Course guide  
200112 - EALG - Algebraic Structures

Last modified: 19/04/2022

Unit in charge: School of Mathematics and Statistics  
Teaching unit: 749 - MAT - Department of Mathematics.

Degree: BACHELOR'S DEGREE IN MATHEMATICS (Syllabus 2009). (Compulsory subject).

Academic year: 2022  ECTS Credits: 7.5  Languages: Catalan

LECTURER

Coordinating lecturer: JORDI GUARDIA RUBIES

Others: Primer quadrimestre:  
JORDI GUARDIA RUBIES - M-A, M-B  
SANTIAGO MOLINA BLANCO - M-A, M-B  
ANA RIO DOVAL - M-A, M-B

PRIOR SKILLS

Contents of Foundations of Mathematics: sets and maps; equivalence relations and order relations; permutations; arithmetic of integers and of polynomials; Euclidean algorithm and Bézout's identity; congruences (modular arithmetic); ...  
Contents of Linear Algebra: vector space, subspace and quotient vector space; bases; matrices and matrix calculus; ...

REQUIREMENTS

The first year courses Foundations of Mathematics and Linear Algebra

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.

Generical:
5. 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.
6. 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.
7. 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.
8. CG-1. Show knowledge and proficiency in the use of mathematical language.
10. 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.
11. CG-4. Translate into mathematical terms problems stated in non-mathematical language, and take advantage of this translation to solve them.

Transversal:
4. 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

During the theory sessions, the teacher presents the contents of the course. In the laboratory sessions, with fewer students, some problems and practical activities will be worked out.

LEARNING OBJECTIVES OF THE SUBJECT

In this course the student gets exposed to and learns some of the main results about the most common algebraic structures: groups, rings, fields and modules.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours large group</td>
<td>45,0</td>
<td>24.00</td>
</tr>
<tr>
<td>Self study</td>
<td>112,5</td>
<td>60.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>30,0</td>
<td>16.00</td>
</tr>
</tbody>
</table>

Total learning time: 187.5 h

CONTENTS

Rings

Description:

Full-or-part-time: 62h 30m
Theory classes: 15h
Practical classes: 10h
Self study: 37h 30m

Fields

Description:

Full-or-part-time: 62h 30m
Theory classes: 15h
Practical classes: 10h
Self study: 37h 30m
**Groups**

**Description:**
Basic concepts on groups. Classical examples of groups. Action of a group on a set. Sylow subgroups. Representations of groups. Discrete logarithm

**Full-or-part-time:** 37h 30m  
Theory classes: 9h  
Practical classes: 6h  
Self study: 22h 30m

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**Modules**

**Description:**
Elementary concepts on modules. Finitely generated modules over principal ideal domains. Applications.

**Full-or-part-time:** 25h  
Theory classes: 6h  
Practical classes: 4h  
Self study: 15h

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**GRADING SYSTEM**

Along the course we will make some assessed activities, representing the 15% of the final grade of the course. A midterm exam (35%) and a final exam (50%) will complement these activities to yield the final grade. If the final exam grade is higher than this weighted mean, the final grade will be that of the exam.

Students failing the course have an extraordinary exam at the end of the academic year.

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**BIBLIOGRAPHY**

**Basic:**

**Complementary:**

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**RESOURCES**

**Hyperlink:**