

Cambridge Centre for Analysis Short Course on Spectral Theory

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This course is an introduction to the many aspects of spectral theory for linear operators and in particular differential operators. Supporting material may be found in:

E B Davies, *Spectral Theory and Differential Operators*, CUP, 1995, which developed from an MSc lecture course that I gave for several years, and is referred to as STDO;

E B Davies, *Linear Operators and their Spectra*, CUP, 2007 contains much more material, and is not restricted to the study of self-adjoint operators. It is referred to as LOTS and is available electronically at http://www.mth.kcl.ac.uk/staff/eb_davies/LOTS.html

It should be emphasized that the copyright belongs to Cambridge University Press, but the author has permission to put a copy on the web, in the hope that some readers may be encouraged to buy the paper version.

This book has an informal ongoing supplement to be found at the same site. The supplement uses the same chapter and section headings as the book, and also has some new sections. It includes a lot of further material.

The course will be given over one week and the material will be based on the above books, but will try to put them into a context, rather than reproducing the proofs. It is hoped that students will be familiar with some proof of the spectral theorem for unbounded, or at least bounded, self-adjoint operators. The flavour of the course may be seen by reading the sections of the two books indicated below.

Outline of the material to be covered

Day 1 Self-adjoint operators.

Domain problems, closedness, cores, cyclic vectors.
STDO sect. 2.1–2.5.

Day 2 Quadratic forms and eigenvalue bounds.

Two approaches to perturbation theory.
STDO sect. 4.3–4.5.

Day 3 Sobolev spaces, ψ DOs and local regularity.

Fourier transforms, distributions, boundary value problems.
STDO chap. 3.

Day 4 Classification of the spectrum and Fredholm operators.

LOTS sect. 4.1–4.3.

Day 5 NSA operators and semigroups.

LOTS sect. 6.1.

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