

**THE GEORGE WASHINGTON UNIVERSITY**  
**Department of Statistics**

**STAT 4198: Introduction to Bayesian Statistics**

**SYLLABUS**

**Course and Contact Information**

Course: STAT 4198-11 Introduction to Bayesian Statistics (CRN: 65846)

Semester: Fall 2021

Lecture: Tuesday and Thursday, 3:45 – 5:00pm

Location: Monroe Hall, Room 250

**Instructor**

Name: Joshua Landon

Campus Office: Rome Hall, Room 756

Phone: 202-994-7851

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Office hours: 11:00am – 12:30pm on Tuesday and Thursday, and by appointment, either in person or remotely at <https://gwu-edu.zoom.us/j/3217834899>

**Course Description**

The aim of this course is to introduce students to the Bayesian statistical modeling and inference and to the related computational strategies and algorithms. The course starts with the treatment of simple models, such as those based on normal and binomial distributions. Concepts of conjugate and non-informative priors are illustrated, for single- and multi-parameters models. Treatment of hypothesis testing and linear regression models are also covered. Bayesian computational methods such as the Gibbs sampler and Metropolis-Hastings algorithms are presented with an emphasis on their implementation and use on simple cases.

**Course prerequisites**

A course in regression analysis. Competence in basic algebra. Familiarity with calculus.

**Recommended Text**

Author	Title
John K. Kruschke	Doing Bayesian Data Analysis: A Tutorial with R and BUGS
Bolstad and Curran	Introduction to Bayesian Statistics

## **Learning Outcomes:**

As a result of completing this course, students will be able to:

1. Develop an understanding of the basic concepts underlying the Bayesian approach to statistical thinking.
2. Develop skills and appreciation for the development of Bayesian models and prior choices.
3. Provide knowledge on Bayesian computing, for the practical application of Bayesian models to data problems solving.

## **Average minimum amount of independent, out-of-class, learning expected per week:**

Over 15 weeks, students will spend 2.5 hours (150 minutes) per week in lecture. Homework assignments and other out-of-class work is estimated at around 5 hours per week (75 hours for the semester) and includes a 2-hour final exam for which approximately 10 hours of review is assumed.

## **Grading**

- Homeworks (40%)
- Midterm Exam (30%)
- Final Exam (30%)

Homeworks will be assigned every week. Exams will be closed-book and closed-notes, but a one-page “cheat sheet” will be allowed.

## **Software**

In this course we will use the following software:

- R (<http://www.r-project.org/>)
- RStudio (<http://www.rstudio.com/>)
- JAGS (<http://mcmc-jags.sourceforge.net/>)
- The rjags package in R

## Tentative Class Schedule

Date	Topic(s) covered
Week 1	Probability and Bayes Rule
Week 2	Specifying Priors and Likelihoods
Week 3	Bayesian Inference for Binomial Proportion
Week 4	Monte Carlo Methods
Week 5	Bayes Factors
Week 6	Bayesian Hypothesis Testing for a Binomial Proportion
Week 7	Bayesian Inference for Poisson
Week 8	Midterm
Week 9	Bayesian Inference for a Normal Mean and Variance
Week 10	Bayesian Hypothesis Testing for a Normal Mean
Week 11	Introduction to JAGS
Week 12	Bayesian Simple Linear Regression
Week 13	Bayesian Multiple Linear Regression
Week 14	Miscellaneous
Week 15	Review
	NOTE: In accordance with university policy, the final exam will be given during the final exam period and not the last week of the semester

## University Policies

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### University Policy on Religious Holidays

1. Students should notify faculty during the first week of the semester of their intention to be absent from class on their day(s) of religious observance.
2. Faculty should extend to these students the courtesy of absence without penalty on such occasions, including permission to make up examinations.
3. Faculty who intend to observe a religious holiday should arrange at the beginning of the semester to reschedule missed classes or to make other provisions for their course-related activities

### Support for Students Outside the

#### **Disability Support Services (DSS)**

Any student who may need an accommodation based on the potential impact of a disability should contact the Disability Support Services office at 202-994-8250 in the Rome Hall, Suite 102, to establish eligibility and to coordinate reasonable accommodations. For additional information please refer to: [gwired.gwu.edu/dss/](http://gwired.gwu.edu/dss/)

#### **Mental Health Services 202-994-5300**

The University's Mental Health Services offers 24/7 assistance and referral to address students' personal, social, career, and study skills problems. Services for students include: crisis and emergency mental health consultations confidential assessment, counseling services (individual and small group), and referrals. [counselingcenter.gwu.edu/](http://counselingcenter.gwu.edu/)

### **Academic Integrity Code**

Academic dishonesty is defined as cheating of any kind, including misrepresenting one's own work, taking credit for the work of others without crediting them and without appropriate authorization, and the fabrication of information. For the remainder of the code, see: [studentconduct.gwu.edu/code-academic-integrity](http://studentconduct.gwu.edu/code-academic-integrity)