

**COURSE DATA****DATA SUBJECT****Code:** 44077**Name:** Seminar on algebra**Cycle:** Master's Degree**ECTS Credits:** 3**Academic year:** 2026-27**STUDY (S)**

Degree	Center	Acad. year	Period
2183 - Master's Degree in Mathematical Research	Facultat de Ciències Matemàtiques	1	Second quarter
2903 - Doble M.U. Prof.Educ.Second (esp. matem.) e Invest.Matem.	Facultat de Formació del Professorat	1	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
2183 - Master's Degree in Mathematical Research	Specialty in fundamental mathematics	ELECTIVES
2903 - Doble M.U. Prof.Educ.Second (esp. matem.) e Invest.Matem.		

COORDINATION

ESTEBAN ROMERO RAMON

SUMMARY

Fermat (deceased in 1665) conjectured that the equation $x^n + y^n = z^n$ has no solutions in positive integers if $n > 2$. 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 / LEARNING OUTCOMES

2183 - Master's Degree in Mathematical Research

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.

Students should apply acquired knowledge to solve problems in unfamiliar contexts within their field of study, including multidisciplinary scenarios.

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****PRESENCIAL ACTIVITIES**

Activity	Hours
Theory	30,00
Total hours	30,00

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	15,00
Independent study and work	30,00
Preparation of lessons	0,00
Preparation for assessment activities	0,00
Resolution of case studies	0,00
Total hours	45,00

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

- 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.