

Subject: Advanced functional analysis

Title: Hilbert space methods for quantum mechanics

Lecturer: Serge Richard (リチャール セルジユ)

Purpose of the course: This course will provide an overview of some classical tools of functional analysis which have been partially developed for quantum mechanics. In particular, an introduction to spectral and scattering theory will be presented. These theories have deep connection with other branches of mathematics, like PDE, operator algebras or dynamical systems. Some up-to-date tools of spectral theory will also be introduced, as for example commutator methods for spectral theory. In order to provide a large panorama on the subject together with applications, some details might be omitted, but references for all proofs will be provided.

Plan of the course: Tentative program: 1) Hilbert space and bounded operators, 2) Unbounded operators, 3) Self-adjoint operators and spectral theory, 4) Some examples, 5) Evolution group and scattering theory, 6) Commutator methods.

Keywords: Hilbert space, self-adjoint operators, spectral and scattering theory, commutator methods.

Required Knowledge: Knowledge on standard undergraduate functional analysis.

Reference: The two main references for this course will be

Amrein: Hilbert space methods in quantum mechanics, 2009

Teschl: Mathematical methods in quantum mechanics, 2009

Attendance: This course is open for any students at Nagoya University as one of the “open subjects” of general education.

Method of Evaluation: Grades based on attendance, a written report, or an examination.

Website of this course:

<http://www.math.nagoya-u.ac.jp/~richard/Hilbert.html>

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