COURSE DATA

DATA SUBJECT

Code: 34157
Name: Mathematical analysis III
Cycle: Undergraduate Studies
ECTS Credits: 9
Academic year: 2026-27

STUDY (S)

Degree	Center	Acad. year	Period
1107 - Degree in Mathematics	Facultat de Ciències Matemàtiques	3	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1107 - Degree in Mathematics	Mathematical analysis	COMPULSORY

COORDINATION

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SUMMARY

The subject Mathematical Analysis III has two well differentiated thematic sections.

A part about Integration theory and Vector Analysis (5 ECTS) and another part about Introduction to the theory of Hilbert spaces and Fourier Analysis (4 ECTS).

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

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

OTHER REQUIREMENTS

Linear Algebra and Geometry I, Mathematical Analysis I, Mathematical Analysis II.

COMPETENCES / LEARNING OUTCOMES

1107 - Degree in Mathematics

Ability to work in teams.

Capacity for analysis and synthesis.

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.

Solve problems that require the use of mathematical tools.

Visualize and interpret the solutions obtained.

DESCRIPTION OF CONTENTS

1. More about integration.

2. Line Integrals. Green's theorem.

3. Surface Integrals. The divergence and Stokes theorems.

4. Introduction to Hilbert spaces. Projection theorem.

5. Spaces of sequences and of integrable functions.

6. Orthonormal bases. Isometry between Hilbert spaces.

7. Trigonometric series of periodic functions and their convergence in L2.

8. Convolution of periodic functions. Fourier coefficients. Properties.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	45,00
Other activities	11,00
Classroom practices	34,00
Total hours	**90,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	22,00
Independent study and work	51,00
Preparation of lessons	24,50
Preparation for assessment activities	37,50
Resolution of case studies	0,00
Total hours	**135,00**

TEACHING METHODOLOGY

a. The aim is to gradually introduce and develop the theoretical and practical content of each topic and the right tools to solve problems.

b. In the problem sessions we will apply the concepts presented in lectures to solve exercises and questions.

c. We shall propose questions and problems to work on. This study will be supervised and evaluated. In the practical sessions we will solve and correct exercises.

d. Use a symbolic computation software package that helps in the conceptual understanding and visualization. It will also serve as a testing method to provide intuitive knowledge

EVALUATION

Each student will have to demonstrate his knowledge on basic concepts, his skills and competences on the subject by means of theoretical and practical exams. Also his capacity to address issues or resolve the problems posed by the teacher will be tested.

Evaluation will use the following items:

1. Written exams that will measure both the acquisition of knowledge, the writing ability and the rigour in proofs. Written practice exams will evaluate the ability to solve problems and exercises. There will be two exams throughout the course (middle and end of course). In each exam there will be a theoretical and a practical part which will contribute each fifty percent of the final mark provided that each qualification is greater than or equal to three out of ten. There will be an exam at the end of the two thematic blocks. It takes a 5/10 to pass the exam. The normative of our Department implies that the parts can be compensated from four points each. Students who take the final exam of the entire subject, to pass Block 1, in addition to obtaining a minimum of 3 out of 10 in each of the theory and practice parts, must obtain a minimum grade of 4 out of 10 in the arithmetic average of theory and practice of each block. Otherwise, the exam grade will be the minimum between the student's grade and 3.9.

2. Participation on the tasks or controls proposed by the teacher will be evaluated (10%), provided that the obtained mark is above a minimum of four points.

3. Participation in the seminars will be evaluated (10%), provided that the obtained mark is above a minimum of four points.

REFERENCES

Reference:

- J. Cerdá ; Intoducció a l¿Anàlisi Funcional. Publicacions i Edicions de la Universitat de Barcelona, 2005.
- K. Saxe; Beginning functional analysis. Undergraduate Texts in Mathematics. Springer-Verlag, New York, 2002.
- A. Galbis y C. Fernández Rosell. Espacios De Hilbert Y Análisis De Fourier. Publicacions De La Universitat De València, dic. de 2024.
- A. Galbis, M. Maestre; Vector Analysis Versus Vector Calculus. Springer, New York, 2012
- L.E. Larson, R.P. Hostetler, B.H. Edwards; Cálculo. McGraw-Hill, 2006.
- J.E. Marsden, A.J. Tromba; Cálculo Vectorial. Addison-Wesley Iberoamericana, 1991.

Complementary reference:

- Brezis, H., Análisis Funcional, Alianza Universidad, 1984
- Duoandikoetxea, J., Fourier Analysis, Graduate Studies in Mathematics, vol. 29, 2001.