Course guides  
200246 - AABS - Abstract Algebra

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: 2021  
ECTS Credits: 3.0  
Languages: Catalan, English

LECTURER

Coordinating lecturer: JOSEP ALVAREZ MONTANER

Others: Primer quadrimestre:  
JOSEP ALVAREZ MONTANER - M-A

PRIOR SKILLS

Minimal concepts of algebra, structures, substructures, homomorphisms. Abilities learned in the Fundamentals of Mathematics and Algebraic Structures subjects are perfectly adequate.

REQUIREMENTS

Even though it would not be strictly necessary, it is highly recommended to have previously studied the subject of Algebraic Structures.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
GM-CE2. CE-2. Solve problems in Mathematics, through basic calculation skills, taking in account tools availability and the constraints of time and resources.
GM-CE4. CE-4. Have the ability to use computational tools as an aid to mathematical processes.
GM-CE6. Ability to solve problems from academic, technical, financial and social fields through mathematical methods.

Generical:
GM-CB5. 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.
GM-CG1. CG-1. Show knowledge and proficiency in the use of mathematical language.
GM-CB4. 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.
GM-CG2. CG-2. Construct rigorous proofs of some classical theorems in a variety of fields of Mathematics.
GM-CG3. 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.
GM-CG4. CG-4. Translate into mathematical terms problems stated in non-mathematical language, and take advantage of this translation to solve them.
GM-CG6. 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:
04 COE. 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.
07 AAT. 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
Two weekly hours, with lecture and problems combined. There will be problems to submit and be corrected.

LEARNING OBJECTIVES OF THE SUBJECT
Introduction to the language of categories and functors.
Basic concepts and results in the theory of modules over commutative rings.
Introduction to algebraic varieties.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>Self study</td>
<td>45,0</td>
<td>60.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>15,0</td>
<td>20.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>15,0</td>
<td>20.00</td>
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</tbody>
</table>

Total learning time: 75 h

CONTENTS

Categories and functors

Description:
Categories and functors. Equivalence of categories.

Full-or-part-time: 12h 30m
Theory classes: 3h
Practical classes: 2h
Self study: 7h 30m

Modules

Description:
Modules and morphisms of modules. Basic operations with modules. Complexes of modules and its homology. The Hom functor and the tensor product functor.

Full-or-part-time: 32h 30m
Theory classes: 7h
Practical classes: 6h
Self study: 19h 30m

Algebras and algebraic varieties

Description:
Ideals and algebraic varieties. Finitely generated algebras. Equivalence of categories between algebraic varieties and finitely generated algebras.

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

The submitted problems will be evaluated and will count up to a 60% of the final grading. For the rest there will be a final exam but, in the case of small groups, it may be replaced with a directed work related to the course.

BIBLIOGRAPHY

Basic: