LTCC Proposed Course

Title: Multi-deck theory of flow at large Reynolds numbers.

Basic Details:
- Core Audience: 2nd/3rd yr applied
- Course Format: extended

Course Description:
- Keywords: laminar viscous flow, large Reynolds number, boundary layer, Poiseuille flow, viscous jets, triple-deck, asymptotic methods, matched expansions, flow separation, instability, flow past an obstacle.
- Syllabus: The course introduces main ideas, mathematical methods and key results in the asymptotic theory of fluid flow at a large Reynolds number. The topics covered include:
  - Brief summary of the method of matched asymptotic expansions.
  - Navier-Stokes equations for a fluid flow and typical boundary-value problems; correlation between theoretical results, computations and observations.
  - Boundary layers, Prandtl’s theory.
  - Triple-deck for an incompressible boundary layer; laminar separation; flow at a trailing edge of a plate; flow past a wall mounted obstacle; results for time-dependent flows and instability; receptivity.
  - Other flows – viscous jets, Poiseuille flow, compressible boundary layers. Exponential upstream influence.
  - Comparisons with experiments, computations, limitations and successes of the asymptotic theories.

- Recommended reading:
- Prerequisites: applied and methods courses at the undergraduate level; familiarity with fluid dynamics of viscous flows and/or perturbations methods will be very helpful.

Format:
- No of discussion/problem sheets: 4
- Electronic lecture notes: to be provided before the course
- Proposed timing: January 2014
- Lecture/computer session/tutorial/discussion split (hours of each): 10 hours
  - lectures, 5th and 10th hours used as a problem class/discussion

Lecturer Details:
- Lecturer: Dr Sergei Timoshin
- Lecturer home institution: Mathematics Department, UCL
- Lecturer e-mail: sergei@math.ucl.ac.uk
- Lecturer telephone number: (+44) 02076792205