

# MAS4303 Modern Bayesian Inference

## Part 2

M. Farrow  
University of Newcastle upon Tyne

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In this second part of the module we will be looking more at applications of Bayesian inference. We will consider a number of types of model which can now be analysed within the Bayesian paradigm using modern computational methods.

### 1 Timetable

Times and locations of classes are as follows.

Tuesday	1-2	Stephenson	T12	Lecture
Thursday	11-12	King George VI	PC Lawn	Practical/Tutorial
Thursday	3-5	Agriculture	305	Lecture

### 2 Lectures

In most lectures, handouts will be used but these may be incomplete, requiring students to add some material by copying from the board or screen and by making their own notes. Generally, some of the more “wordy” sections will be provided on handouts. In some lectures the handout might be a summary of the main points. Some lectures may 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/mas4303/>

You can find this from the School Home Page under “Additional Teaching Information” and from “Blackboard”. I may even manage to put things onto Blackboard itself!

### 3 Practicals and Tutorials

There will be weekly practical classes. These are an important part of the course. We will be analysing data using R and BRugs, which is an implementation in R of the BUGS system for “**B**ayesian **I**nference **U**sing **G**ibbs **S**ampling.” I do expect there to be examination questions which involve the use of the BUGS language. Some information will be provided on the examination paper but you will need to have the ability to use it.

You can also use the practicals as tutorials by discussing problems with me during these sessions. There should also be time during some of the lecture periods, particularly the double period on Thursday afternoons, for some “tutorial” discussion.

### 4 Assessment

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

Coursework assignments	20%
Tests	10%
Examination	70%

You will have already had two assignments and a test in the first part of the module. There will be two further assignments and another test in this part of the module. Each assignment will count for 5% of the module mark, as will the test. Assignments must be handed in by 4.00 pm on the dates given below, in the homework letterbox at the Mathematics and Statistics General Office, 3rd floor, Herschel Building.

Assignment	Hand out	Hand in
3	Week 7	Week 8 (Thursday November 20th)
4	Week 9	Week 10 (Thursday December 4th)

It is planned to hold the test in Week 11.

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

## 5 Staff availability

This part of the module will be taught this year by me, Dr. M. Farrow. I work in room 312 on the third floor of the Herschel Building. 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`. 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 notice next to the door.

## 6 Reading List

- Gamerman, D., 2006. *Markov Chain Monte Carlo* (2nd edn.) Chapman and Hall. (R)
- Congdon, P., 2006. *Bayesian Statistical Modelling* (2nd edn.) Wiley. (B)
- Gentle, J.E., 2003. *Random Number Generation and Monte Carlo Methods* (2nd edn.) Springer. (B)
- Lee, P.M., 2004. *Bayesian Statistics: An Introduction* (3rd edn.). Arnold. (B)

## 7 Teaching Plan

Here is an outline of the topics which I plan to cover. there are five “Chapters.” I plan to start a chapter on the Thursday afternoon and finish it with the practical on the following Thursday morning. Of course, things do not always go exactly to plan but I hope to stick reasonably closely to this.

Chapter		Start	
1	The normal linear model	Week 6	Thursday November 6th
2	Generalised Linear Models	Week 7	Thursday November 13th
3	Missing Data and Data Augmentation	Week 8	Thursday November 20th
4	Mixture Models	Week 9	Thursday November 27th
5	Random Effects and Hierarchical Models	Week 10	Thursday December 4th