LTCC Proposed Course

Title: Topics in the Design of Experiments

Basic Details:

- Core Audience (1st yr or 2nd/3rd yr: pure, app. or stats): 2nd/3rd year, statistics
- Course Format (extended or intensive): extended

Course Description:

- Keywords: clinical trials; design of experiments; *D*-optimality; equivalence theorems; optimal design; sequential design
- Syllabus:
  This course covers some of the topics which are essential background for much of the current research in design of experiments. It is in two parts:
  Optimal design theory A very natural way to design an experiment is to specify an optimality criterion which captures the objectives of the experiment and then to find a design which optimises this criterion. The theory of optimal design has been developed mainly in the context of "generally useful criteria", such as *D*-optimality, and this is now starting to have a major impact on practice in areas as diverse as mixture experiments in agrochemical formulation studies and pharmacokinetic and pharmacodynamic studies using nonlinear models.
  The general theory will be described, with an emphasis on equivalence theorems for finding optimal designs, and applications to linear and nonlinear models will be discussed.
  Sequential design In clinical medicine, there are both economic and ethical advantages to designing trials sequentially, due to the reduced number of subjects required and the possibility of early stopping. In this course, the ideas of stopping rules and the impact they have on inference after the experiment, will be introduced. The possibility of adaptive design, in which the allocation of treatments is decided sequentially, will also be discussed.
- Recommended reading: Atkinson, A. C., Donev, A. N. and Tobias, R. (2007) *Optimal Experimental Designs, with SAS*. Oxford University Press.
  Whitehead, J. R. (1997) *Design and Analysis of Sequential Clinical Trials*, 2nd edition. Wiley.
- Additional Optional reading:
- Prerequisites: Fundamentals of Statistical Inference; Statistical Modelling and Estimation or an undergraduate level course in linear models.

Format:

- No of discussion/problem sheets (typically 4 for extended courses, and 1 for intensive courses, with solutions): 2
- Electronic lecture notes (these are strongly encouraged, as they will form the core of the individual study of the students): Yes
- Necessary support facilities: none
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- Necessary software requirements for computing facilities:
- Proposed timing: late spring
- Lecture/computer session/tutorial/discussion split (hours of each): 10/ 0/ 0/ 0/

Lecturer Details:

- Lecturer: Dr Steve Coad
- Lecturer home institution: Queen Mary
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