There will be three Assignments to work out and a Final Take-Home Exam. Each of these will count 25% of your grade.

Syllabus

The Bayesian Decision Theoretic Model
- Practical Examples illustrating various loss (utility) functions
- Two action problems, ‘k’ action problems, estimation problems
- Applications to standard frequentist type problems
- Admissibility, minimax procedures

Selecting the prior
- Noninformative priors
- Types of Prior Information and the resulting prior distributions
- Conjugate priors and resulting posterior distributions

Computations for the posterior
- Accept-reject sampling
- Hierarchical Bayesian and Empirical Bayesian models
- Mixture models
- Markov Chain Monte Carlo (MCMC) techniques
- BUGS
- Predictive distribution

Robust Bayesian methods
- Partial prior information
- Families of priors

Sequential Bayesian models
- Interim analysis
- Further assurance
- Optimal stopping rules
- The Secretary problem

Note: throughout the course practical examples will be introduced with the emphasis on understanding the theoretical concept and seeing how it is applied.

References: (the order does not indicate importance)
1. Statistical Decision Theory and Bayesian Analysis, J.O. Berger
2. The Bayesian Choice, (2nd edition) C. Robert
3. Bayesian Ideas and Data Analysis: An Introduction for Scientists and Statisticians, Christensen, Johnson, Branscum, Hanson
4. Bayesian Theory, J.Bernardo and A..F.M.Smith
5. Bayesian Data Analysis, (3rd edition), Gelman, Carlin, Stern &Rubin
6. Markov Chain Monte Carlo in Practice, Gilks etc
7. The BUGS Book, Lunn, Jackson, Best, Thomas, Spieglehalter
9. An Introduction to Bayesian Analysis: Theory and Methods, J.K.Ghosh and M. Delampady
10. Optimal Statistical Decisions, DeGroot
12. Operational Subjective Statistical Methods, Lad