Universidad Zaragoza

Academic Year/course: 2021/22

68452 - Introduction to Computational Methods in Biology

Syllabus Information

Academic Year: 2021/22
Subject: 68452 - Introduction to Computational Methods in Biology
Faculty / School: 100 - Facultad de Ciencias
Degree: 626 -
ECTS: 6.0
Year: 01
Semester: First semester
Subject Type: Compulsory
Module:

1. General information

1.1. Aims of the course

The course will provide the students with basic skills regarding computation required for the successful completion of their Master studies.

1.2. Context and importance of this course in the degree

Different courses in this Master assume that all students have basic programming skills, and are acquainted with programming languages such as R, as well as elementary knowledge on Statistics and basic algorithms. This introductory course covers this basic knowledge.

1.3. Recommendations to take this course

No specific recommendations are applicable.

2. Learning goals

2.1. Competences

Transversal Competences:

- CT 01 ? To properly manage available resources and time for solving a problem or developing a project.
- CT 02 ? To communicate their own conclusions and the advanced knowledge providing rationale for them to both specialized and non-specialized audiences in a clear and unambiguous way.
- CT 03 ? To convey oral, written and graphical information using appropriate presentation tools and within space and time restrictions.
- CT 05 - Use Information and Communications Techniques (ICTs) as a tool for expression and communication
- CT 06 - To be proficient in knowledge that provides a basis for the proposal and development of ideas, specifically within the context of research

Specific Competences

- CE 29 Understand and manage the information technology in order to accurately and efficiently communicate to system managers and other computational experts the problems and needs that appear in research on biological and / or bioinformatics problems.
- CE 30 Be acquainted and manage a set of basic computer tools for the development and study of biological problems.
- CE 31 Efficiently manage web resources that are useful for the development and study of biological problems.
- CE 32 Exhibit skill in the use of some of the most widely used programming languages in the field of biological and / or bioinformatic problems.

- CE 33 Know how to construct and develop code to solve relatively simple problems in relation to the treatment of biological and / or bioinformatics data.

2.2. Learning goals

- Students will learn essential concepts and acquire skills in using widely-used computer tools required to carry out computational work in Biology and Biomedicine.
- Students will be able to describe the essentials of computer systems supporting web- and cloud-based resources for the analysis of biological data.
- Students will be able to identify, assess and efficiently apply available computer-based tools used in biotechnological and biomedical environments.
- Students will be able to effectively and efficiently catch up on the use of applications used in later courses in the Master.
- Students will be able to follow and adapt to the new trends in Biotechnology and Biomedicine-oriented computational tools.

2.3. Importance of learning goals

Mastery in computational skills is undoubtedly required for practitioners and researchers in Biophysics aiming at completing their studies and, moreover, develop a professional career.

3. Assessment (1st and 2nd call)

3.1. Assessment tasks (description of tasks, marking system and assessment criteria)

Evaluation is based upon two types of activities:

Activity	Weight
Solving of problems and practical cases, both individually and in team. Students must submit a report at the end of each session following the guidelines and presentation format to be marked. The qualifications and the corrected exercises will be made available to students for review. These types of controls are framed within the concept of continuous evaluation, which will allow monitoring of the learning process.	75%
Written exam which can include both theoretical and applied questions discussed throughout the course.	25%

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The course will follow an eminently practical approach. Theoretical sessions introducing the main concepts will be immediately followed by practical sessions where students will solve exercises (which tend to reinforce the theoretical notions) and problems within the scope of Biophysics. Problems will require a discussion of the question considered, and the methodology required for solving it: modelling the system under study, designing algorithms (which includes considerations on their correctness and efficiency) and implementing them using a programming language.

4.2. Learning tasks

- **Theory sessions** (1.5 ECTS: 15 hours), where the basic theoretical knowledge of the subject is presented to students. who are encouraged to participate.
- **Practice sessions** (2 ECTS: 20 hours), dedicated to discuss exercises and problems. They will be interspersed with the theory sessions. Students will analyse the application of the methods developed in the theory sessions by solving exercises and cases.
- **Workshops and practical work in the computer room** (2.5 ECTS: 25 hours). They will deal with aspects

presented in the theory and practice sessions.

- **Autonomous work and study** (9 ECTS: 90 hours)

4.3. Syllabus

- Basic notions on Computing.
    - Computers, their elements and basic operation.
    - Representation and coding of the information.
    - Notions of Operating Systems.
- Basic programming elements in some advanced language: common concepts and differences between platforms:
    - Data Structures
    - Control Structures
    - Functions
- Implementation of simple programs and algorithms
- Examples of numerical methods relevant to computational biology
- Use of a programming language (R) to implement statistical and data analysis tools to biological data

4.4. Course planning and calendar

The course will start the first week of the Master.

It will cover 60 face-to-face sessions, of which approximately the first 60% will correspond to computers and programming, the following 15% to the use of statistical methods for the analysis of biological data and the final 25% to the introduction of fundamental algorithms.

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course will be provided on the first day or class.

4.5. Bibliography and recommended resources

http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=68452