Degreed competences to which the subject contributes

Basic:
- 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.
- CB8. (ENG) Que los estudiantes sean capaces de integrar conocimientos y enfrentarse a la complejidad de formular juicios a partir de una información que, siendo incompleta o limitada, incluya reflexiones sobre las responsabilidades sociales y éticas vinculadas a la aplicación de sus conocimientos y juicio.

Teaching methodology
- Master classes
- Class exhibitions
- Team work
- Written work
- Problem resolution
- Practical exercises

Learning objectives of the subject
- Ability to generate random numbers according to simple laws of probability distribution
- Ability to perform a multidimensional integral through the Monte Carlo and correctly estimate its statistical variance
- Know how to perform a calculation program for the classical simulation of a system multiparticular using the Metropolis method
- Know the methods of variance reduction and their optimal choice according to the type of problem to solve
- Ability to perform multidimensional optimization using techniques stochastic
- Know the main stochastic methods used in the study of quantum systems
230861 - SM - Stochastic Methods for Optimization and Simulation

Study load

<table>
<thead>
<tr>
<th>Total learning time: 100h</th>
<th>Hours large group:</th>
<th>36h</th>
<th>36.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Self study:</td>
<td>64h</td>
<td>64.00%</td>
</tr>
</tbody>
</table>

Content

**Stochastic methods for optimization and simulation**

<table>
<thead>
<tr>
<th>Learning time: 100h</th>
</tr>
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<tbody>
<tr>
<td>Theory classes: 24h</td>
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<tr>
<td>Practical classes: 10h</td>
</tr>
<tr>
<td>Guided activities: 10h</td>
</tr>
<tr>
<td>Self study: 56h</td>
</tr>
</tbody>
</table>

**Description:**

1. Monte Carlo integration: distribution functions and their sampling, Monte Carlo crude, rejection, variance reduction techniques, multidimensional integration, Metropolis method.
2. Application of the Monte Carlo method to many particle systems: systems discrete (Ising), continuous systems in different statistical sets, finite-size scaling, advanced Monte Carlo methods.
5. Applications of the Monte Carlo method to quantum systems: wave functions for bosons and fermions, Monte Carlo variational, Monte Carlo diffusive, Monte Carlo of road integrals.

Qualification system

Oral tests 20% - 30%
Works carried out by the student 70% - 80%

Bibliography