Universidad Zaragoza

Academic Year/course: 2023/24

26925 - Statistical Physics

Syllabus Information

Academic year: 2023/24
Subject: 26925 - Statistical Physics
Faculty / School: 100 - Facultad de Ciencias
Degree: 447 - Degree in Physics
ECTS: 6.0
Year: 3
Semester: Second semester
Subject type: Compulsory
Module:

1. General information

The general objective of the subject is to provide the student with the basic knowledge that will allow them to understand and study, from a microscopic point of view, the phenomena associated with the macroscopic character of a physical system. Two basic preliminary concepts are the microstate and the microstate, and the relationship between them is established by the mathematical notions of measurement (probability) and the information associated with it.

These approaches and objectives are aligned with the following Sustainable Development Goals (SDGs) of the United Nations Agenda 2030 (https://www.un.org/sustainabledevelopment/es/), in such a way that the acquisition of the learning results of the subject provides training and competence to contribute to some extent to their achievement: Goal 4: Quality Education.

2. Learning results

- Obtaining the "thermodynamic fundamental relation" of various physical systems with discrete and continuous energy levels (spectra) in the various generalized canonical formalisms.
- Calculation of partition functions of factorizable systems.
- Calculation of the classical Maxwell-Boltzmann probability distribution for ideal gases.
- Obtaining quantum ideal fluid properties of fermions and bosons.
- Interpretation of the results of a phase transition (order-disorder) simulation.

3. Syllabus

- Macroscopic Physics and Microscopic Physics
- Formalisms of Statistical Mechanics.
- Application of formalisms to factorizable model systems.
- Open systems and grand canonical formalism.
- Ideal quantum fluids. Bose-Einstein and Fermi-Dirac statistics.
- Non-factorizable systems. The Ising model.
- Introduction to critical phenomena.

4. Academic activities

Programmed educational activities 2.4 ECTS (60 hours) distributed as follows:

- Participative master classes (34 hours).
- Group problem solving classes (20 hours).
- Simulation practices (6 hours).
- Study and work by the student 3.44 ECTS (86 hours).
- Evaluation 0.16 ECTS (4 hours).

5. Assessment system

The student must demonstrate that they has achieved the expected learning results by means of the following evaluation activities.

Individual resolution of a problem, and its oral presentation (20% of the final grade).

Passing the subject by means of a single global test.

Completion of a theoretical-practical test at the end of the term on all the contents of the syllabus, including those corresponding to the simulation practices (if these have not been previously evaluated). This test will consist of two parts:

Part A: compulsory for all students (80% of the final grade)

Part B: one additional problem (20% of the final grade). Students who have passed activity 1 are exempted from taking this part of the final exam.