University of the Balearic Islands

Teaching guide

Academic year	2014-15
Subject	11008 - Non Equilibrium Collective Phenomena
Group	Group 1, 2S
Teaching guide	A
Language	English

Subject identification

Subject	11008 - Non Equilibrium Collective Phenomena
Credits	0.75 de presencials (18.75 hours) 2.25 de no presencials (56.25 hours) 3 de totals (75 hours).
Group	Group 1, 2S
Teaching period	2nd semester
Teaching language	English

Professors

Lecturers	**Horari d'atenció als alumnes**					
	Starting time	**Finishing time**	**Day**	**Start date**	**Finish date**	**Office**
Cristóbal López Sánchez	12:00h	13:00h	Wednesday	09/02/2015	26/06/2015	203, Instituto edificios universitarios de investigación

Contextualisation

This is one of the courses of the Specific Module of the master of Physics of Complex Systems.

Requirements

Recommendable

The concepts and methods needed have been previously acquired in the courses of the Structural Module of the master, in particular in *Cooperative and Critical Phenomena: applications*.

Skills

Specific

* E4: To understand the critical and cooperative phenomena from the perspective of cross-disciplinary physics and complex systems..
* E5: To understand the meaning of concepts like scaling laws, and to apply the techniques of the renormalization group..
* E7: To know the main concepts of non equilibrium statistical physics, including reticular models and growth..

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Generic

* TG2: To acquire the capability to develop a research plan covering from the bibliographic research and strategy to the conclusions..
* TG3: To be able to write in a clear and precise way the different steps of the research work and to present the results to an expert audience..
* TG6: To develop the capability to understand and to apply knowledge of high perfomance computation and advanced numerical methods to the field of complex systems..

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

Chapter 1.. Introduction: stochastic many particle systems.

Chapter 2.. The dynamics of phase transitions.

Chapter 3.. Absorbing phase transitions.

Chapter 4.. Dynamic renormalization group.

Teaching methodology

In-class work activities

Modality	Name	Typ. Grp.	Description	Hours
Theory classes	Lectures	Large group (G)	Explanation of theoretical concepts by the professor.	17.75
Assessment	Oral presentation	Large group (G)	Oral presentation to the whole class of an assigned problem.	1

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.

Distance education work activities

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Modality	Name	Description	Hours
Individual self-study	Autonomous work	The students have to apply the concepts and techniques learned during the lectures to solve assigned exercises, and present the solutions in written form.	56.25

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

Oral presentation

Modality	Assessment
Technique	Objective tests **(non-retrievable)**
Description	Oral presentation to the whole class of an assigned problem.
Assessment criteria	Quality and accuracy of the presented work, as well as the clarity in the oral exposition.

Final grade percentage: 50%

Autonomous work

Modality	Individual self-study
Technique	Papers and projects **(non-retrievable)**
Description	The students have to apply the concepts and techniques learned during the lectures to solve assigned exercises, and present the solutions in written form.
Assessment criteria	Quality and accuracy of the presented work.

Final grade percentage: 50%

Resources, bibliography and additional documentation

Basic bibliography

1. Marro and Dickmann, *Non-Equilibrium Phase transitions in Lattice Models*, Cambridge University Press, 1999.
2. W. Horsthemke and R. Lefever, *Noise induced transitions: Theory and Applications in Physics, Chemistry, and Biology,* Springer, 2007.
3. A. L. Barabasi and E. Stanley, *Fractal Concepts in Surface growth*, Cambridge University Press, 1995.
4. M. Kardar, *Statistical Physics of Fields*, Cambridge University Press, 2007.
5. G. Odor, *Universality in Nonequilibrium Lattice Systems: Theoretical Foundations*, Wordl Scientific, 2008.
6. M. Henkel, H. Hinrichsen, S. Lubeck, *Nonequilibrium Phase Transitions*, Springer, 2009.

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7. P. M. Chaikin and T. C. Lubensky, "Principles of Condensed Matter Physics". Cambridge Univ. Press (2000)

Other resources

The lecture notes, presentations and other additional material will be available at the master's webpage.

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