

Subject and title: C*-algebraic methods in spectral theory.

Lecturer: Serge Richard (リシヤール セルジユ)

Method of Evaluation: Grades based on attendance, voluntary works and written reports.

Reference: There is no specific book related to this course. References and additional material will be provided during the lectures.

Purpose of the course: This course will provide an overview on some of the most recent tools introduced in functional analysis for the study of operators related to quantum mechanics. During the first lectures, we shall review some basic properties of bounded and unbounded operators on Hilbert spaces, and introduce the spectral theorem for self-adjoint operators. After reviewing some definitions and properties related to C*-algebras, we shall show how crossed product C*-algebras are naturally linked to generalized Schrödinger operators, and how information on these operators can be deduced from representations of these algebras. A related construction involving twisted crossed product algebras and its application for magnetic systems will then be discussed.

Plan of the course: Tentative program: 1) Linear operators on a Hilbert space, 2) C*-algebras, 3) Dynamical systems and crossed product C*-algebras, 4) Schrödinger operators and essential spectrum, 5) Twisted crossed product algebras, 6) Pseudodifferential calculus, 7) Magnetic systems.

Keywords: Self-adjoint operators, spectrum, C*-algebras, crossed product, magnetic systems.

Required Knowledge: Knowledge on standard undergraduate functional analysis.

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

Additional advice: This course will not be very technical but rather interdisciplinary.

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More information on:

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