

## 课程详述

### COURSE SPECIFICATION

以下课程信息可能根据实际授课需要或在课程检讨之后产生变动。如对课程有任何疑问，请联系授课教师。

The course information as follows may be subject to change, either during the session because of unforeseen circumstances, or following review of the course at the end of the session. Queries about the course should be directed to the course instructor.

1.	<b>课程名称 Course Title</b>	数学建模 Mathematical Modeling
2.	<b>授课院系 Originating Department</b>	数学系 Department of Mathematics
3.	<b>课程编号 Course Code</b>	MA206
4.	<b>课程学分 Credit Value</b>	3
5.	<b>课程类别 Course Type</b>	专业选修课 Major Elective Courses
6.	<b>授课学期 Semester</b>	春季 Spring
7.	<b>授课语言 Teaching Language</b>	根据学生的情况可以是英文、中文或者两者相结合。 English, Chinese, or both
8.	<b>授课教师、所属学系、联系方式 Instructor(s), Affiliation &amp; Contact</b> (For team teaching, please list all instructors)	李景治博士，数学系 Dr. Jingzhi Li, Department of Mathematics
9.	<b>实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact</b>	To be announced 待公布
10.	<b>选课人数限额(可不填) Maximum Enrolment (Optional)</b>	50

11. 授课方式 Delivery Method	讲授	习题/辅导/讨论	实验/实习	其它(请具体注明)	总学时
	Lectures	Tutorials	Lab/Practical	Other (Please specify)	Total
学时数 Credit Hours	48				48
12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	常微分方程 A 或者常微分方程 B Ordinary differential equation A or Ordinary differential equation B				
13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite					
14. 其它要求修读本课程的学系 Cross-listing Dept.					

### 教学大纲及教学日历 SYLLABUS

#### 15. 教学目标 Course Objectives

本课程是高强度介绍数学建模，主要使用图形、数值、符号计算和数学写作技巧描述和探究实际数据和现象。重点在运用微积分，高等代数的知识来研究和分析应用型的模型和问题，特别是物理、生态、环境、医学、管理、经济、信息技术等领域的一些典型实例，在传授知识的同时，通过典型建模实例的分析和参加建模实践活动，培养和增强学生自学能力、创新素质。

This course is an intensive introduction to mathematical modeling using graphical, numerical, symbolic, and verbal techniques to describe and explore real-world data and phenomena. Emphasis is on the use of calculus and linear algebra to investigate and analyze applied problems and questions in physics, ecology, medicine, management, economics and information, etc., supported by the use of appropriate technology, and on effective communication of quantitative concepts and results.

#### 16. 预达学习成果 Learning Outcomes

能够以通用数学形式从各种问题中模拟情况；

能够以口头、数字、图形和符号形式表达和处理数学信息、概念和思想，同时解决各种问题；

能够通过不同的（归纳、演绎和象征）推理模式解决多步问题；

能够在评估、分析和综合中正确使用适当的技术解决问题的信息；

能够从给定的情况中提取定量数据，以各种方式将数据转换成信息，评估信息，提取基本信息，进行逻辑推理，得出合理结论；

能够在运用科学方法探索自然和宇宙的同时适当地运用定量推理；

Ability to model situations from a variety of settings in generalized mathematical forms;

Ability to express and manipulate mathematical information, concepts, and thoughts in verbal, numeric, graphical and symbolic form while solving a variety of problems;

Ability to solve multiple-step problems through different (inductive, deductive and symbolic) modes of reasoning;

Ability to properly use appropriate technology in the evaluation, analysis, and synthesis

of information in problem-solving situations;

Ability to extract quantitative data from a given situation, translate the data into information in various modes, evaluate the information, abstract essential information, make logical deductions, and arrive at reasonable conclusions;

Ability to employ quantitative reasoning appropriately while applying scientific methodology to explore nature and the universe;

#### 17. 课程内容及教学日历（如授课语言以英文为主，则课程内容介绍可以用英文；如团队教学或模块教学，教学日历须注明主讲人）

**Course Contents (in Parts/Chapters/Sections/Weeks. Please notify name of instructor for course section(s), if this is a team teaching or module course.)**

- 1.Introduction (2 hours)
- 2.Writing skills (4 hours)
- 3.Modeling Change (2 hours)
- 4.Modeling proportionality and Geometric Similarity (4 hours)
- 5.Model Fitting (4 hours)
- 6.Data-driven modeling (4 hours)
- 7.Simulation Modeling (4 hours)
- 8.Discrete Probabilistic Modeling (4 hours)
- 9.Discrete Optimization Modeling (4 hours)
- 10.Dimensional Analysis (4 hours)
- 11.Modeling with Ordinary Differential Equations (6hours)
- 12.Optimization of Continuous Modeling (6hours)

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

A First Course in Mathematical Modeling, by Frank R. Giordano, William P. Fox, Steven B. Horton, Maurice D. Weir, Cengage Learning; 5 edition (2013)

数学建模, 姜启源, 清华大学出版社, 第四版, 2011

English Writing of Mathematics, Tao Tang, Jiu Ding, Higher Education Press, 2013

课程评估 ASSESSMENT

19. 评估形式 Type of Assessment	评估时间 Time	占考试总成绩百分比 % of final score	违纪处罚 Penalty	备注 Notes
出勤 Attendance		10%		
课堂表现 Class Performance				
小测验 Quiz		20%		
课程项目 Projects		30%		
平时作业 Assignments		10%		
期中考试 Mid-Term Test		15%		
期末考试 Final Exam		15%		
期末报告 Final Presentation				

其它（可根据需要  
改写以上评估方  
式）  
**Others (The  
above may be  
modified as  
necessary)**

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20. 记分方式 **GRADING SYSTEM**

<input checked="" type="checkbox"/> A. 十三级等级制 <b>Letter Grading</b> <input type="checkbox"/> B. 二级记分制（通过/不通过） <b>Pass/Fail Grading</b>
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**课程审批 REVIEW AND APPROVAL**

21. 本课程设置已经过以下责任人/委员会审议通过  
**This Course has been approved by the following person or committee of authority**

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