

# MAS353 Experimental Design

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University of Newcastle upon Tyne

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Welcome to MAS353 “Experimental Design.” Here are a few bits of information about this module. (It is possible that some details may change. If they do I will let you know).

The topic of experimental design is a bit different from other branches of statistics in that it is concerned with planning experiments before we collect the data rather than analysing the data afterwards. However, in fact, this module is also concerned with the analysis of data from planned experiments and so might be better called “Design and Analysis of Experiments” or even simply “Designed Experiments.” Very often the analysis of the data uses the analysis of variance (ANOVA) so there will be quite a lot of ANOVA in the course.

## 1 Timetable

Times and locations of classes are as follows.

Lectures M414		Tutorials M503	
Every week		Odd weeks	
Monday	9.00	Thursday	4.00
Wednesday	12.00	Friday	12.00

## 2 Lectures

In the lectures, some handouts may be used but these may be incomplete, requiring students to add some material by copying from the board or OHP and by making their own notes. Generally, only some of the more “wordy” sections will be provided on handouts. Some lectures will not have handouts at all. Where handouts are provided, I will also make them available on the Web at the following address.

<http://www.mas.ncl.ac.uk/~nmf16/teaching/mas353/>

(You can find this from the School Home Page under “Additional Teaching Information”).

## 3 Tutorials

The tutorials take place in odd weeks. That is Week 1 (Feb 2,3), Week 3 (Feb 16, 17), Week 5 (Mar 2, 3), Week 7 (Mar 16, 17), Week 9 (Apr 27, 28) and Week 11 (May 11, 12).

Students are expected to attend one of the two tutorials in those weeks when they take place. I propose to try leaving it up to you which one you wish to attend. However, if too many people choose one, then it may be necessary for me to assign individuals to one or the other.

## 4 Assessment

The assessment for this module is based on three elements as follows.

Coursework assignments	10%
In-course test	10%
Examination	80%

I plan to give five pieces of assessed coursework. These will be equally weighted, so each counts for 2% of the module mark. The dates will be as follows. Work must be handed in by 5.00 pm on the Wednesdays given below, in the homework box outside the Mathematics and Statistics General Office, 5th floor, Merz Court.

Assignment	Hand out	Hand in
1	Week 1	Week 2 (February 8)
2	Week 3	Week 4 (February 22)
3	Week 5	Week 6 (March 8)
4	Week 7	Week 8 (March 20)
5	Week 9	Week 10 (May 3)

The test will last for 50 minutes and will take place on Wednesday 15th March, 12.05-12.55, in the usual lecture period and room (M414).

The examination will last one and a half hours and will take place during the normal examination period at the end of the semester.

## 5 Staff availability

The module will be taught this year by me, Dr. M. Farrow. My room is M517 in Merz Court. You will have an opportunity to talk to me during the tutorials but, if you feel that it is necessary to see me at another time, then you can contact me by email, perhaps to make an appointment to see me. My email address is [malcolm.farrow@newcastle.ac.uk](mailto:malcolm.farrow@newcastle.ac.uk). Alternatively you can come to my room without an appointment but, of course, I will not always be there. Information on when I am likely to be available is given on the door.

## 6 Reading List

- Mead, R., 1990. *The Design of Experiments: Statistical Principles for Practical Applications*, Cambridge University Press.
- Cochran, W. and Cox, G., 1992. *Experimental Design*, Wiley.

## 7 Teaching Plan

Here is an outline of the topics which I plan to cover in each week. Of course, things do not always go exactly to plan but I hope to stick reasonably closely to this.

Week		Topic	
1	Monday	30/1	Introduction
	Wednesday	1/2	$t$ -test and ANOVA
	Tutorials		Problems 1
2	Monday	6/2	Completely randomized design
	Wednesday	8/2	Multiple comparisons
3	Monday	13/2	Contrasts
	Wednesday	15/2	2-way ANOVA
	Tutorials		Problems 2
4	Monday	20/2	Randomized blocks I
	Wednesday	22/2	Randomized blocks II
5	Monday	27/2	Latin squares I
	Wednesday	1/3	Latin squares II
	Tutorials		Problems 3
6	Monday	6/3	Missing data and outliers
	Wednesday	8/3	Sample size
7	Monday	13/3	Factorial experiments I
	Wednesday	15/3	<b>Mid-Semester Test</b>
	Tutorials		Problems 4
8	Monday	20/3	Factorial experiments II
	Wednesday	22/3	$2^n$ factorial experiments I
9	Monday	24/4	$2^n$ factorial experiments II
	Wednesday	26/4	$2^n$ factorial experiments II
	Tutorials		Problems 5
10	Wednesday	3/5	Confounding
11	Monday	8/5	Fractional replication
	Wednesday	10/5	(Spare)
	Tutorials		(Returning work)
12	Monday	15/5	Revision
	Wednesday	17/5	Revision