Universitat Autònoma de Barcelona

2018/2019

Algebraic structures

Code: 100096
ECTS Credits: 9

Degree	Type	Year	Semester
2500149 Mathematics	OB	2	2

Contact

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Use of languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: Yes
Some groups entirely in Spanish: No

Teachers

Francesc Perera Domènech
Joan Claramunt Caros
Álvaro Sánchez Madrigal

Prerequisites

the academic prerequisites consist of the contents of the courses "Fonaments de les Matemàtiques" and "Àlgebra Lineal" from the first year. The hability to manipulate algebraic operations, and the familiarity you already acquiered with arithmetic operations and permutation group will be enhanced and you will enter a further layer up in abstraction, a common feature in mathematics.

Objectives and Contextualisation

The main objective of this course is to introduce tha basic algebraic structures: groups, commutative rings and fields. A lot of emphasis will be put in getting to know a variety of commutative rings, we will study higly non-trivial examples of those and we will study ways to produce even more examples. The sorts of rings we will encounter are typically those that appear in the theory of divisions. In the last part of the course we will introduce the notion of a field and field extensions and we will focus more particularly on finite fields.

Content

1. Groups.

- Groups, subgroups, homomorphisms.
- Lagrange's Theorem.
- Normal Subgroups. Quotient Groups.
- Isomorphism Theorems.
- Groups acting on sets.

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- Singular Groups: cyclic, symmetric and some abelian groups.

2. Commutative Rings.

- Rings, ideals, quotient rings, principal ideals.
- Morfphisms. Isomorphism Theorems for rings.
- Maximal and Prime Ideals. Zorn's Lemma.
- Fraction fiel of a Domain.
- Polynomial Rings.

3. Factorization.

- Irreducibles and primes. Unique Factorization Domains.
- Greates common divisor.
- Principal Ideal Domains.
- Ani Principal Ideal Domain is a Unique Factorization Domain.
- Factoritzation in polynomial rings. Eisenstein's criterion.

4. Finite Fields.

- Fields, characteristic, subfields.
- Existence and unicity of finite fields.