Course guide
200242 - SEC - Mathematics for Secondary Education

Last modified: 19/05/2022

Unit in charge: School of Mathematics and Statistics
Teaching unit: 749 - MAT - Department of Mathematics.
Degree: BACHELOR'S DEGREE IN MATHEMATICS (Syllabus 2009). (Optional subject).
Academic year: 2022 ECTS Credits: 6.0 Languages: Catalan

LECTURER

Coordinating lecturer: MARIA ALBERICH CARRAMIÑANA

Others:
Primer quadrimestre:
MARIA ALBERICH CARRAMIÑANA - M-A
MONICA BLANCO ABELLAN - M-A

PRIOR SKILLS

Basic but solid math training.

REQUIREMENTS

Interest in the social, cultural and historical aspects of mathematics, very particularly in its teaching in the last years of high school.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
3. CE-2. Solve problems in Mathematics, through basic calculation skills, taking in account tools availability and the constraints of time and resources.
4. CE-4. Have the ability to use computational tools as an aid to mathematical processes.
5. Ability to solve problems from academic, technical, financial and social fields through mathematical methods.

General:
1. CB-4. Have the ability to communicate their conclusions, and the knowledge and rationale underpinning these to specialist and non-specialist audiences clearly and unambiguously.
2. To have developed those learning skills necessary to undertake further interdisciplinary studies with a high degree of autonomy in scientific disciplines in which Mathematics have a significant role.
6. CG-1. Show knowledge and proficiency in the use of mathematical language.
7. CG-2. Construct rigorous proofs of some classical theorems in a variety of fields of Mathematics.
8. 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.
9. CG-4. Translate into mathematical terms problems stated in non-mathematical language, and take advantage of this translation to solve them.
10. 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. EFFICIENT ORAL AND WRITTEN COMMUNICATION. Communicating verbally and in writing about learning outcomes, thought-building and decision-making. Taking part in debates about issues related to the own field of specialization.
12. 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.
TEACHING METHODOLOGY

Theory classes, which will include the historical and technical contextualization of the syllabus, followed by practical classes, in which the theory will be applied to problem solving in an interactive way with the students. Collaborative work in the workshops through projects with a fortnightly development period. Seminar sessions held by the students, who will present the results of their work in each project, and by invited external visitors.

LEARNING OBJECTIVES OF THE SUBJECT

- To show the essential unity of mathematics through the study of some classical problems that are part of the general mathematical culture, so they are also of intrinsic interest. These are interesting topics that, due to their transversal nature, are excluded from the contents of more specialized subjects.

- To make it clear, through real and relevant historical examples, that classical mathematical problems are seldom solved in a framework that is closed up on itself, but rather the influence of seemingly distant fields has been decisive. In addition, these solutions have often had unintended implications.

- To understand the relevance of the technical and historical contextualization of any mathematical topic that needs to be explained, presented or studied.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours large group</td>
<td>30,0</td>
<td>20.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>30,0</td>
<td>20.00</td>
</tr>
<tr>
<td>Self study</td>
<td>90,0</td>
<td>60.00</td>
</tr>
</tbody>
</table>

Total learning time: 150 h

CONTENTS

Classic problems in mathematics

Description:
- Geometry of the triangle.
- Geometry of the circumference.
- Euler's formula and the five regular polyhedra.
- Chaos and fractals.
- Arithmetic and cryptography.
- The sets of the natural numbers, the integers, the rationals, the real ones and the complexes.
- Hyperbolic geometry.
- Spherical geometry and cartography.
- Statistics. The case of the normal distribution.
- The transcendence of pi and e.
- Lattice geometry and Pick's theorem.

Full-or-part-time: 120h
Theory classes: 24h
Guided activities: 24h
Self study: 72h
**Dissemination workshop**

**Description:**
Creative projects related to the subject will be developed with the aim of bringing mathematical knowledge and its technological applications closer to the general public and to secondary school students in particular.

**Full-or-part-time:** 30h
- Theory classes: 6h
- Practical classes: 6h
- Self study: 18h

**GRADING SYSTEM**

Participation in class and written and oral presentations, 50%
Midterm exam, 20%
The final exam has two alternatives:
A) with the content not included in the midterm exam, 30%
B) with the content of the whole course 50% (you will lose the midterm exam score)

**EXAMINATION RULES.**

The exams will consist of problems and theory questions, possibly in the form of a summary of a long topic.

**BIBLIOGRAPHY**

**Basic:**

**Complementary:**