

AMS 206

Bayesian Statistics

Winter 2006

Course Policies and Syllabus

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Office Hours	Mondays 2-3pm, Wednesdays 3-4pm or by appointment

Web page: <http://www.soe.ucsc.edu/classes/ams206/Winter06/>

Lectures: Monday, Wednesday, and Friday, 11:00am-12:10pm, Engineering 2 room 192

Required Text: *Bayesian Modeling, Inference and Prediction*, David Draper, not yet published but available from SlugBooks as a reader.

Prerequisites: Knowledge of calculus (one-variable required, multivariate very helpful) and some prior exposure to probability and statistics (at least at the level of AMS 5, preferably calculus-based, i.e., at the level of AMS 131).

Course Objectives: To introduce the basic ideas of Bayesian statistics, including both foundations of the philosophy and practical aspects of implementation (such as computing), so that by the end of the course, students should be able to apply these skills and produce a complete analysis of a (straightforward) real-world problem. This course is also meant as a pre-requisite for AMS 207.

Homework: There will be short weekly assignments, due at the beginning of class on the dates specified on the schedule on back (generally on Wednesdays, except March 3 and 10; the last assignment is due at start of the assigned exam period and should be turned in at the instructor's office since we won't have a final exam). You may discuss homework freely with other students, but you must write up assignments on your own. You must show your work for full credit. The material in this course will build upon itself, so it is important for you to keep current. Please note that if enrollment is high, not all problems on each assignment may be graded. Assignments will have both required and optional problems. The optional problems will not count toward the course grade, but it is highly recommended that you do the optional problems if you plan to take AMS 207.

Reading: There is a lot of material in this course and it will go quickly. I may not have time to cover everything in class, so you will be expected to read the relevant sections of the text (listed on the schedule).

Computing: We will be using the statistical package **R**, which is open-source, so you can download and run it on the computer of your choice. There will be several self-paced computing labs to be done on your own time, which will walk you through some of the basic R skills. Some homework problems will require extensive computation.

Exams: There will be an in-class midterm on Wednesday, February 15. This exam will be open book/notes, and will have the weight of two homework assignments in the course grade. There is no final exam.

Course Grade: Homework: 80%
Midterm: 20%

Tentative Schedule

Date	Sections	Topics
Jan 6	1.1-1.2	Intro to the course; probability review and philosophy
9	1.2-1.3	Decision theory
11		Review of probability distributions and CLT
13	2.1-2.2	Frequentist inference – maximum likelihood estimation
16		Holiday (no class)
18	2.3.1-2.3.4	Exchangeability; using R (HW #1 due)
20	2.3.5	Priors and posteriors
23	2.3.6	Conjugate priors
25	2.4	Discrete responses (HW #2 due)
27	2.5	Gaussian responses
30	(2.5)	Continuous responses
Feb 1	3.1	Monte Carlo estimation (HW #3 due)
3	3.1.1	Rejection sampling
6	3.2	Review of Markov chains
8	3.3.1	Metropolis-Hastings sampling (HW #4 due)
10	3.3.2	Gibbs sampling
13		Review
15		Midterm exam
17	3.3.2	More on complete conditionals
20		Holiday (no class)
22	3.3.5	MCMC monitoring and convergence diagnostics (HW #5 due)
24	(3.3.6)	More on MCMC
27	4.1	Hierarchical modeling I
Mar 1		(no class)
3		Hierarchical modeling II (HW #6 due)
6	4.2	Model selection
8	(5.1)	Empirical Bayes and Objective Bayes
10		Additional examples (HW #7 due)
13		Special Topics
15		Recap
22		(HW #8 due at 4pm in BE 151)