

230860 - CBS - Complexity in Biological Systems

Coordinating unit: 230 - ETSETB - Barcelona School of Telecommunications Engineering
 Teaching unit: 748 - FIS - Department of Physics
 Academic year: 2019
 Degree: MASTER'S DEGREE IN ENGINEERING PHYSICS (Syllabus 2018). (Teaching unit Optional)
 ECTS credits: 4 Teaching languages: English

Teaching staff

Coordinator: Alonso Muñoz, Sergio
 Others: Pons Rivero, Antonio Javier

Degree competences to which the subject contributes

Basic:

- CB6. (ENG) Poseer y comprender conocimientos que aporten una base u oportunidad de ser originales en el desarrollo y/o aplicación de ideas, a menudo en un contexto de investigación
- CB7. (ENG) Que los estudiantes sepan aplicar los conocimientos adquiridos y su capacidad de resolución de problemas en entornos nuevos o poco conocidos dentro de contextos más amplios (o multidisciplinares) relacionados con su área de estudio.
- CB10. (ENG) Que los estudiantes posean las habilidades de aprendizaje que les permitan continuar estudiando de un modo que habrá de ser en gran medida autodirigido o autónomo.

Teaching methodology

Master class, written work, problem resolutions, practical exercises, search of information, practices

Learning objectives of the subject

- Understand what a complex system is and how to characterize it.
- Obtain a basic knowledge in biological phenomena, from the molecular/celular scale to the macroscale.
- Dominate numerical techniques and use specific software related with the subject.
- Be able to include the theoretical knowledge to solve biological problems.
- Be able to present the results of a project in a written text and orally. using a precise language and putting the results in the correct context.

Study load

Total learning time: 100h	Hours large group:	36h	36.00%
	Self study:	64h	64.00%

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Content

<p>Complex spatio-temporal dynamics in biology</p>	<p>Learning time: 25h Theory classes: 9h Self study : 16h</p>
<p>Description: Oscillations, excitability, bistability Synchronization in biological systems Spatio-temporal chaos: Cardiac fibrillation</p>	
<p>Analisi of complex biosignals</p>	<p>Learning time: 25h Theory classes: 9h Self study : 16h</p>
<p>Description: Deterministic and stochastic signals Statistical properties Nonlinear analysis of temporal series</p>	
<p>Self-organization in biological systems</p>	<p>Learning time: 25h Theory classes: 9h Self study : 16h</p>
<p>Description: Self-assembling: protein folding, and membrane formation Growing processes: chemotaxis. tumor growing and morphogenesis Flocking, swarming y gregarious behavior</p>	
<p>Biological networks</p>	<p>Learning time: 25h Theory classes: 9h Self study : 16h</p>
<p>Description: Metabolic networks, interactome, regulatory and signal networks Neural networks, functional networks and conectome Networks in ecology and epidemiology</p>	



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Qualification system

Written test (30%)
Oral test (40%)
Works done by the student (30%)

Bibliography