

**Bayesian Statistics 249**  
TUE & THU 2:00 pm - 3:30 pm,  
FXB G12 (HSPH)

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### **Overview**

The objective of this course is to provide a rigorous development of Bayesian theory and methods. Case studies will be presents. The course is based on selected material from the literature and will include basics of computational methods, Bayesian modeling, decision theory and Bayesian experimental designs.

### **Schedule**

Class will meet on Tue and Thu from August 28 to December 14.

**Grading:**

Homework assignments 30%  
In class exam (October) 35%  
In class exam (December) 35%

**Topics that will be covered include:**

1)Introduction to the likelihood principle and Bayesian inference:  
*Beta-binomial model,*  
*Conjugate models,*  
*Linear Model.*

2)MCMC and other posterior approximation algorithms:  
*Metropolis–Hastings algorithm,*  
*Gibbs sampling,*  
*Variational inference.*

3)Introduction to Bayesian nonparametric models:  
*Polya trees,*

*Dirichlet process,*  
*Dirichlet mixtures.*

4) Penalized regression, Bootstrap, Splines and Bayesian interpretations.

5) Experimental designs:  
*Randomized experiments,*  
*Interim decisions.*

6) Optimal sequential designs:  
*Bandit problems,*  
*Adaptive Trial Designs.*

7) Semiparametric models.

8) Bayesian time to event models.

## **COURSE MATERIALS**

Slides, notes, and homework assignments will be posted on the course website.

The primary text for the class will be

• *Bayesian Data Analysis* by Gelman, Carlin, Stern, Dunson Vehtari, and Rubin.  
ISBN:9781439898208

Several articles will be recommended during the course and listed on the course website.