

COURSE GUIDE
Mathematical Methods 3
Last updated date: 19/06/2021
Approval date:
Física Atómica, Molecular y Nuclear: 19/06/2021
Física Teórica y del Cosmos: 21/06/2021

Grado (Bachelor's Degree)	Bachelor's Degree in Mathematics + Bachelor's Degree in Physics	Branch	Sciences
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Module	Métodos Matemáticos y Programación	Subject	Métodos Matemáticos
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Year of study	2 ^o	Semester	2 ^o	ECTS Credits	6	Course type	Compulsory course
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PREREQUISITES AND RECOMMENDATIONS

Linear Algebra and Geometry, Calculus, Mathematical Methods I

BRIEF DESCRIPTION OF COURSE CONTENT (According to the programme's verification report)

- Hilbert spaces
- Series expansions, eigenfunctions

SKILLS
GENERAL SKILLS

- CG01 - Capacidad de análisis y síntesis
- CG02 - Capacidad de organización y planificación
- CG03 - Comunicación oral y/o escrita
- CG05 - Capacidad de gestión de la información
- CG06 - Resolución de problemas
- CG07 - Trabajo en equipo
- CG08 - Razonamiento crítico
- CG09 - Aprendizaje autónomo
- CG10 - Creatividad
- CG11 - Iniciativa y espíritu emprendedor

SUBJECT-SPECIFIC SKILLS

- CE03 - Comprender y conocer los métodos matemáticos para describir los fenómenos físicos.



- CE05 - Modelar fenómenos complejos, trasladando un problema físico al lenguaje matemático.

LEARNING OUTCOMES

That the student understands the general concepts of Hilbert spaces, especially in their application to Physics, and is able to solve the associated problems.

PLANNED LEARNING ACTIVITIES

THEORY SYLLABUS

- Unit 1. Normed spaces and Banach spaces
- Unit 2. Euclidean spaces and Hilbert spaces
- Unit 3. Function spaces and series
- Unit 4. Functions and distributions
- Unit 5. Linear operators
- Unit 6. Introduction to spectral theory

PRACTICAL SYLLABUS

RECOMMENDED READING

ESSENTIAL READING

1. L. Abellanas y A. Galindo, Espacios de Hilbert, Eudema, 1987.
2. S. K. Berberian, Introducción al espacio de Hilbert, Teide, 1977.
3. P. García González, J. E. Alvarelos Bermejo y J. J. García Sanz, Introducción al formalismo de la mecánica cuántica, U.N.E.D., Madrid, 2001.
4. G. Helmberg, Introduction to spectral theory in Hilbert space, North Holland, 1969.
5. R. P. Kanwall, Generalized functions (theory and technique), Academic Press, 1983.
6. A. N. Kolmogórov y S.V. Fomín, Elementos de la teoría de funciones y del análisis funcional, M.I.R., 1975.
7. R.D. Richtmyer, Principles of Advanced Mathematical Physics, vol. 1, Springer-Verlag, 1978.
8. P. Roman, Some modern mathematics for physicists and other outsiders, vol. 2, Pergamon, 1975.
9. A. Vera López y P. Alegría Ezquerra, Un curso de Análisis Funcional. Teoría y problemas, AVL,



1997.

10. E. Romera Gutiérrez, M. C. Boscá Díaz-Pintado, F. Arias de Saavedra Alías, F. J. Gálvez Cifuentes, J. I. Porras Sánchez, Métodos Matemáticos: Problemas de Espacios de Hilbert, Operadores lineales y Espectros, Paraninfo, 2013.

COMPLEMENTARY READING

TEACHING METHODS

- MD01 Lección magistral/expositiva
- MD03 Resolución de problemas
- MD07 Seminarios y/o exposición de trabajos
- MD09 Análisis de fuentes y documentos

ASSESSMENT METHODS (Instruments, criteria and percentages)

ORDINARY EXAMINATION DIET

The evaluation will be carried out mainly from the exams; additionally, the realization of problems and tasks proposed to be solved individually will be considered, by means of which the students will have to demonstrate the acquired knowledge and understanding.

- Passing any of the tests will not be achieved without a thorough and balanced knowledge of all the material.
- In the ordinary call, the final exam grade will constitute 70% of the grade, and the remaining 30% will be evaluated in a complementary way according to: participation in class, delivery of work and/or problems, oral or written assessments
- To pass the course it will be necessary to obtain at least 3 points (out of 10) in the final exam grade.

EXTRAORDINARY EXAMINATION DIET

- Final exam with theoretical questions and problems, related to the subject taught in class.
- In extraordinary call, the final exam grade will constitute 100% of the grade.

SINGLE FINAL ASSESSMENT (evaluación única final)

- Those students who, following the Regulations of the UGR with terms and deadlines that are required therein, take advantage of this evaluation modality, will carry out the final evaluation only.
- It will consist of a theory and / or exam problems.

