The goal of this course is to develop sophisticated tools for probability modeling and data analysis from the Bayesian perspective. Key topics covered in the course include hierarchical models, optimization algorithms and Monte Carlo simulation techniques.

**Prerequisites:** Statistics 201 and 202 (or equivalent), or permission of instructor

**Professor:**
Dr. Jonathan Stroud  
stroud@gwu.edu 202-994-6889  
**Lectures:** Mondays, 6:10-8:40pm, 2020 K, Room 26

**Required Textbook:**

**Required Software:**
The R statistical package is needed and can be downloaded at www.r-project.org

**Course Topics**
1. Introduction to Bayesian Inference (Ch.1)
2. Simple Parametric Models (Ch. 2, 3)
3. Regression Models from the Bayesian Perspective (Ch. 14,15)
4. Frequentist properties of Bayesian methods (Ch. 4)
5. Hierarchical and Mixture Models (Ch. 5,18)
6. Optimization Algorithms for Model Estimation (Ch. 12)
7. Monte Carlo Simulation Algorithms for Model Estimation (Ch. 10,11,13)
8. Model Checking (Ch. 6)
9. Nonparametric and Semiparametric Bayesian models
10. Hidden Markov Models

**Other Course Information**

**Office hours:** Mondays 1-3pm, and by appointment.  
**Course Website:** Blackboard

**Evaluation:**
Your course grade will be calculated from homeworks. Homework assignments will be assigned every two weeks or so and will be turned in for grading. *No late homework will be accepted, for any reason whatsoever.*
Learning Outcomes:
As a result of completing this course, students will be able to:
1. Design and carry out Bayesian analysis on real datasets.
2. Analyze complex (e.g., hierarchical, nonlinear and mixture) models using modern Bayesian methods.
3. Implement sophisticated optimization and Monte Carlo simulation techniques for Bayesian inference.