M249 Guide

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1 Introduction

Welcome to Practical modern statistics (M249). The aim of M249 is to provide a broad perspective on modern statistics by introducing you to four important topics, namely medical statistics, time series, multivariate analysis and Bayesian statistics. The four topics covered in M249 use quite different techniques, so the module is organized in four independent books, each of which aims to provide a practical introduction to the subject, with much emphasis on real problems and real data.

The focus throughout M249 is very much on statistical ideas, analysis of data and interpretation of results. Much use is made of three software packages, SPSS, LearnBayes and WinBUGS, to do the calculations, thus freeing you to display the data, choose appropriate techniques, undertake the analysis and interpret the results.

We hope that you will find M249 enjoyable, interesting and useful.

Note that since M249 was first produced, the University has changed some of its terminology. In particular, the word ‘module’ is now used in place of ‘course’. In M249 you may see both of these words used, and you should take them to have the same meaning.

As a consequence, what is referred to in some of the M249 texts as the ‘Course Guide’ is now called the ‘M249 Guide’.

2 What to do first

2.1 Preparatory work

M249 requires a good knowledge of statistical ideas and methods at an introductory level. M249 begins with an Introduction to statistical modelling unit in which all the prerequisite statistical knowledge is reviewed. If you have already studied the module Analysing data (M248), then you should find study of the Introduction to statistical modelling straightforward. If you have studied the module Introducing statistics (M140) and are now studying M248 and M249 concurrently, then you should find most of Introduction to statistical modelling straightforward but you may find some sections are unfamiliar and take longer.

M249 does not include any complicated mathematical arguments, and you will not be required to produce a great deal of algebra in your assignments. However, you do need some basic mathematical skills, similar to those required for a basic statistics module such as M248. Thus, if you have passed M248, or done well in Introducing statistics (M140) or a Level 1 module in Mathematics, your mathematical knowledge should be sufficient. In particular, no knowledge of calculus, differentiation or integration is required.

2.2 Calculator

You will need a calculator, with basic mathematical functions including log and exp. A memory is useful. More advanced features, such as statistical functions, graphics and programming facilities, are not required. The M249 website provides guidance on the type of calculator you are permitted to take into the examination. If you have not used a calculator for some time, you might find it useful to practise using it. In particular check that you can obtain natural logarithms, as opposed to logs to base 10 – only natural logs are used in M249.
3 The M249 components

3.1 Study texts

The study texts comprise the Introduction to statistical modelling, Books 1 to 4, and the Review Unit. Each one of Books 1 to 4 has an associated computer book containing software-based activities.

Books 1, 2 and 3 each comprise three parts; Book 4 has four parts. This division into parts is purely to help you pace your study.

The Introduction to statistical modelling and each part of the four books is timetabled for two weeks’ study; see the study planner on the M249 website.

The Review Unit contains some revision material to help you begin your preparations for the examination.

3.2 Computer software

The M249 software comprises SPSS, LearnBayes and WinBUGS.

SPSS is a commercial statistics package that is widely used by statisticians and other researchers. You will be introduced to SPSS in the Introduction to statistical modelling, and will use SPSS in Computer Books 1, 2 and 3.

LearnBayes was developed specifically for M249, and serves both as a teaching aid and as a software tool for Bayesian analysis. You will use LearnBayes in Parts I and II of Book 4.

WinBUGS was developed by researchers at the Medical Research Council’s Biostatistics Unit in Cambridge, and is now established as the leading statistical package for undertaking Bayesian analyses using Markov chain Monte Carlo techniques. You will use WinBUGS in Parts III and IV of Book 4.

The software is provided on a DVD-ROM, sent out with the other materials. Installation instructions are provided with the DVD-ROM, and further information is available in the Software Guide. Ideally, you should install SPSS before M249 begins, in case there are difficulties with getting the software properly installed on your computer. You will need to install LearnBayes and WinBUGS before you start studying Book 4.

3.3 Handbook

The Handbook is provided to give you a convenient source of notation and definitions, and relevant statistical tables, for use throughout the year and during the examination. It is a good idea to start using the Handbook right from the beginning of the module, so that you may familiarize yourself with its contents. You may annotate the Handbook with whatever written material you feel would help you. (Note, however, that you are not permitted to add extra pages or sticky notes when taking it into the examination.) Only the printed version of the Handbook that is sent to you in the M249 mailing can be taken into the examination. Copies downloaded from the M249 website are not allowed into the examination.
3.4 Website

You can access the M249 website from your StudentHome page. The study planner, the tutor-marked assignments (TMAs), any data sets you require to answer the TMAs, the specimen examination paper and its solutions are available only through the M249 website.

It is important that you check the website frequently, as Errata and News items will be posted there.

The M249 website will give you access to the forums, which you can use to communicate with other students and with the M249 team.

You will also find links to websites related to the methods and data sets described in M249, and to the wider statistical community. The website also gives you access to a range of other resources that you may find of interest, though they are not an integral part of M249.

3.5 Continuous assessment

There are four tutor-marked assignments (TMAs). See the study planner for their cut-off dates.

TMA 01 Introduction to statistical modelling and Book 1 Medical statistics
TMA 02 Book 2 Time series
TMA 03 Book 3 Multivariate analysis
TMA 04 Book 4 Bayesian statistics

The TMAs and any data sets you require to answer them are provided on the M249 website. The TMAs are designed to help you learn and progress towards meeting the learning outcomes of M249. They will also enable your tutor to provide you with targeted feedback, and to indicate how your answers might be improved, if appropriate.

To demonstrate you have sufficiently engaged with the material in M249, you will need to obtain 30% or more on each of at least three TMAs to pass the module. Note this means you can still pass the module if you have great difficulty with, or do not submit, one of the TMAs.

3.6 Examination

There is a three-hour examination at the end of M249 that is based upon the material in Books 1 to 4. You should familiarize yourself with the format of the examination well in advance. A specimen examination paper is on the M249 website, and you should work through this carefully before the examination. Sample solutions are also provided. You will be allowed to take into the examination your calculator (see Subsection 2.2) and the M249 Handbook, which you may annotate as described in Subsection 3.3. No other materials will be allowed.

The examination constitutes 100% of your overall module score. However, remember that to be able to pass the module you do need to demonstrate your engagement with the material in M249 via the TMAs (as stipulated in Subsection 3.5) as well as the exam. Further details of how results are determined are given in the Assessment Handbook.
4 Keeping up to schedule

It is important to try to keep up to schedule. To help you with this, M249 has been written in such a way that the material in each book does not depend on earlier books (although each draws on material from the Introduction to statistical modelling).

The assignment cut-off dates are usually very soon after the end of the last study week for the relevant book. We recommend that you try to finish the assignment questions relating to each part of a book as soon as you finish that part, otherwise you will have a lot of work to do in a few days before the cut-off date.

5 Support for your studies

5.1 Your tutor

Your tutor is there to help you understand the ideas in M249, and will provide comments and feedback on your written assignments to help you with your studying. You are advised to go through each marked assignment in detail and to take note of the comments written by your tutor; they will help you avoid similar errors in later TMAs and in the examination. Your tutor can also give you help with both statistical and computing problems: this assistance covers use of the software.

5.2 The OU Computing Helpdesk

If you need help with any aspect of using your computer to study, a good place to start is the OU’s Computing Guide, which is linked from your StudentHome page.

If you get stuck, contact the OU Computing Helpdesk, which provides technical support for the M249 computer resources and other OU-provided IT services and applications, including online forums and tutorials, problems with usernames or passwords, and access to websites and other online facilities. Help with system or hardware queries (e.g. your internet connections, formatting hard drives, installing hardware or operating systems, etc.) is not provided. Details of how to contact the OU Computing Helpdesk are on your StudentHome page.

5.3 Your fellow students

One of the best ways of learning is by talking about your work with fellow students. Unfortunately, in Level 2 modules you may see them only at the infrequent day schools or tutorials during the year. That leaves a lot of weeks when you could be on your own. A convenient way to keep in touch is to use the M249 forums.

5.4 Other support

You are not expected to study alone. Support is available from tutors, from other students, through tutorials, and via the M249 website.

Try to attend tutorials as these will give you the opportunity to interact with a tutor directly and, just as importantly, interact with other students. If you experience difficulties that are not directly related to the content of M249, you are welcome to contact your Student Support Team – see your StudentHome page for details.
6 The M249 team

Practical modern statistics (M249) was produced by the following team.

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