COURSE DATA

DATA SUBJECT

Code: 34168
Name: Algebraic structures
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1107 - Degree in Mathematics	Facultat de Ciències Matemàtiques	2	First quarter
1928 - Double Degree Program Physics-Mathematics	Facultat de Ciències Matemàtiques	4	First quarter
1935 - Double Degree Program in Mathematics-Telematics Engineering	Facultat de Ciències Matemàtiques	2	First quarter
1936 - Double Degree Program in Mathematics-Telematics Engineering	Facultat de Ciències Matemàtiques	2	First quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1107 - Degree in Mathematics	Algebraic structures	COMPULSORY
1928 - Double Degree Program Physics-Mathematics	Cuarto Curso (Obligatorio)	COMPULSORY
1935 - Double Degree Program in Mathematics-Telematics Engineering	Segundo curso	COMPULSORY
1936 - Double Degree Program in Mathematics-Telematics Engineering	Segundo curso	COMPULSORY

COORDINATION

BALLESTER BOLINCHES ADOLFO

PEREZ CALABUIG VICENT

SUMMARY

Algebra is the branch of mathematics that focuses more specifically on the structure of operations defined on particular sets.
At the origin of this discipline lies the solution of polynomial equations by radicals, and much of its development was driven by this objective.

In this course, we will focus on the basic structures that offer the most interesting development: **groups and rings**. We will formalize the notion of the **ring of polynomials**, laying the groundwork for the development of **Galois Theory**, which is the core content of the subject *Algebraic Equations* in the following course, as well as the course *Linear Algebra and Geometry II*, whose central aim is the theory of **endomorphisms** and the study of **linear or quadratic structures invariant under a change of basis**.

Algebra is important in itself and in other branches of mathematics: **elementary geometric transformations in Euclidean geometry**; **transformation groups** that define different geometries¿linear, differential, algebraic, analytical; **groups that capture topological invariants**; groups in **coding theory**, **cryptography**, and **arithmetic**.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

OTHER REQUIREMENTS

Students are expected to have completed the course in Basic Mathematics.
In addition, it is advisable that they have also taken the course *Linear Algebra and Geometry I*.

COMPETENCES / LEARNING OUTCOMES

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Adapting to new situations.

Capacity for analysis and synthesis.

Capacity for criticism.

Capacity for organization and planning.

Capacity of abstraction and modeling.

Expressing mathematically in a rigorous and clear manner.

Knowing the time and the historical context in which occurred the great contributions of women and men in the development of mathematics.

Learn autonomously.

Possess and understand the mathematical knowledge.

Reason logically and identify errors in the procedures.

DESCRIPTION OF CONTENTS

1. Groups. Subgroups. Homomorphisms.
2. Symmetric and alternating groups.
3. Action by permutations of a group. Sylow theory.
4. Rings. Subrings and ideals. Homomorphisms.
5. Divisibility in rings.
6. Polynomial rings. Factorization.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	30,00
Other activities	7,50
Classroom practices	22,50
Total hours	**60,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	0,00
Independent study and work	15,00
Preparation of lessons	52,50
Preparation for assessment activities	22,50
Resolution of case studies	0,00
Total hours	**90,00**

TEACHING METHODOLOGY

The theoretical in-person component will primarily consist of attendance at lectures delivered by the instructor responsible for this part of the course.

Emphasis will be placed on fostering student engagement through the formulation and resolution of questions during the sessions.

Attention will also be given to ensuring coherence between the lecture content and the broader structure of the course.

The practical in-person sessions will be structured in two parts: the first will involve the instructor presenting and solving a representative or conceptually motivating problem; the second will consist of collaborative group work in which students solve a set of problems assigned by the instructor.

EVALUATION

1. Theory and Practical Sessions:
Assessment will take place in two stages:

- **Continuous assessment** based on participation in both practical and theoretical classes, as well as the presentation of results during the practical sessions. Additionally, instructors may administer quizzes or tests during the semester if deemed appropriate. This component will account for **10% (one point)** of the final grade.

- **Final assessment** consisting of theoretical-practical examinations, which will account for **80% (eight points)** of the final grade. In order to pass the course, students must obtain a **minimum score of 4 out of 10** on the exams.

2. Seminars:
Participation and attendance in seminar sessions will be assessed and will contribute **10% (one point)** to the final grade.

Second Examination Session:
The scores obtained in continuous assessment and seminar participation will be carried over to the second examination session. These components **cannot be retaken or recovered** in the second session.

REFERENCES

- Abstract Algebra Autor: Dummit-Foote Editorial: Wiley 2004
- Algebra Autor: T. W. Hungerford Editorial: Springer 1974
- Un curso de Álgebra Autor: Gabriel Navarro Editorial: Universitat de València 2002
- Abstract Algebra with applications, Volums I i II Autor: K. Spindler Editorial : Marcel Dekker 1994
- Un curso de Estructuras Algebraicas Autor: Alexander Moretó https://alexmoqui.wordpress.com/2012/11/29/un-curso-de-estructuras-algebraicas/