

Academic Year/course: 2022/23

## 39149 - Biological Physics

### Syllabus Information

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**Academic Year:** 2022/23

**Subject:** 39149 - Biological Physics

**Faculty / School:** 100 - Facultad de Ciencias

**Degree:** 577 - Joint Program in Physics and Mathematics

**ECTS:** 5.0

**Year:**

**Semester:** Second semester

**Subject Type:** Optional

**Module:**

## 1. General information

### 1.1. Aims of the course

The aims of the course are aligned with the following Sustainable Development Goals (SDGs):

- Goal 4: Quality Education

## 2. Learning goals

## 3. Assessment (1st and 2nd call)

## 4. Methodology, learning tasks, syllabus and resources

### 4.1. Methodological overview

The learning process that has been designed for this subject is based on the following:

**Lectures:** They present the student with the basic theoretical contents for the acquisition of the competences. The development of the class allows the discussion and participation of the student.

**Group problem solving:** The student must solve and present the solution (or the difficulties encountered on the way to it) of the problems posed by the lecturers. The subject allows the problems to be presented from different points of view and gives rise to discussion.

**Laboratory practices and simulation:** It will allow the student to check and put into practice the knowledge acquired in the theoretical sessions.

**Study and presentation of scientific works:** The student will acquire skills in the study and analysis of advanced literature and case studies, so that it will integrate the knowledge and techniques acquired during the course. It will also provide the student with skills in the presentation and discussion of scientific results.

### 4.2. Learning tasks

The program offered to the student to help him/her achieve the expected results includes the following activities:

On site work: 2 ECTS (50 hours) distributed as follows:

1A .- Lectures (30 hours).

1B .- Group problem solving classes and presentation of papers (17 hours).

1C .- Laboratory and/or simulation practices (3 hours).

Study of scientific works in the context of the subject 0.9 ECTS (22.5 hours).

Study and non-attendance work by the student 2 ECTS (50 hours)

Assessment 0.1 ECTS (2.5 hours).

### **4.3. Syllabus**

#### **I . FUNDAMENTALS**

0.- Physics and Biology. Motivation and historical introduction.

1.- Review of Molecular and Cellular Biology. Biological molecules: DNA, RNA and proteins. Membranes.

2.- Random walks and diffusion.

3.- Statistical Physics in and out of balance.

4.- Life at low Reynolds number.

#### **II. APPLICATIONS.**

5.- Water properties.

6.- Physics of Biopolymers.

7.- Cooperative phenomena.

8.- Self-organization phenomena.

9. - Molecular machines: enzymes and molecular motors.

10.- Membranes and physics of the nervous system: neurons and networks.

11.- Systems biology. Genetic regulation networks.

Appendix: Methods of Numerical Simulation in Biomolecules.

### **4.4. Course planning and calendar**

Calendar of lectures and presentation of papers

The schedule of the lectures will be as established by the Faculty of Science and will be announced in advance.

There will be 4 hours per week of classroom sessions. Three hours per week will be devoted to theoretical contents (lectures) and one hour to group problem solving and/or presentation and discussion of papers.

The schedule for practical sessions and numerical simulation tutorials will be determined depending on the number of students enrolled.

The practical classes will be given in afternoon sessions.

Assessment : The assessment dates by means of a global written exam are those determined and published each year by the Dean of the Faculty of Sciences on its website.

### **4.5. Bibliography and recommended resources**

<http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=39149>