COURSE DATA

DATA SUBJECT

Code: 34169
Name: Algebraic equations
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	3	First quarter
1928 - Double Degree Program Physics-Mathematics	Facultat de Ciències Matemàtiques	5	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1107 - Degree in Mathematics	Algebraic structures	COMPULSORY
1928 - Double Degree Program Physics-Mathematics	Quinto Curso (Obligatorio)	COMPULSORY

COORDINATION

SANUS VITORIA LUCIA

NAVARRO ORTEGA GABRIEL

SUMMARY

The aim of this course is to present the basic concepts and results of Galois theory and its application to the solvability of equations by radicals. This problem, one of the oldest in the history of mathematics, has its origin in Babylonian times, culminating in the work of Galois, who created the theory to characterize solvable equations by radicals. In this course we will begin to introduce this issue in the historical context. After reviewing the basic concepts of the theory of rings, polynomial rings fundamentally, and irreducibility criteria, we develop the rudiments of the theory of fields.

We will see how to translate the main problems into problems in the theory of groups.

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PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

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

OTHER REQUIREMENTS

A good monitoring of the subject happens to have in mind the theory of vector spaces, discussed in the course Linear Algebra and Geometry I, as well as group theory and ring theory given in the subject Algebraic Structures.

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. Irreducibility of polynomials.

2. Field extensions. Splitting fields of polynomials

3. Galois extensions. Fundamental theorem of Algebra

4. Solvables groups. Resolubility of equations by radicals.

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	24,00
Preparation of lessons	49,50
Preparation for assessment activities	16,50
Resolution of case studies	0,00
Total hours	**90,00**

TEACHING METHODOLOGY

Attendance is strongly recommended both the lectures and classes of problems.

In the lectures we give the necessary and important for understanding and troubleshooting tools.

In the problem-solving classes will deepen the assimilation and understanding of the concepts developed in the lectures by solving problems and exercises. This work will be completed by the explanations made by the teacher on board and the active participation of students in the discussion of the various arguments used in solving problems.

This course will also provide resources through the Virtual Classroom. In the same we will incorporate statements of the lists of issues and additional material that may complement the lectures and problems.

EVALUATION

The mark obtained in the exam will count 75% of the final grade. The seminar will note the 10% and 115% continuous assessment.

In the second call, the evaluation system will be the same.

To pass you must obtain a minimum grade of 4 out of 10 on the test.

REFERENCES

- D. S. DUMMIT, R. M. FOOTE, Abstract Algebra. John Wiley & Sons, 2004 (1999, 1991).
- G. NAVARRO ORTEGA, Un curso de Álgebra. Publicaciones de la Universitat de Valencia, 2002.
- T. W. HUNGERFORD, Algebra. Springer-Verlag, 1974. - N. JACOBSON, Basic Algebra. Vol.1. W.H. Freeman and Company, 1985.
- D. COX, Galois Theory¿. John Wiley & Sons, 2004.
- J.B. FRALEIGH, A first course in abstract algebra¿. Adison-Wesley Publishing Co. 7th edition, 2002.
- D.J.H. GARLING, ¿A course in Galois Theory¿. Cambridge Univ. Press, 1986.
- J. MILNE, ¿Fields and Galois Theory¿, http://www.jmilne.org/math/
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- A. M. de VIOLA PRIORI, J.E. de VIOLA PRIORI, Teoría de cuerpos y Teoría de Galois. Reverté, 2006.
- K. SPINDLER, ¿Abstract Algebra with Applications, Vol. I, II, Marcel Dekker, New York, 1994.