SHORT DESCRIPTION AND JUSTIFICATION

Mathematics is an essential tool in experimental science and engineering. This course aims to deepen into the mathematical knowledge acquired in the secondary education, and develop the ability to apply that knowledge in the area of Chemistry and Biomolecular Sciences.


COMPETENCES

- That students demonstrate knowledge in the area of study, which is mostly constructed on the grounds of the general secondary education (high school). Even though this knowledge is usually at the level of advanced textbooks, it also includes some of the corresponding state-of-the-art (CB1).
- That students have the ability to 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 understand and apply basic knowledge of Mathematics, Chemistry, Physics and Biology to the field of Biotechnology (E1).

PREVIOUS REQUIREMENTS

Competences of the earlier educational stages.
CONTENTS

- **Complex number**
  Imaginary and complex numbers. Basic operations. Exponential and logarithmic functions.

- **Linear algebra**

- **Vector space and linear transformations**
  Vector space. Basis and dimension. Change of basis. Linear transformations in the Euclidean space. Matrix representation of a LT.

- **Inner product space and secular equations**

- **Real functions**
  Definition. Limit. Continuity. Continuous functions and their properties

- **Derivation**

- **Integration**

- **Ordinary differential equations**

- **Laplace transform**
  Definition and existence theorem. Properties. Problem solving and initial value problems.

- **Multivariable calculus**

- **System of linear differential equations**
METHODOLOGY

LEARNING ACTIVITIES

<table>
<thead>
<tr>
<th>Learning activities</th>
<th>ECTS Credits</th>
<th>Competences</th>
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</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>2.8</td>
<td>CB1, E1</td>
</tr>
<tr>
<td>Case and Problem-Solving Sessions</td>
<td>1.9</td>
<td>CB1, CB3, E1</td>
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<td>Seminars</td>
<td>0.2</td>
<td>CB1, CB3, E1</td>
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<tr>
<td>Practical and Lab Work</td>
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<td>CB1, CB3, E1</td>
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<tr>
<td>Presentations</td>
<td>-</td>
<td>CB1, CB3, E1</td>
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<tr>
<td>Personal Study</td>
<td>6.7</td>
<td>CB1, CB3, E1</td>
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<td>Assessment Tasks (Exams, Continuous Assessment...)</td>
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<td><strong>TOTAL</strong></td>
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TEACHING METHODOLOGY

The expository sessions of the course (which account for the 75% approx. of sessions) combine the exposure of theoretical content with solving examples and exercises, directly related with the theory explained. The practical sessions (25% approx.) are devoted exclusively to solve cases and problems. Additionally, some exercises are proposed as personal study and they are later corrected by the teacher.

The course will also have seminar sessions devoted to the resolution of questions raised by students, collecting synthetically the material studied so far. For personal study, students have available a collection of problems and exercises and textbooks.

ASSESSMENT

ASSESSMENT METHODS

<table>
<thead>
<tr>
<th>Evaluation Methods</th>
<th>Weight</th>
<th>Competences</th>
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<tbody>
<tr>
<td>Final Exam</td>
<td>40%</td>
<td>CB1, E1</td>
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<td>Midterm Exam/s</td>
<td>30%</td>
<td>CB1, E1</td>
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<tr>
<td>Continuous Assessment Activities</td>
<td>30%</td>
<td>CB1, CB3, E1</td>
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<td>Reports and Presentations</td>
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<td>CB1, CB3, E1</td>
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<td>Lab or Field Work</td>
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<td>Projects</td>
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<td>Host Student Evaluation</td>
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<tr>
<td>Participation</td>
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</table>
LEARNING OUTCOMES

- Students must demonstrate that they know and understand the main concepts and properties of calculus, differential calculus and linear algebra. (E1, CB1)
- Students must demonstrate knowledge and skill for solving mathematical equations involving one or many variables, in calculating derivatives and integrals and they must know how to solve differential equations. (E1, CB1)
- Students must demonstrate proficiency in calculus and linear algebra for selecting and applying the most suitable mathematical methods in solving problems related with biosciences. (CB3)

QUALIFICATION

The evaluation of the course considers the scores of the follow-up activities, whose averages represent a continuous assessment mark (EC), two partial exams, whose average represents a second note (EP) and the final exam (EF), obtaining a mark out of 10. The final grade (FG) is calculated by the formula:

$$FG = 0.3*EC + 0.3*EP + 0.4*EF.$$  

The final exam has two different parts, covering the subjects of each partial exam. The final score is calculated as the average of the two parts, only if the score is greater than 3.5 out 10 in both parts. On the contrary, the final score will be the lowest score of both parts. When the score obtained at the final exam corresponding to a midterm exam improve the mark obtained earlier, this mark will replace it.

In the final examinations, the student that in any of the midterm exams has a score of 4.0 out 10 or higher, he can choose between giving up this part of the exam (assuming for this part of the exam the mark corresponding to the midterm exam) or submit it to the effect of improving the grade.

ASSESSMENT OF COMPETENCES

For the evaluation of E1/CB1 competencies, it is used the final exams mark as indicator. For the evaluation of competency CB3, the indicator used is the final mark of the continuous assessment activities.
BIBLIOGRAPHY


DOCUMENT HISTORY

PREVIOUS REVISIONS

CURRENT REVISION
March 6, 2019, Roger Estrada