课程大纲
COURSE SYLLABUS

1.	**课程代码/名称** **Course Code/Title**	**MAT7104**贝叶斯统计**MAT7104 Bayesian Statistics**
2.	**课程性质** **Compulsory/Elective**	专业选修课 Major Elective Courses
3.	**课程学分/学时** **Course Credit/Hours**	3/48
4.	**授课语言** **Teaching Language**	双语 English/Chinese
5.	**授课教师** **Instructor(s)**	周彦 Yan Zhou
6.	**是否面向本科生开放** **Open to undergraduates or not**	是 Open to undergraduates
7.	**先修要求** **Pre-requisites**	（如面向本科生开放，请注明区分内容。 If the course is open to undergraduates, please indicate the difference.） 统计线性模型（MA329） Statistical Linear Models（MA329）

8. **教学目标**
Course Objectives

本课程介绍贝叶斯统计的基本理论和基本推导，包括先验分布的引入以及如何推导后验分布并进行统计推断。本课程还重点介绍贝叶斯分析中的统计计算问题，并引导学生利用R语言编程进行贝叶斯推断和模拟。本课程的基本目标是使已经修读经典的概率统计（频率学派）课程的学生了解贝叶斯统计的基本思想，掌握贝叶斯统计的基本方法，为在实际中使用和研究贝叶斯统计打下良好的基础。
To introduce the basic concepts and theories in Bayesian statistics, including the prior distribution and posterior analysis. Introduce the statistical computing issues in Bayesian analysis, especially the use of R programming language in Bayesian inference. The aim of this course is to teach students who have taken the classical probability and statistics courses to handle the basic thinking and fundamental methods in Bayesian statistics, to lay a good foundation for the subsequent data analyses in practice.

9. **教学方法**
Teaching Methods

讲授 Lectures

10. **教学内容**
Course Contents
（如面向本科生开放，请注明区分内容。 If the course is open to undergraduates, please indicate the difference.）

Section 1	Introduction: General concepts in Bayesian analysis; basic concepts of prior distributions and related issues. (2 hours)
Section 2	Single-Parameter Models: Basic skills in computing posterior distributions in single-parameter models; various types of prior distributions. (4 hours)
Section 3	Multi-Parameter Models: Basic skills in computing posterior distributions in multi-parameter models. (4 hours)
Section 4	Hierarchical Models: Hierarchical model settings. (6 hours)
Section 5	Model Checking: Goodness-of-fit; PP p-value. (6 hours)
Section 6	Model Comparison: Bayesian hypothesis testing; model comparison. (6 hours)
Section 7	Introduction to Bayesian Computation: Numerical integration; distributional approximations; various sampling methods. (6 hours)
Section 8	Markov Chain Simulation: Gibbs sampler; Metropolis-Hastings algorithms; convergence diagnostics; WinBUGs. (8 hours)

	Section 9	
	Section 10	
	……	

11. 课程考核
Course Assessment

（①考核形式 Form of examination；②.分数构成 grading policy；③如面向本科生开放，请注明区分内容。If the course is open to undergraduates, please indicate the difference.）
平时作业 Assignments 30%
期末考试 Final Exam 70%

12. 教材及其它参考资料
Textbook and Supplementary Readings

教材（Texbook）:
Gelman, A. Carlin J. B., Stern, H. S, Dunson, D. B., Vehtai, A. and Rubin, D. B. (2013). Bayesian Data Analysis, (3rd edition). Chapman & Hall/CRC, New York.
其他参考资料（Supplementary Readings）:
1. Robert, C.P. and Casella, G. (2005). Monte Carlo Statistical Methods (2nd edition). Springer, New York.
2. Gilks, W.R., Richardson, S. and Spiegelhalter, D.J. (1996). Markov Chain Monte Carlo in Practice. Chapman & Hall, London.
3. Congdon, P. (2001). Bayesian Statistical Modelling. Wiley, New York.