Textbooks:
Carlin and Louis: "Bayes and Empirical Bayes Methods for Data Analysis" 2nd Ed, Chapman and Hall/CRC.

Selected Bibliography:
Gelman, Carlin, Stern, and Rubin: "Bayesian Data Analysis", Chapman and Hall.
Gilks, Richardson, and Spiegelhalter: "MCMC in Practice", Chapman and Hall.

Prerequisites:
Stat 301-302, Stat 312-313, Stat 244-245, Stat 343, and consent of the instructor.

class participation (10%), homework (50%), project (40%)

Software:
C or C++, or you can choose any other language or software package (eg. R, Matlab).
Outline:
1. Sep 30 ..... Introduction to Bayesian statistics (Bayesian theorem, choice of priors, conjugate families, posterior distributions)
2. Oct 2 ..... Introduction to Bayesian statistics (cont.)
3. Oct 7 ..... Bayesian inference (model selection and model checking in Bayesian models)
4. Oct 9 ..... Bayesian inference (cont.)
5. Oct 14 ..... Deterministic algorithms and Optimization of functions
6. Oct 16 ..... The EM algorithm
7. Oct 21 ..... The EM algorithm
8. Oct 23 ..... Stochastic Algorithms overview; Data augmentation
9. Oct 28 ..... Data augmentation
10. Oct 30 ..... MCMC methods
11. Nov 4 ..... MCMC methods
12. Nov 6 ..... No Class
    Project proposals due
14. Nov 13 ..... Gibbs Sampling
15. Nov 18 ..... Advanced MCMC techniques
16. Nov 20 ..... No Class
17. Nov 25 ..... Advanced MCMC techniques
18. Dec 2 ..... Final Presentations
19. Dec 4 ..... Final Presentations
20. Dec 11 ..... Final Project Papers due

- There will be 5 homeworks. Homework solutions must contain a detailed description of the algorithm as well as the interpretation of results. Your full code should always be provided in appendix.

- Project proposals (2-3 pages) will be due on Nov 11: describe the problem, write the likelihood and posterior of parameters of interest, and show some preliminary results (based on simple methods or just summaries). Projects should deal with real-life problems of interest to you, and should ultimately result in a 10 page (double-spaced) final report.