

## 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.	课程名称 <b>Course Title</b>	动力系统 Introduction to Dynamical Systems				
2.	授课院系 <b>Originating Department</b>	数学系 Department of Mathematics				
3.	课程编号 <b>Course Code</b>	MAT8009				
4.	课程学分 <b>Credit Value</b>	3				
5.	课程类别 <b>Course Type</b>	专业选修课 Major Elective Courses				
6.	授课学期 <b>Semester</b>	春季 Spring / 夏季 Summer / 秋季 Fall				
7.	授课语言 <b>Teaching Language</b>	英文 English				
8.	授课教师、所属学系、联系方式（如属团队授课，请列明其他授课教师） <b>Instructor(s), Affiliation &amp; Contact</b> (For team teaching, please list all instructors)	Jana Hertz Department of Mathematics, Block 3, Wisdom Valley Jana Hertz, Room 427, <a href="mailto:rhertz@sustech.edu.cn">rhertz@sustech.edu.cn</a> , 0755-8801-8121				
9.	实验员/助教、所属学系、联系方式 <b>Tutor/TA(s), Contact</b>	待公布 To be announced				
10.	选课人数限额(可不填) <b>Maximum Enrolment (Optional)</b>					
11.	授课方式 <b>Delivery Method</b>	讲授 <b>Lectures</b>	习题/辅导/讨论 <b>Tutorials</b>	实验/实习 <b>Lab/Practical</b>	其它(请具体注明) <b>Other (Please specify)</b>	总学时 <b>Total</b>
	学时数 <b>Credit Hours</b>	48				48

12. 先修课程、其它学习要求 <b>Pre-requisites or Other Academic Requirements</b>	常微分方程 A 或 B (MA201a 或 MA201b) Ordinary Differential Equations A or B (MA201a or MA201b)
13. 后续课程、其它学习规划 <b>Courses for which this course is a pre-requisite</b>	
14. 其它要求修读本课程的学系 <b>Cross-listing Dept.</b>	

**教学大纲及教学日历 SYLLABUS**

15. **教学目标 Course Objectives**

The goal of this course is to introduce the student into some of the main research areas of Dynamical Systems.

16. **预达学习成果 Learning Outcomes**

In the first part of the course a panorama of dynamical systems is given, with several paradigmatic examples. We then introduce basic notions of topological dynamics, limit sets, recurrence, classification. Symbolic dynamics is a necessary tool for classification, and will be studied. In the final section, we introduce hyperbolic dynamics, and classical theorems such as the stable manifold theorem

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.)**

Section 1. Examples and basic concepts.

- 1.1 The notion of a dynamical system (1h)
- 1.2 Circle rotations (1h)
- 1.3 Expanding endomorphisms of the circle (2h)
- 1.4 Shifts and subshifts (2h)
- 1.5 Quadratic maps (1h)
- 1.6 The Gauss transformation (1h)
- 1.7 Hyperbolic toral automorphisms (2h)
- 1.8 The horseshoe (2h)
- 1.9 Chaos and Lyapunov exponents (2h)
- 1.10 Attractors: the solenoid, the Lorenz attractor, the Hénon map (3h)
- 2. Topological dynamics
  - 2.1. Limit sets and recurrence (2h)
  - 2.2 Topological transitivity and topological mixing (2h)
  - 2.3. Expansiveness (1h)
  - 2.4. Topological entropy. Examples (5h)
  - 2.5. Equicontinuity, distality, proximality (2h)
- 3. Symbolic dynamics
  - 3.1. Subshifts and codes (1h)
  - 3.2. Subshifts of finite type (1h)
  - 3.3. Topics in symbolic dynamics (4h)
- 4. Hyperbolic dynamics
  - 4.1 Brief introduction on surfaces manifolds and differentiability (2h)
  - 4.2. Hyperbolic sets (2h)
  - 4.3. Pseudo orbits and shadowing property (2h)
  - 4.4. Stable manifold theorem (4h)
  - 4.5. Topics in hyperbolic dynamics (2h)

1. Introduction to Dynamical Systems, M. Brin and G. Stuck
2. A first course in Dynamics, B. Hasselblatt and A. Katok.
3. Introduction to the Modern Theory of *Dynamical Systems*, by A. Katok and B. Hasselblatt.

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				
课堂表现 Class Performance				
小测验 Quiz				
课程项目 Projects				
平时作业 Assignments				
期中考试 Mid-Term Test				
期末考试 Final Exam				
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)				

20. 记分方式 GRADING SYSTEM

- A. 十三级等级制 Letter Grading  
 B. 二级记分制（通过/不通过） Pass/Fail Grading

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