

LTCC Proposed Course

Title: Introduction to harmonic analysis

Basic Details:

- Core Audience (1styr or 2nd/3rdyr: pure, app. or stats): suitable for pure mathematics students and also for applied / stats students interested in harmonic analysis
- Course Format (**Extended:** 5 x 2hr lectures or **Intensive:** 2 x 4hr lectures over 2 consecutive days): extended

Course Description:

- Keywords: Harmonic analysis; Fourier series; Fourier transform
- Syllabus: The course will serve as an introduction to harmonic analysis as a collection of methods for the study of problems with translation invariance. The three main topics will be (1) Discrete Fourier transform: definition, basic properties and some applications. (1 lecture) (2) Fourier series: definition, basic properties, summability, convergence, applications. (2 lectures) (3) Fourier transform: definition, inversion, Poisson summation, applications. (2 lectures) Particular emphasis will be put on the applications of harmonic analysis in other parts of mathematics, including number theory (equidistribution mod 1, Roth's theorem on arithmetic progressions), probability theory (spectral analysis of the random walk), partial differential equations (heat equation), and even efficient computation (fast multiplication algorithms), time permitting.
- Recommended reading: E. M. Stein and R. Shakarchi, "Fourier Analysis"; H. L. Montgomery, "Early Fourier Analysis"
- Additional Optional reading: H. Dym and H. P. McKean, "Fourier series and integrals"; Y. Katznelson, "Introduction to Harmonic Analysis"
- Prerequisites: No special prerequisites beyond undergraduate analysis.

Format:

- No of discussion/problem sheets (typically 4 for extended courses, and 1 for intensive courses, with solutions): 4
- Electronic lecture notes (these are strongly encouraged, as they will form the core of the individual study of the students): will be prepared in due course
- Necessary support facilities: A large whiteboard would be very helpful
- Necessary software requirements for computing facilities.: none
- Proposed timing: Mon 10:50–12:50, Term 3 or 4
- Lecture/computer session/tutorial/discussion split (hours of each):

Lecturer Details:

- Lecturer: Sasha Sodin
- Lecturer home institution: QMUL
- Lecturer e-mail: a.sodin@qmul.ac.uk
- Lecturer telephone number: 07423429474