basque center for applied mathematics

EXCELENCIA SEVERO OCHOA

EUSKO JAURLARITZA GOBIERNO VASCO
HEZKUNTZA SAILA
DEPARTAMENTO DE EDUCACIÓN

Courses 2017-18

Fabio Pizzichillo

16-20 April 2018 (5 sessions)
09:30 - 11:30 (a total of 10 hours)

INTRODUCTION TO THE THEORY OF SELF-ADJOINT OPERATORS

Self-adjoint operators in Hilbert spaces play a fundamental role in modern mathematics. There are numerous applications in classical physics, modern physics, and partial differential equations. The aim of this course is to give an introduction to the theory of self-adjoint operators: focusing on standard techniques, we will approach the problem of self-adjointness of an operator.

We will follow the following scheme: we will briefly introduce the main properties of a self-adjoint operator. Then we will focus on Kato's perturbation theory: we will understand “how much” is possible to perturb a self-adjoint operator without losing self-adjointness.
Then we will focus on the problem of the extension of a symmetric operator. We will use two different techniques: quadratic forms and Von Neumann's theory.
In any section, we will apply the theoretical results to differential operators, paying a particular attention to the Schrödinger and Dirac Hamiltonians.

PREREQUISITES
Linear Algebra, Basic Properties of the Fourier Transform, Basic Functional Analysis.

REFERENCES
[1] M. Reed and B. Simon, Methods of Mathematical Physics I: Functional analysis, Academic Press New York, 1972;
[2] M. Reed and B. Simon, Methods of Mathematical Physics II: Fourier analysis and Self-Adjointness, Academic Press New York, 1972;
[3] T. Kato, Perturbation Theory for Linear Operators, Springer, 1980.

***Registration is free, but inscription is required before 11th April:** So as to inscribe send an e-mail to reception@bcamath.org. Student grants are available. Please, let us know if you need support for travel and accommodation expenses.