES AND GLOBAL DYNAMICS
Code: 37325
Type: CORE COURSE
ECTS credits: 6
Degree: 340 - UNDERGRADUATE DEGREE PROGRAMME IN ENVIRONMENTAL SCIENCES
Academic year: 2023-24
Center: 501 - FACULTY OF ENVIRONMENTAL SCIENCES AND BIOCHEMISTRY
Group(s): 40
Year: 3
Duration: C2
Main language: Spanish
Second language: English
Use of additional languages:
English Friendly: Y
Web site:
Bilingual: N

Lecturer: **MARIA BELEN HINOJOSA CENTENO** - Group(s): **40**

Building/Office	Department	Phone number	Email	Office hours
Sabatini/0.36	CIENCIAS AMBIENTALES	5470	mariabelen.hinojosa@uclm.es	Tuesdays from 15:00 to 17:00; Wednesdays and Thursdays from 12:00 to 14:00 (appointment by e-mail)

Lecturer: **JULIO MUÑOZ MARTIN** - Group(s): **40**

Building/Office	Department	Phone number	Email	Office hours
Edificio Sabatini/0.17.1	MATEMÁTICAS	926051674	julio.munoz@uclm.es	Mondays, Tuesdays and Wednesdays from 16:00 to 18:00. Previously check this schedule in the Moodle of the subject and request an appointment via e-mail.

Lecturer: **VÍCTOR ORTEGA BLÁZQUEZ** - Group(s): **40**

Building/Office	Department	Phone number	Email	Office hours
	MATEMÁTICAS		Victor.Ortega@uclm.es	

Lecturer: **ANTONIO PARRA DE LA TORRE** - Group(s): **40**

Building/Office	Department	Phone number	Email	Office hours
ICAM/0.26	CIENCIAS AMBIENTALES	926051400	antonio.parra@uclm.es	Tuesday, Wednesday and Thursday from 12:00 to 14:00 (appointment by e-mail). The schedule will be updated in the Virtual Secretary if necessary.

Lecturer: **IVAN TORRES GALAN** - Group(s): **40**

Building/Office	Department	Phone number	Email	Office hours
Sabatini/0.35	CIENCIAS AMBIENTALES	5472	ivan.torres@uclm.es	Monday 12:00 to 14:00, wednesday 10:00 to 12:00, thursday 12:00 to 14:00. Emailing in advance for confirmation is advised.

2. Pre-Requisites

Not established

3. Justification in the curriculum, relation to other subjects and to the profession

Third year subject, it belongs to the subject Ecology. This subject also includes the compulsory subject Ecology and the optional subjects Functional Ecology of Plants, Terrestrial Ecosystems, Aquatic Ecosystems and Fire Ecology. Knowledge of global processes and dynamics is essential to be able to contextualise all work related to the environment in the present scenario of global change. Understanding the different scales and dimensions of both ecological and socio-economic factors and processes allows for a global vision of the environmental state of the world, deepening the multidisciplinary training and the students' capacity for integration. It is these themes that will guide professional work and opportunities in the near future.

4. Degree competences achieved in this course

Course competences

Code	Description
E02	Capacity for multidisciplinary consideration of an environmental problem
E03	Awareness of the temporal and spatial dimensions of environmental processes
E05	Capacity for qualitative data interpretation
E06	Capacity for quantitative data interpretation
T02	To know and apply the Information and Communication Technologies (ICT).
T03	To use a correct oral and written communication.
T04	To know the ethical commitment and professional deontology.

5. Objectives or Learning Outcomes

Course learning outcomes

Description

To know, of the different compartments of the Earth, its structure, its spatial and temporal variability as well as its main processes.

Knowledge of the basic aspects related to energy and matter flows in communities.
To know the main actions of man on the structure and global functioning of the planet. Describe the main components of the ecosystem structure and functioning.
To know the main compartments of the planet as well as the main biogeochemical cycles. The Earth as a model of physical-chemical-biological interactions.
To know and apply practically some of the main models concerning the exchange of materials between the terrestrial compartments.

Additional outcomes

Application of simplified mathematical models to the study of Natural Dynamical Systems, in particular global ones.
Use of specific software for Dynamic Simulation.
Analysis of numerical results of simulations and interpretation of predictions in the context of their practical application to the resolution of specific environmental problems.
Understanding of the global magnitude of environmental problems.

6. Units / Contents

Unit 1: Introduction

- **Unit 1.1** The Earth as a system
- **Unit 1.2** System dynamics

Unit 2: Models and simulation

- **Unit 2.1** Theory of models
- **Unit 2.2** Dynamic environmental modeling

Unit 3: System Earth

- **Unit 3.1** Basic components of system Earth: Geosphere, Hydrosphere, Atmosphere, Biosphere
- **Unit 3.2** The biogeochemical cycle of C
- **Unit 3.3** The biogeochemical cycle of N
- **Unit 3.4** The biogeochemical cycle of P
- **Unit 3.5** The biogeochemical cycle of S
- **Unit 3.6** The global water cycle

ADDITIONAL COMMENTS, REMARKS

The lab sessions will consist on practical exercises of system dynamics and global biogeochemical cycle modeling

7. Activities, Units/Modules and Methodology

Training Activity	Methodology	Related Competences (only degrees before RD 822/2021)	ECTS	Hours	As	Com	Description
Class Attendance (theory) [ON-SITE]	Lectures	E02 E03 E05 E06 T02 T03 T04	1.52	38	N	-	Masterclasses
Writing of reports or projects [OFF-SITE]	Self-study	E02 E03 E05 E06 T02 T03 T04	0.6	15	Y	Y	Work assignment related to the contents of Topic 2 and its applications (Modeling).
Computer room practice [ON-SITE]	Guided or supervised work	E03 E05 E06 T02 T03 T04	0.8	20	Y	Y	Completion of on-site computer-based practicals and passing a short test on them. Attendance at practicals is compulsory and, due to their nature, cannot be made up.
Practicum and practical activities report writing or preparation [OFF-SITE]	Self-study	E03 E05 E06 T02 T03 T04	1.2	30	Y	Y	Writing the report of the practical sessions
Mid-term test [ON-SITE]	Assessment tests	E02 E03 E05 E06 T03 T04	0.04	1	Y	N	Mid-term test on the theoretical contents of the course, which may eliminate material for the final test.
Study and Exam Preparation [OFF-SITE]	Self-study	E02 E03 E05 E06	1.8	45	N	-	Studying for the tests
Final test [ON-SITE]	Assessment tests	E02 E03 E05 E06 T03 T04	0.04	1	Y	Y	Test on the theoretical contents of the subject
		Total:	**6**	**150**			
		Total credits of in-class work: 2.4					**Total class time hours: 60**
		Total credits of out of class work: 3.6					**Total hours of out of class work: 90**

As: Assessable training activity
Com: Training activity of compulsory overcoming (It will be essential to overcome both continuous and non-continuous assessment).

8. Evaluation criteria and Grading System

Evaluation System	Continuous assessment	Non-continuous evaluation*	Description
Mid-term tests	30.00%	0.00%	Mid-term test that may eliminate material for the final exam. Minimum mark of 4 out of 10 to pass this activity.
Final test	30.00%	60.00%	Final test with a weight of 30% of the total of the subject, provided that material has been eliminated in the mid-term test. In case of not having passed the mid-term test, or opting for non-continuous assessment, it will be necessary to take the whole subject in the final test (60% weight). Minimum mark of 4

			out of 10 to pass this activity.
Other methods of assessment	15.00%	15.00%	Evaluation of the report or work related to modelling. Minimum mark of 4 out of 10 to pass this activity.
Laboratory sessions	10.00%	10.00%	Assessment of the student's performance by means of a test. Minimum mark of 4 out of 10 to pass this activity.
Practicum and practical activities reports assessment	15.00%	15.00%	Submission of a written report. Minimum mark of 4 out of 10 to pass this activity.
Total:	**100.00%**	**100.00%**	

According to art. 4 of the UCLM Student Evaluation Regulations, it must be provided to students who cannot regularly attend face-to-face training activities the passing of the subject, having the right (art. 12.2) to be globally graded, in 2 annual calls per subject , an ordinary and an extraordinary one (evaluating 100% of the competences).

Evaluation criteria for the final exam:

Continuous assessment:

The default mode assigned to the student will be continuous assessment. Any student may request a change to the non-continuous assessment mode (before the end of the class period) by sending an email to the teacher, provided that they have not completed 50% of the evaluable activities.

In order to pass the subject, it will be necessary to obtain a minimum mark of 4 out of 10 in each of the evaluable activities. In any case, the course will only be considered passed if the overall grade, weighting the different evaluable activities according to the table above, results in a mark of 5 or higher (out of 10).

All the evaluable activities will be recoverable, either in the extraordinary or special completion call. However, attendance to the practicals, due to their nature, is considered as a compulsory and not recoverable activity in order to pass the subject.

Non-continuous evaluation:

The default mode assigned to the student will be continuous assessment. Any student may request a change to the non-continuous assessment mode (before the end of the class period) by sending an email to the teacher, provided that they have not completed 50% of the evaluable activities.

The same criteria will be applied in non-continuous assessment than in continuous assessment, taking into account the weightings shown in the table above.

Specifications for the resit/retake exam:

The same criteria will be applied in the extraordinary exam session than in the ordinary exam session. In this call, it will only be necessary to pass the part/s of the ordinary call that have not been passed with at least a 4 out of 10. In any case, the subject will only be considered passed if the overall grade, weighting the different evaluable activities according to the table above, results in a mark of 5 or higher (out of 10).

Specifications for the second resit / retake exam:

The same criteria will be applied in the special completion call than in the extraordinary exams. In this call it will only be necessary to pass the part/s of the previous year that have not been passed with at least a 4 out of 10. In any case, the course will only be considered passed if the overall grade, weighting the different evaluable activities according to the table above, results in a mark of 5 or higher (out of 10)

9. Assignments, course calendar and important dates

Not related to the syllabus/contents	
Hours	**hours**
Writing of reports or projects [AUTÓNOMA][Self-study]	15
Computer room practice [PRESENCIAL][Guided or supervised work]	20
Practicum and practical activities report writing or preparation [AUTÓNOMA][Self-study]	30
Mid-term test [PRESENCIAL][Assessment tests]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	45
Final test [PRESENCIAL][Assessment tests]	1
Unit 1 (de 3): Introduction	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	4
Unit 2 (de 3): Models and simulation	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	10
Unit 3 (de 3): System Earth	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	24
Global activity	
Activities	**hours**
Mid-term test [PRESENCIAL][Assessment tests]	1
Class Attendance (theory) [PRESENCIAL][Lectures]	38
Practicum and practical activities report writing or preparation [AUTÓNOMA][Self-study]	30
Computer room practice [PRESENCIAL][Guided or supervised work]	20
Final test [PRESENCIAL][Assessment tests]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	45
Writing of reports or projects [AUTÓNOMA][Self-study]	15
Total horas:	150

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Likens, Gene E.	Biogeochemistry of a forested ecosystem	Springer		0-387-94502-4	1995	
Lovelock	Gaia					

Lovelock, J. E.	Gaia : una nueva visión de la vida sobre la tierra	Hermann Blume	84-7214-267-1	1983
Lovelock, J. E.	The ages of Gaia : a biography of our living Earth	Oxford University Press	0-19-286180-8	1995
MARTINEZ, Silvio	Dinámica de sistemas	Alianza	84-206-9820-2 (O.C.)	1986
Ogata, Katsuhiko	Dinámica de sistemas	Prentice-Hall hispanoamericana	968-880-074-0	1987
Schlesinger, William H.	Biogeochemistry : an analysis of global change	Academic Press	0-12-625155-X	1997
Shugart, Herman H.	Terrestrial ecosystems in changing environments	Cambridge University Press	0521563429, hardback	1998
Walker B, Steffen W, Mooney H (eds)	Global change and terrestrial ecosystems	Cambridge University Press	0-521-57810-8	1996
	Introduction to computer simulation : a system dynamics mode	Productivity Press	1-56327-170-2	1996
Aracil, Javier	Dinámica de sistemas	Alianza Editorial	84-206-8168-7	1997
Aracil, Javier	Dinámica de sistemas	Alianza Editorial	84-206-8168-7	2005
Ford, Andrew	Modeling the environment : an introduction to system dynami	Island Press	1-55963-601-7	1999
Ford, Andrew	Modeling the environment : an introduction to system dynamic	Island Press	978-1-59726-472-3	2010
Huggett, R. J.	Modelling the human impact on nature Systems analysis of environmental problems	Oxford University Press.		1993
JEFFERS, John N. R.	Modelos en ecología	Oikos-tau	84-281-0735-1	1991
Jacobson, Charlson, Rodhe & Orians (eds)	Earth System Science	Academic Press	9780123793706	2000