

LTCC Advanced Course

Title: Design of Experiments

Basic Details:

Core Audience: (first/second/third year and Pure/App./Stats) second/third year Stats

Course Format: extended

Course Description: This course describes the fundamental concepts of design of experiments (DoE) and some modern practical applications.

Key words: Factorial experiments, Analysis of variance, Regression

Syllabus:

Week 1: Classical design principles: randomisation, replication, blocking.

Week 2: Complex treatment structures: factorial structures, nonlinear models, response surfaces.

Week 3: Optimal design theory and algorithms for its application.

Week 4: Current areas of interest, e.g. experiments on networks, optimal subsampling of big data sets.

Week 5: Current areas of interest, e.g. experiments with functional responses, dynamic treatments.

Examples from a range of application areas will be used to motivate and illustrate the methods covered in the module.

Recommended reading:

Book Statistical principles for the design of experiments, Mead, R., Gilmour, S. G., Mead, A., Cambridge University Press 2012.

Experiments : planning, analysis and optimization, Wu, C. F. J., Hamada, M.S. 3rd ed., Newark, Wiley 2021.

Optimal Design of Experiments: A Case Study Approach, Goos, P., Jones, Hoboken, Wiley 2011.

Optimum Experimental Designs, With SAS, Atkinson, A., Donev, A., Tobias, R., Oxford, Oxford University Press 2007.

Design and analysis of experiments, Montgomery, D., 10th ed., Wiley 2020

Additional or optional reading:

Prerequisites: Theory of linear models

Format:

- Number 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 studies of the students) Yes, but will be prepared week by week in 2024-25.
- Necessary support facilities: Writing space
- Proposed timing: any time after Theory of Linear models.
- Lecture/computer session/tutorial/discussion split (hours of each): 10 hours lecture, R, for exercises, but not needed in class.

Lecturer Details:

- Lecturer: Steven Gilmour / Vasiliki Koutra / Kalliopi Mylona / Caterina May
- Lecturer home institution: King's College London
- Lecturer e-mail: steven.gilmour@kcl.ac.uk