

Course 7	<p>Bayesian Inference</p> <p>An introduction to modern Bayesian inference and is illustrated throughout with real, practical examples using free Bayesian software.</p>
Program	<ol style="list-style-type: none"> 1. Introduction: Bayesian basics <ol style="list-style-type: none"> a. Bayes theorem b. Prior and posterior distributions c. Credible intervals d. Bayesian prediction e. Differences between classical and Bayesian approaches 2. Conjugate models <ol style="list-style-type: none"> a. Coin tossing problems b. Normal models c. "Rare event" models d. Multivariate extensions 3. MCMC and other simulation methods <ol style="list-style-type: none"> a. Monte Carlo simulation b. Importance and rejection sampling c. The Metropolis Hastings algorithm and extensions d. Gibbs sampling e. Alternative approaches: sequential importance sampling and approximate Bayesian methods 4. Regression and Hierarchical models <ol style="list-style-type: none"> a. Linear regression and ANOVA models b. Generalized linear models c. Dynamic models d. Hierarchical models 5. Model selection <ol style="list-style-type: none"> a. Bayes factors b. Model selection criteria: BIC, DIC c. Model averaging <p>Software: R and WinBugs. Prior knowledge of R is useful but not required.</p>
Bibliography	<ul style="list-style-type: none"> • Lunn, D., Jackson, C, Best, N, Thomas, A. and Spiegelhalter, D. <i>The BUGS Book: A Practical Introduction to Bayesian Analysis</i>. Chapman & Hall, 2012. • Gelman, A., Carlin, B., Stern H. and Rubin, D. <i>Bayesian Data Analysis</i> (2nd ed.) Chapman & Hall, 2003. • Robert, C. P. and Casella, G. <i>Introducing Monte Carlo Methods with R</i>. Springer Verlag, 2009. • Ntzoufras, I. <i>Bayesian Modeling Using WinBUGS</i>. Wiley, 2009. • Krushke, J. <i>Doing Bayesian Data Analysis: A Tutorial with R and BUGS</i>, Academic Press, 2010.