COURSE DATA

Data Subject	
Code	34157
Name	Mathematical analysis III
Cycle	Grade
ECTS Credits	9.0
Academic year	2022 - 2023

Study (s)

Degree	Center	Acad. year	Period
1107 - Degree in Mathematics	Faculty of Mathematics	3	Second term

Subject-matter

Degree	Subject-matter	Character
1107 - Degree in Mathematics	6 - Mathematical analysis	Obligatory

Coordination

Name	Department
MAESTRE VERA, MANUEL	15 - Mathematical Analysis
MOLTO MARTINEZ, ANIBAL FCO JAVIER	15 - Mathematical Analysis

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.

OUTCOMES

1107 - Degree in Mathematics

- Capacity for analysis and synthesis.
- Solve problems that require the use of mathematical tools.
- Ability to work in teams.
- Learn autonomously.
- Possess and understand the mathematical knowledge.
- Expressing mathematically in a rigorous and clear manner.
- Reason logically and identify errors in the procedures.
- Capacity of abstraction and modeling.
- Knowing the time and the historical context in which occurred the great contributions of women and men in the development of mathematics.
- Visualize and interpret the solutions obtained.

LEARNING OUTCOMES

Evaluate line and surface integrals. Knowledge of the fundamental theorems of vector calculus, and some of its applications to physics. Understanding the basics of the theory of Hilbert spaces and how to use the basic properties of the most common function and sequence spaces. The ability to evaluate the Fourier series expansion of a periodic function.

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

ACTIVITY	Hours	% To be attended
Theory classes	56,00	100
Classroom practices	34,00	100
Other activities	11,00	100
Development of group work	7,00	0
Development of individual work	15,00	0
Study and independent work	35,00	0
Readings supplementary material	5,00	0
Preparation of evaluation activities	37,50	0
Preparing lectures	10,00	0
Preparation of practical classes and problem	14,50	0
TOTAL	**225,00**	

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.

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

Basic

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Referència b1: J. Cerdá ; Intoducció a lAnàlisi Funcional. Publicacions i Edicions de la Universitat de Barcelona, 2005.
Referència b2: C.H. Edwards, Advanced calculus of several variables, Academic Press, New York, 20033
Referència b3: C. Fernández y A. Galbis, Presentaciones de las prácticas de vectorial, (comunicación personal).
Referència b4: W.H. Fleming, Functions of several variables, Springer, New York,
1987.
Referència b5: A. Galbis, M. Maestre; Vector Analysis Versus Vector Calculus. Springer, New York, 2012.
Referencia b6: J.E. Marsden, A.J. Tromba; Cálculo Vectorial. Addison-Wesley Iberoamericana, 1991.
Referencia b7:
K. Saxe; Beginning functional analysis. Undergraduate Texts in Mathematics. Springer-Verlag, New York, 2002.

Additional

- Referencia c1: Brezis, H., Análisis Funcional, Alianza Universidad, 1984
Referencia c2: Duoandikoetxea, J., Fourier Analysis, Graduate Studies in Mathematics, vol. 29, 2001.