SPECTRAL THEORY FOR OPERATORS AND SEMIGROUPS

A.A. ALBANESE, L. LORENZI, E.M. MANGINO, A. RHANDI

MAIN BODY

LECTURE 1: A survey on Operator theory

- **1.1:** Main definitions and properties of bounded operators on a Banach space. Dual operators and some basic properties.
- **1.2:** Closed operators. Definitions and different characterizations. Closable operators and closure of an operator.
- **1.3:** Spectrum and resolvent of a (bounded or closed) operator. Basic properties. Spectral radius.
- **1.4:** Normal and selfadjoint operators and their basic properties.
- **1.5:** Exercises.

LECTURE 2: Compact operators and Riesz-Schauder theory

- **2.1:** Compact operators: definitions, examples, Schauder theorem.
- **2.2:** Riesz-Schauder theory for compact operators.
- **2.2:** Spectral decomposition theorem for selfadjoint compact operators.
- **2.3:** Exercises.

LECTURE 3: Spectral representation theorem for bounded operators

- **3.1:** Spectral representation theorem for bounded and selfadjoint operators on a separable Hilbert space H.
- **3.2:** Spectral theorem for normal operators.
- **3.3:** Exercises.

LECTURE 4: Spectral representation theorem for unbounded operators I

- **4.1.:** Adjoint of an unbounded operator, selfadjoint and symmetric operators. Definitions and basic properties.
- **4.2.:** Dissipative operators. Definitions and main properties.
- **4.3.:** Representation theorem for unbounded selfadjoint operators.
- **4.4.:** Spectral mapping theorem for the resolvent operator of closed linear operator.
- **4.5:** Exercises.

LECTURE 5: Spectral representation theorem for unbounded operators II

- **5.1:** Spectral representation theorem for selfadjoint operators.
- **5.2:** Positive operators and minimax theorems for their eigenvalues.
- **5.3:** Exercises.