Syllabus

Subject

Subject / Group	11008 - Non Equilibrium Collective Phenomena / 1
Degree	Master's Degree in Physics of Complex Systems
Credits	3
Period	Second semester
Language of instruction	English

Professors

Lecturers	Office hours for students					
	Starting time	Finishing time	Day	Start date	End date	Office / Building
Cristóbal López Sánchez	13:00	14:00	Monday	17/09/2018	05/07/2019	Edificio Instituts Universitaris

Context

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

Requirements

Recommended

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. .

Generic

* TG2: To acquire the capability to develop a research plan covering from the bibliographic research and strategy to the conclusions. .

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* 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

Range of topics

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 (0.75 credits, 18.75 hours)

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 Aula Digital platform.

Distance education tasks (2.25 credits, 56.25 hours)

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

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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

Frau en elements d'avaluació

In accordance with article 33 of Academic regulations, "regardless of the disciplinary procedure that may be followed against the offending student, the demonstrably fraudulent performance of any of the evaluation elements included in the teaching guides of the subjects will lead, at the discretion of the teacher, a undervaluation in the qualification that may involve the qualification of "suspense 0" in the annual evaluation of the subject".

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.

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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.
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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