

课程大纲

COURSE SYLLABUS

1.	课程代码/名称 Course Code/Title	非线性动力学与混沌 Nonlinear Dynamics and Chaos
2.	课程性质 Compulsory/Elective	专业选修课 Major Elective Course
3.	开课单位 Offering Dept.	力学与航空航天工程系 Department of Mechanics and Aerospace Engineering
4.	课程学分/学时 Course Credit/Hours	3/48
5.	授课语言 Teaching Language	英文 English
6.	授课教师 Instructor(s)	李明武 Mingwu Li
7.	开课学期 Semester	春季学期 Spring Semester
8.	是否面向本科生开放 Open to undergraduates or not	是 Yes
9.	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.) For undergraduates, the pre-requisites include MA201b. For graduates, there is no pre-requisites.
10.	教学目标 Course Objectives	(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.) The objectives of this course are: 1) To demonstrate the importance and essentiality of nonlinearity in the physical (and further, engineering) world. 2) To introduce the fundamentals of nonlinear dynamics and chaos, including concepts, theories, and methods. 3) To develop students' ability to apply the fundamentals of nonlinear dynamics to solve nonlinear problems in mechanics, mechanical, and aerospace engineering.
11.	教学方法 Teaching Methods	(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.) This course is based on lectures (理论课)。
12.	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.)
	第一周 Week 1	非线性动力学简介 Introduction to nonlinear dynamics
	第二周 Week 2	动力系统引论 (解的存在性、唯一性及对参数和初始条件的依赖性) Fundamentals of dynamical systems
	第三周 Week 3	平衡点、不动点及其稳定性分析 1

	Equilibrium, fixed point and their stability analysis Part I
第四周 Week 4	平衡点、不动点及其稳定性分析 2 Equilibrium, fixed point and their stability analysis Part II
第五周 Week 5	周期解及其稳定性分析 1 Periodic orbit and its stability analysis Part I
第六周 Week 6	周期解及其稳定性分析 2 Periodic orbit and its stability analysis Part II
第七周 Week 7	平衡点分叉 Bifurcation of equilibrium
第八周 Week 8	不动点及周期解分叉 Bifurcation of fixed point and periodic orbit
第九周 Week 9	中心流形、稳定流形及不稳定流形 Center, stable and unstable manifolds
第十周 Week 10	规范型分析 Normal form analysis
第十一周 Week 11	结构稳定性、通用性及横截性 Structural stability, genericity, and transversality
第十二周 Week 12	数值方法 Numerical methods
第十三周 Week 13	分形 Fractal
第十四周 Week 14	混沌系统动力学 1 Chaos Part I
第十五周 Week 15	混沌系统动力学 2 Chaos Part II
第十六周 Week 16	复习 Review
第十七、八周 Week 17-18	期末考试 Final exam
13. 课程考核 Course Assessment	
	<p>(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.)</p> <p>Undergraduates: Assignments (30%), Mid-term test (30%), Final Exam (40%) Graduates: Assignments (50%), Mid-term test (20%), Final Exam (30%)</p>
14. 教材及其它参考资料 Textbook and Supplementary Readings	
	<ol style="list-style-type: none"> 1. Stephen Wiggins, Introduction to Applied Nonlinear Dynamical Systems and Chaos, Springer, 2013. 2. Steven Strogatz, Nonlinear Dynamics and Chaos, CRC Press, 2015. 3. J. Guckenheimer & P. Holmes, Nonlinear Oscillations, Dynamical Systems and Bifurcations, Springer, 1983.