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 Course Title	实变函数(H) Real Analysis (H)
2.	授课院系 Originating Department	数学系 Department of Mathematics
3.	课程编号 Course Code	MA337
4.	课程学分 Credit Value	3
5.	课程类别 Course Type	专业核心课 Major Core Courses
6.	授课学期 Semester	秋季 Fall
7.	授课语言 Teaching Language	中英双语 English & Chinese
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） Instructor(s), Affiliation& Contact （For team teaching, please list all instructors）	邱雁南 Yannan QIU 数学系 Department of Mathematics qiuyn@sustech.edu.cn
9.	实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact	待公布 To be announced
10.	选课人数限额(可不填) Maximum Enrolment （Optional）	

11.	授课方式 Delivery Method	讲授 Lectures	习题/辅导/讨论 Tutorials	实验/实习 Lab/Practical	其它(请具体注明) Other（Please specify）	总学时 Total
	学时数	3				

Credit Hours				

12.	先修课程、其它学习要求 **Pre-requisites or Other Academic Requirements**	数学分析 III 或数学分析 III(H) 数学分析精讲 Mathematical Analysis III or Mathematical Analysis III(H) or Mathematical Analysis
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

This course introduces measure theory and various tools for analyzing the behavior of functions on R^n.

本课程引入测度理论，以及用以分析实空间上函数行为的各种工具。

16.　预达学习成果 Learning Outcomes

The students will be able to understand the construction of measure and know real analysis techniques such as changing the order of integration and limits, changing the order of integrations, establishing properties that hold almost everywhere, establishing estimates about L^p norms or weak L^p norms and extracting useful information from them, etc.

学生将能理解测度的构造并知晓各种实分析技术，比如交换积分与取极限的次序，交换多重积分的次序，建立几乎处处成立的性质，建立关于 L^p 范数或弱 L^p 范数的估计并从其中获得有用信息等。

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.)

This course covers measure theory, Lebesgue's theory of integration and differentiation, L^p spaces, and generalized functions . It comprises 24 lectures, with each lecture lasting 100 minutes.

Topic 1: Cardinality of sets, Baire category theorem (3 lectures);

Topic 2: The Lebesgue measure on R^n, abstract measure, measurable sets and non-measurable sets (3 lectures);

Topic 3: Measurable functions, almost everywhere convergence, convergence in measure, Littlewood's three principles (3 lectures);

Topic 4: Lebesgue integral, monotone convergence theorem, dominated convergence theorem, premeasure, product measure, the monotone class theorem, the Fubini-Tonelli theorem (4 lectures);

Topic 5: The Lebesgue differentiation theorem, the Hardy-Littlewood maximal function, functions of bounded variation, absolutely continuous functions, the fundamental theorem of calculus, approximations to the identity, the formula for integration by parts, the change-of-variable formula, the Radon-Nikodym theorem (6 lectures);

Topic 6: The theory of L^p spaces (2 lectures);

Topic 7: Distributions (2 lectures);

Review. (1 lecture)

本课程讲授测度理论，Lebesgue 积分与微分理论，L^p 空间，及广义函数，包括 24 次课，每次课 100 分钟。
主题一：集合的基数，Baire 纲定理（3 次课）；
主题二：R^n 上的 Lebesgue 测度，抽象测度，可测集与不可测集（3 次课）：
主题三：可测函数，几乎处处收敛，依测度收敛，Littlewood 三原则（3 次课）；
主题四：Lebesgue 积分，单调收敛定理，控制收敛定理，预测度，乘积测度，单调类定理，Fubini-Tonelli 定理（4 次课）；
主题五：Lebesgue 微分定理，Hardy-Littlewood 极大函数，有界变差函数，绝对连续函数，微积分基本定理，对单位的逼近，分部积分公式，换元公式，Radon-Nikodym 定理（6 次课）；
主题六：L^p 空间（2 次课）；
主题七：广义函数（2 次课）。
复习（1 次课）

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

教材 Textbooks:

1. Real Analysis (ISBN 9787510040535), by Elias M. Stein & Rami Shakarchi;

2. An introduction to measure theory (ISBN 9787040469059), by Terence Tao。

参考文献 References:

1. An Epsilon of Room I: Real Analysis (ISBN 9787040469004), by Terence Tao;

2. Analysis I-IV (ISBN 9783540059233, 9783540209218, 9783319160528, 9783319169064), by Roger Godement。
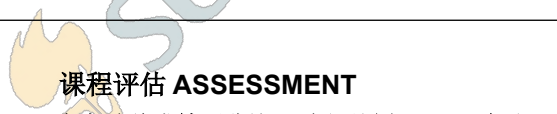
课程评估 ASSESSMENT

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		30%		
期中考试 Mid-Term Test		30%		

期末考试 Final Exam	40%		
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