Universitat de les Illes Balears

Syllabus

Academic year	2017-18
Subject	11005 - Introduction to Complex Systems
Group	Group 1, 1S
Syllabus	A
Language	English

Subject

Name	11005 - Introduction to Complex Systems
Credits	0.75 in-class (18.75 hours) 2.25 distance (56.25 hours) 3 total (75 hours).
Group	Group 1, 1S
Period	First semester
Language	English

Lecturers

Lecturers	**Office hours for students**					
	Starting time	**Finishing time**	**Day**	**Start date**	**End date**	**Office**
Emilio Hernandez Garcia ehg899@uib.es	You need to book a date with the professor in order to attend a tutorial.					
Maximino San Miguel Ruibal msr260@uib.es	You need to book a date with the professor in order to attend a tutorial.					
Roberta Zambrini -	You need to book a date with the professor in order to attend a tutorial.					

Context

This is one of the compulsory courses of the Structural Module of the Master in Physics of Complex Systems. The objective is to provide an overview of different topics that will be developped in specific courses in order to give to the students a global view of the contents of the Master.

Requirements

There are not specific requirements, being an introductory course.

Skills

Specific

* General understanding on key concepts of Complex Systems, such as collective phenomena, emergence, nonlinearity, thresholds, criticality, multi-scale phenomena, power laws and measures of complexity.

Generic

* To be able to describe, both mathematically and physically, complex systems in different situations (TG1).
* To acquire the capacity to develop a complete research plan covering from the bibliographic research and strategy to the conclusions (TG2).

Date of publication: 14/07/2017

* To write and describe rigorously the research process and present the conclusions to an expert audience (TG3).
* To acquire the ability to ask questions, read and listen critically and participate actively in seminars and discussions (TG4).
* To acquire the ability to disseminate and present the concepts acquired at a non-expert (TG5).

Basic

* You may consult the basic competencies students will have to achieve by the end of the Master's degree at the following address: http://estudis.uib.cat/master/comp_basiques/

Content

Theme content

1. What are complex systems'
2. Collective phenomena. Emergence
3. Networks as skeletons of complex systems
4. Nonlinearity. Thresholds. Criticality
5. Multi-scale phenomena. Power laws
6. Information, computation and measures of complexity.
7. Complexity in physical systems
8. Complexity in social systems
9. Complexity in ecology and life sciences

Teaching methodology

In-class work activities

Modality	Name	Typ. Grp.	Description	Hours
Theory classes	Lessons	Large group (G)	Presentation of all the course contents	11.25
Practical classes	Exercises and discussions	Large group (G)	Exercices and attendance to seminars	4.5
Assessment	Presentation	Large group (G)	Presentation of a document or materials on a subject of the course	3

At the beginning of the semester a schedule of the subject will be made available to students through the UIBdigital platform. The schedule shall at least include the dates when the continuing assessment tests will be conducted and the hand-in dates for the assignments. In addition, the lecturer shall inform students as to whether the subject work plan will be carried out through the schedule or through another way included in the Campus Extens platform.

Date of publication: 14/07/2017

Distance education work activities

Modality	Name	Description	Hours
Individual self-study	elaboration of document or materials	Preparation of a document or materials on a subject of the course	28.25
Individual self-study	individual study	Understanding theoretical concepts	28

Specific risks and protective measures

The learning activities of this course do not entail specific health or safety risks for the students and therefore no special protective measures are needed.

Student learning assessment

Exercises and discussions

Modality	Practical classes
Technique	Other methods **(non-retrievable)**
Description	Exercices and attendance to seminars
Assessment criteria	Exercices and active attendance to seminars (questions and comments)

Final grade percentage: 20%

Presentation

Modality	Assessment
Technique	Papers and projects **(non-retrievable)**
Description	Presentation of a document or materials on a subject of the course
Assessment criteria	Quality of presentation and adequacy of answers to questions

Final grade percentage: 40%

Date of publication: 14/07/2017

elaboration of document or materials

Modality	Individual self-study
Technique	Papers and projects **(non-retrievable)**
Description	Preparation of a document or materials on a subject of the course
Assessment criteria	Deepness, and explanatory and outreach potential of the document or materials

Final grade percentage: 40%

Resources, bibliography and additional documentation

Basic bibliography

N. Boccara
Modeling Complex Systems
(Springer-Verlag, 2nd edition, New York, 2010)
M. Mitchell
Complexity: A Guided Tour
Oxford University Press, USA; First Edition edition (2009)
G. Nicolis, C. Nicolis
Foundations of Complex Systems: Nonlinear Dynamics, Statistical Physics, Information and Prediction
World Scientific (2007)

Complementary bibliography

Papers recommended during the course

Date of publication: 14/07/2017