LTCC Basic Course

Title: Special functions and applications

Basic Details:

- Core Audience (1st year or higher; applied and pure mathematics):
- Course Format (Extended: 5 x 2hr lectures)

Course Description:

- Keywords: hypergeometric, Heun, elliptic, hyperelliptic, orthogonal polynomials, Riemann theta functions.

- Course description: Special functions are solutions of certain differential or functional equations that are useful for expressing solutions of large classes of problems. We will study elliptic and theta functions, orthogonal polynomials, generalised hypergeometric functions and Heun functions as well as their confluence limits. Solutions of equations arising in various applications will be discussed.

- Syllabus:
    1. Fuchsian equations. The hypergeometric equation. Integral representations of solutions. Identities. Monodromy.
    2. Generalised hypergeometric functions. The Heun equation. Confluence limits and behaviour at irregular singularities.
    3. Orthogonal polynomials.
    4. Elliptic functions. Addition laws. Riemann surfaces.
    5. Riemann theta functions. Finite gap potentials.

- Recommended reading: G. E. Andrews, R. Askey and R. Roy. Special Functions. CUP 1999.

- Prerequisite: A good knowledge of basic complex analysis.

Format:

- No of discussion/problem sheets: 4 with solutions
- Electronic lecture notes will be available.

Lecturer Details:

- Lecturer: Rod Halburd
- Lecturer home institution: University College London
- Lecturer e-mail: r.halburd@ucl.ac.uk