

Course Policies and Syllabus

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Web page: <http://www.soe.ucsc.edu/classes/ams206/Winter08/>

Lectures: Monday, Wednesday, and Friday, 11:00am-12:10pm, Porter 148

Required Text: Jeff Gill, *Bayesian Methods: A Social and Behavioral Sciences Approach*. Chapman and Hall/CRC Press, 2nd edition, 2008.

Prerequisites: Knowledge of calculus (one-variable required, multivariate very helpful) and some prior exposure to probability and statistics (preferably calculus-based, i.e., at the level of AMS 131/CE 107). Knowledge of inference (e.g., AMS 132 or AMS 205) is helpful but not required.

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. 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. 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. Some homework problems will require extensive computation.

Exams: There will be an in-class midterm on Friday, February 15, and a final exam on Thursday, March 20 from 9-11am. For each exam, you may bring a calculator and one 8½in by 11in. piece of paper with notes on both sides. The final will be comprehensive.

	Homework:	60%
Course Grade:	Midterm:	15%
	Final Exam:	25%

Tentative Schedule

Date	Sections	Topics
Jan 9	1.1-1.3	Intro to the course; probability review and philosophy
11	1.3	Review of probability distributions and CLT
14	2.1-2.2	Likelihoods and (Frequentist) maximum likelihood estimation
16	2.2	Likelihoods; using R
18	1.4-1.7	Bayes Theorem - discrete version
21		Holiday (no class)
23	2.3-2.6	Priors and posteriors (HW #1 due)
25	2.3.3	Conjugate priors, binomial model
28	5.3, 5.5	Poisson model
30	3.1-3.3	Gaussian model (1 parameter) (HW #2 due)
Feb 1	3.4-3.9	Gaussian model (2 parameters)
4	5.1-5.8	Priors
6	4.1	Linear regression (HW #3 due)
8	4.2, 6.1-6.3	Regression, model quality
11	7.1-7.4	Hypothesis testing
13		Review
15		Midterm exam
18		Holiday (no class)
20	8.1-8.3	Monte Carlo estimation
22	9.1-9.2	Markov chains
25	9.4	Metropolis-Hastings sampling
27	9.3, 9.7	Gibbs sampling (HW #4 due)
29	(6.2)	More on complete conditionals, prior sensitivity
Mar 3	12.1-12.2	MCMC monitoring and convergence diagnostics
5	10.5	Exchangeability (HW #5 due)
7	10.1-10.4	Hierarchical modeling
10	10.1-10.4	Hierarchical modeling
12		Additional examples (HW #6 due)
14		Special Topics
17		Recap
20		Final Exam 9-11am