

COURSE SPECIFICATION

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.	Course Title	Mathematical Modeling
2.	Originating Department	Department of Mathematics
3.	Course Code	MA206
4.	Credit Value	3
5.	Course Type	Major Elective Courses
6.	Semester	Spring
7.	Teaching Language	English, Chinese, or both
8.	Instructor(s), Affiliation & Contact For team teaching, please list all instructors	Dr. Jingzhi Li, Department of Mathematics
9.	Tutor/TA(s), Contact	To be announced
10.	Maximum Enrolment () Optional	50

11.			/ /	/	()	
	Delivery Method	Lectures	Tutorials	Lab/Practical	Other Please specify	Total
	Credit Hours	48				48
12.	Pre-requisites or Other Academic Requirements	<div style="display: flex; justify-content: space-around;"> A B </div> Ordinary differential equation A or Ordinary differential equation B				
13.	Courses for which this course is a pre-requisite					
14.	Cross-listing Dept.					

SYLLABUS

15. **Course Objectives**

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. **Learning Outcomes**

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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.

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. 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)

2011

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

ASSESSMENT

19.

Type of Assessment	Time	% of final score	Penalty	Notes
Attendance		10%		
Class Performance				
Quiz		20%		
Projects		30%		
Assignments		10%		
Mid-Term Test		15%		
Final Exam		15%		
Final Presentation				

Others (The
above may be
modified as
necessary)

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20.

GRADING SYSTEM

A.	Letter Grading
B.	/ Pass/Fail Grading

REVIEW AND APPROVAL

21.

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This Course has been approved by the following person or committee of authority

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