COURSE DATA

Data Subject

Code	44077
Name	Seminar on algebra
Cycle	Master's degree
ECTS Credits	3.0
Academic year	2024 - 2025

Study (s)

Degree	Center	Acad. year	Period
2183 - Master's Degree in Mathematical Research	Faculty of Mathematics	1	Second term

Subject-matter

Degree	Subject-matter	Character
2183 - Master's Degree in Mathematical Research	4 - Specialty in fundamental mathematics	Optional

Coordination

Name	Department
ESTEBAN ROMERO, RAMON	363 - Mathematics

SUMMARY

Fermat (deceased in 1665) conjectured that the equation xn+yn=znx^n + y^n = z^n has no solutions in positive integers if n>2n > 2. In 1995, Wiles provided the proof of this result. In this course, we will study some concepts and results from certain algebraic structures related to number theory that have been developed during various attempts to prove Fermat's conjecture.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

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

Other requirements

No additional requirements are established.

COMPETENCES (RD 1393/2007) // LEARNING OUTCOMES (RD 822/2021)

2183 - Master's Degree in Mathematical Research

- Students should apply acquired knowledge to solve problems in unfamiliar contexts within their field of study, including multidisciplinary scenarios.
- Que los estudiantes comprendan los conceptos y las demostraciones rigurosas de teoremas fundamentales de áreas transversales de las Matemáticas.
- Que los estudiantes posean la capacidad para enunciar y verificar proposiciones en alguna de las áreas de las Matemáticas y para transmitir los conocimientos matemáticos adquiridos, oralmente y por escrito.
- Que los estudiantes sean capaces de comprender de manera autónoma artículos de investigación o innovación en alguna de las áreas de las Matemáticas.

LEARNING OUTCOMES (RD 1393/2007) // NO CONTENT (RD 822/2021)

- Know and use the basic methods of number theory.
- Be able to solve issues related to the course syllabus.
- Produce mathematical content for public presentation, both oral and written.
- Search for and selectively choose bibliographic material to prepare and present work related to the course.

DESCRIPTION OF CONTENTS

1. Algebraic Numbers and Integral Dependence

Integral dependence, norms and traces, discriminant.

2. Quadratic and Cyclotomic Fields

Quadratic fields, cyclotomic fields.

3. Factorization into Irreducibles

Factorization into irreducibles, factorization in rings of quadratic integers, applications.

4. Quadratic Residues

Quadratic residues, the two squares theorem.

5. Ideals

Dedekind domains, divisibility in Dedekind domains, norm and class of ideals, applications.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	30,00	100
Development of individual work	15,00	0
Study and independent work	15,00	0
Readings supplementary material	15,00	0
TOTAL	**75,00**	

TEACHING METHODOLOGY

Master classes and problem-solving. Presentation of students' work.

EVALUATION

Continuous assessment through the resolution of proposed questions and presentation of students' work.

REFERENCES

Basic

- I. Stewart, D. Tall. Algebraic number theory and Fermat's last theorem. 4ª edición, CRC Press, Boca Raton (Florida, USA), 2016.
- T. W. Hungerford. Algebra. 2ª edición, Springer, New York (USA), 1980.

- A. Vera López, R. Esteban-Romero. Problemas y ejercicios de matemática discreta. AVL, Bilbao, 1995.