UNIVERSITY OF GLASGOW, SCHOOL OF MATHEMATICS AND STATISTICS

Design of Experiments: Chapter 3

1 KEY CONCEPTS

- Definition and computation of main effects and interactions;
- Differences between One-Factor-At-A-Time and Factorial designs;
- Definition and properties of linear models for factorial experiments;
- Relationship between parameter estimates and factorial effects;
- Decomposition of the ANOVA table;
- Principles of factorial effects;
- Blocking and confounding in factorial experiments;
- ANOVA decomposition in blocked factorial experiments.

2 EXERCISES

- A scientist wishes to investigate the simultaneous influence of $m = 5$ factors on a response using a factorial experiment. Each factor can be set to two values. Suppose the scientist has a maximum of 100 units available for experimentation. How many replicates of a full factorial experiment can be performed? How many runs will this experiment have?

  How does this answer change if one of the factors has three levels? How many runs will this experiment have?

- Consider an unreplicated 2^2 experiment. What treatments should be assigned to each of two blocks, if estimating the overall mean and the two main effects is essential?

- Consider an unreplicated 2^6 experiment being run in blocks of size 8. If one point of interest to the scientist was estimating the main effect of factor 6. Why would the following defining blocks be a bad idea?

$$B_1 = 123456 \qquad B_2 = 12345 \qquad B_3 = 12$$