COURSE: BIOINFORMATICS

SUBJECT MATTER: Information Analysis (Data analysis)
MODULE: Complements
PROGRAM: Degree in Biotechnology

GENERAL FEATURES *
Type: ☐ Basic training, ☑ Compulsory, ☐ Elective
☐ Final Degree Project, ☐ Practicum
Duration: Semestral
Semester/s: 5
Number of ECTS credits: 6
Language / s: Spanish, Catalan, English

DESCRIPTION

SHORT DESCRIPTION AND JUSTIFICATION

The latest advances in genomic sequencing techniques allow nowadays to sequence the genome of any organism in few hours or days. As a result of this progress, the amount of available genomic data, together with functional annotations of each gene / protein, is growing exponentially. Bioinformatics is an emerging discipline that helps the organization, analysis, visualization and interpretation of genomic and post-genomic data to extract knowledge by combining multiple scientific disciplines (computer science, statistics, biology, physics, ...). The subject will offer an overview of the applications of the most common bioinformatics tools for the resolution of biotechnological and bioengineering problems, with special emphasis on the analysis of sequence-function relationships in proteins. Students will receive the necessary training to understand the techniques used by different bioinformatics applications as well as their fundamentals. Each conceptual block of the subject will be divided into an applied module, in which examples and practical demonstrations of how to use the corresponding bioinformatic tools are presented, and a theoretical module, in which the concepts and foundations of said tools are exposed.

COMPETENCES (of the course placed in relation to the pre-assigned competences in the subject matter)

- That students can gather and interpret relevant data (normally within their area of study) to think over and make judgments on relevant social, scientific or ethical issues (CB3).
- Be able to work in a multidisciplinary environment (T2).
- Be able to use tools, systems or processes to carry out the activities in the field of Biotechnology according to the established requirements (E4).
- Be able to analyse, integrate and interpret data and information in the field of Biosciences (E7).

PREVIOUS REQUIREMENTS

CONTENTS


1. INTRODUCTION

2. ELECTRONIC DATABASES

3. SEQUENCES COMPARISON

4. PROTEIN FAMILIES

5. EVOLUTIONARY PROCESSES
Evolution and molecular phylogeny. Methods for the reconstruction and interpretation of phylogenetic trees.

6. PROTEIN STRUCTURE
METHODOLOGY

LEARNING ACTIVITIES

<table>
<thead>
<tr>
<th>Learning Activities</th>
<th>ECTS Credits</th>
<th>Competences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>1,3</td>
<td>B3, T2, E4, E7</td>
</tr>
<tr>
<td>Case and Problem-Solving Sessions</td>
<td>0,7</td>
<td>B3, T2, E4, E7</td>
</tr>
<tr>
<td>Seminars</td>
<td>0,1</td>
<td>B3, T2, E4, E7</td>
</tr>
<tr>
<td>Practical and Lab Work</td>
<td>-</td>
<td>B3, T2, E4, E7</td>
</tr>
<tr>
<td>Presentations</td>
<td>-</td>
<td>B3, T2, E4, E7</td>
</tr>
<tr>
<td>Personal Study</td>
<td>3,6</td>
<td>B3, T2, E4, E7</td>
</tr>
<tr>
<td>Assessment Tasks (Exams, Continuous Assessment...)</td>
<td>0,3</td>
<td>B3, T2, E4, E7</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>6,0</strong></td>
<td><strong>B3, T2, E4, E7</strong></td>
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</table>

TEACHING METHODOLOGY

It is based in the following activities:

- Presentation and explanation of contents by a teacher (possibly including demonstrations).
- Resolution of exercises and problems, and exposition / discussion of cases by a teacher with the active participation of students.
- Period of instruction carried out by a teacher with the aim of reviewing, discussing and resolving doubts about the materials and topics presented in the lectures and in the case and problem-solving sessions.
- Personal work of the student necessary to acquire the competences of each subject matter, and to assimilate the knowledge exposed in lectures and case and problem-solving sessions, using the recommended reference materials. They also include the preparation of tasks related to the other activities, and the preparation of exams.
- Oral and / or written tests made during the academic period of a course, or once it has finished (final exams, follow-up controls)
**ASSESSMENT**

**ASSESSMENT METHODS**

<table>
<thead>
<tr>
<th>Assessment methods</th>
<th>Weight</th>
<th>Competences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final Exam (EX)</td>
<td>40%</td>
<td>E7</td>
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<tr>
<td>Midterm Exam/s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continuous Assessment Activities (AS)</td>
<td>35%</td>
<td>E4</td>
</tr>
<tr>
<td>Reports and Presentations (TP)</td>
<td>20%</td>
<td>B3, T2</td>
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<tr>
<td>Lab or Field Work</td>
<td></td>
<td></td>
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<tr>
<td>Projects</td>
<td></td>
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<tr>
<td>Host Student Evaluation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participation (TP)</td>
<td>5%</td>
<td>B3, T2</td>
</tr>
</tbody>
</table>

**LEARNING OUTCOMES**

- The student must demonstrate that he identifies and knows how to access the information of the main databases with biological information. (→ B3, T2, E7) [Follow-up activities, Reports and Presentations, Final Exam]
- The student must demonstrate proficiency in the correct use of basic bioinformatics tools for the analysis and comparison of genomic sequences. (→ E4) [Final Exam, Follow-up activities]
- The student must demonstrate adequacy to correctly formulate and execute a strategy based on bioinformatic tools that allow the resolution of bioscience problems. (→ E4, E7) [Final exam]

**QUALIFICATION**

- Follow-up activities will consist of a minimum of 4 tests, which will include questions of theoretical fundamentals such as quizzes and practical resolution of exercises. From the direct average of the results of the tests, the AS grade will be obtained, scored over 10 points.
- An individual or group project will be carried out on the subject proposed by the teacher and the result can be exposed and discussed with the rest of the students and / or the teacher. The project, as well as the participation in the presentations, will make up the TP grade, scored over 10 points.
- The final exam will consist of a theoretical foundations part (EX-T, scored over 2 points) and a problems solving part (EX-P scored over 8 points). The sum of the qualification of both parts will result in the final grade of the exam EX, scored over 10 points.
- The final grade of the subject will be \(0.4 \times (EX-T + EX-P) + 0.35 \times AS + 0.25 \times TP\) as long as each of the qualifications involves a minimum 50% of its value. Otherwise, the final grade of the subject will correspond to the lowest grade of them scored over 10 points.
In the second ordinary call of the subject it will be possible to re-evaluate the AS, TP and / or EX grades that have not reached the minimum of 50% of their value through the activities proposed by the professor. In this case, the final grade of the subject will be calculated in the same way as in the previous paragraph. Once the ordinary calls of the subject have been exhausted, the final grade of the subject will be directly the qualification of the final exam EX obtained in the successive extraordinary calls.

ASSESSMENT OF THE COMPETENCES

For the evaluation of competences B3 and T2, the grades of the reports and presentations, and of the participation (TP) will be used as indicators. For the evaluation of competence E4, the grades of the follow-up activities (AS) will be used as indicators. For the evaluation of competence E7, the final exam grade (EX) will be used as an indicator. In the case of extraordinary calls, the final exam grade (EX) will be used as the sole indicator for the evaluation of all the competences.

BIBLIOGRAPHY


DOCUMENT HISTORY

PREVIOUS REVISIONS
February 22nd 2019, Dr. Xevi Biarnés

CURRENT REVISION
February 22nd 2019, Dr. Xevi Biarnés