200003 - FM - Fundamentals of Mathematics

Coordinating unit: 200 - FME - School of Mathematics and Statistics
Teaching unit: 749 - MAT - Department of Mathematics
Academic year: 2019
Degree: BACHELOR'S DEGREE IN MATHEMATICS (Syllabus 2009). (Teaching unit Compulsory)
ECTS credits: 7,5
Teaching languages: Catalan, Spanish

Teaching staff
Coordinator: JAUME MARTÍ FARRÉ
Others:
MARIA LUZ ALBEROLA PEREZ - M-A
MARINA GARROTE LOPEZ - M-A
LÁZARO ALBERTO LARRAURI BORROTO - M-A
JAUME MARTÍ FARRÉ - M-A
JOSÉ LUIS RUIZ MUÑOZ - M-A

Degree competences to which the subject contributes

Specific:
1. CE-2. Solve problems in Mathematics, through basic calculation skills, taking in account tools availability and the constraints of time and resources.
2. CE-3. Have the knowledge of specific programming languages and software.
3. CE-4. Have the ability to use computational tools as an aid to mathematical processes.

General:
4. CB-1. Demonstrate knowledge and understanding in Mathematics that is founded upon and extends that typically associated with Bachelor's level, and that provides a basis for originality in developing and applying ideas, often within a research context.
5. CB-2. Know how to apply their mathematical knowledge and understanding, and problem solving abilities in new or unfamiliar environments within broader or multidisciplinary contexts related to Mathematics.
6. CB-3. Have the ability to integrate knowledge and handle complexity, and formulate judgements with incomplete or limited information, but that include reflecting on social and ethical responsibilities linked to the application of their knowledge and judgements.
7. CG-1. Show knowledge and proficiency in the use of mathematical language.
8. CG-2. Construct rigorous proofs of some classical theorems in a variety of fields of Mathematics.
9. CG-3. Have the ability to define new mathematical objects in terms of others already know and ability to use these objects in different contexts.
10. CG-4. Translate into mathematical terms problems stated in non-mathematical language, and take advantage of this translation to solve them.
12. CG-6 Detect deficiencies in their own knowledge and pass them through critical reflection and choice of the best action to extend this knowledge.

Transversal:
11. SELF-DIRECTED LEARNING. Detecting gaps in one's knowledge and overcoming them through critical self-appraisal. Choosing the best path for broadening one's knowledge.
The main objective of the course is to help saving the bridge between secondary school mathematics and university mathematics by providing students the necessary foundation for developing their undergraduate studies.

This objective involves two intertwined lines. One is to make students aware of the essential role of the concept of proof in mathematics. The other one is to securely establish the basic contents related to language, numerical sets, and elements of algebra.

### Teaching methodology

Theoretical classes essentially consist in instructor presentations, including detailed examples. In practical sessions, some problems are solved by the instructors as a model, and some others by the students.

### Learning objectives of the subject

The main objective of the course is to help saving the bridge between secondary school mathematics and university mathematics by providing students the necessary foundation for developing their undergraduate studies.

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### Study load

<table>
<thead>
<tr>
<th>Total learning time: 187h 30m</th>
<th>Hours large group:</th>
<th>45h</th>
<th>24.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours medium group:</td>
<td>0h</td>
<td></td>
<td>0.00%</td>
</tr>
<tr>
<td>Hours small group:</td>
<td>30h</td>
<td></td>
<td>16.00%</td>
</tr>
<tr>
<td>Guided activities:</td>
<td>7h 30m</td>
<td></td>
<td>4.00%</td>
</tr>
<tr>
<td>Self study:</td>
<td>105h</td>
<td></td>
<td>56.00%</td>
</tr>
</tbody>
</table>
## Content

<table>
<thead>
<tr>
<th>Mathematical formalism: statements and proofs</th>
<th>Learning time: 28h 45m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory classes: 7h</td>
<td>Practical classes: 5h</td>
</tr>
</tbody>
</table>

**Description:**

<table>
<thead>
<tr>
<th>Sets and mappings</th>
<th>Learning time: 28h 45m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory classes: 7h</td>
<td>Practical classes: 5h</td>
</tr>
</tbody>
</table>

**Description:**

<table>
<thead>
<tr>
<th>Relations, operations and structures</th>
<th>Learning time: 31h 30m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory classes: 9h</td>
<td>Practical classes: 4h</td>
</tr>
</tbody>
</table>

**Description:**

<table>
<thead>
<tr>
<th>Number sets. Numerability</th>
<th>Learning time: 16h 45m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory classes: 4h</td>
<td>Practical classes: 3h</td>
</tr>
</tbody>
</table>

**Description:**
| The field of complex numbers | Learning time: 16h 45m  
Theory classes: 4h  
Practical classes: 3h  
Self study : 9h 45m |
|-----------------------------|-------------------------------------------------|
| Arithmetic | Learning time: 28h 45m  
Theory classes: 7h  
Practical classes: 5h  
Self study : 16h 45m |
| Polynomials | Learning time: 28h 45m  
Theory classes: 7h  
Practical classes: 5h  
Self study : 16h 45m |
The subject is assessed by means of the continuous assessment and a final exam. The continuous assessment mark will be obtained from a not eliminatory midterm exam (similar to the final exam), and from qualifying some other activities carried out during the term.

The final mark of the subject will be worked out according to the formula:

$$\text{Mark} = \max\{\text{final exam mark}; \ 70\% \ \text{final exam mark} + 25\% \ \text{midterm exam mark} + 5\% \ \text{other activities}\}.$$ 

An extra exam will take place on July for students that failed the regular semester.

### Bibliography

**Basic:**


**Complementary:**