

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	数论专题 Topics in Number Theory				
2.	授课院系 Originating Department	数学系 Department of Mathematics				
3.	课程编号 Course Code	MA319				
4.	课程学分 Credit Value	2				
5.	课程类别 Course Type	专业选修课 Major Elective Courses				
6.	授课学期 Semester	夏季 Summer				
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)	吴正尧，（外聘教师）汕头大学数学系 Wu Zhengyao, Department of Mathematics, Shantou University Email: wuzhengyao@stu.edu.cn Webpag: http://wuzhengyao.oschina.io/homepage/				
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 Credit Hours	32				32

<p>12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements</p>	<p>初等数论(MA209-16)、抽象代数(MA214)或者抽象代数(H)(MA219)、数学分析III(MA203a)或数学分析精讲(MA213-16) Elementary Number Theory (MA209-16), Abstract Algebra(MA214), Mathematical Analysis III (MA203a) or Real Analysis(MA213-16)</p>
<p>13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite</p>	<p>代数曲线 等更高等的数论或代数几何课程 More advanced courses in number theory or algebraic geometry, such as Algebraic Curves</p>
<p>14. 其它要求修读本课程的学系 Cross-listing Dept.</p>	

教学大纲及教学日历 SYLLABUS

15. **教学目标 Course Objectives**

本课程为数学与应用数学专业学生设计，是抽象代数等课程的后续课程。课程旨在引导学生学习现代数论的重要专题知识，为有志于在数论或代数几何方向深入学习和研究的高年级学生打下扎实的知识基础。作为专题课，本课程每次开课的主要专题可能随授课教师而稍有变化。主要的可选主题包括：数域、代数整数、离散赋值和离散赋值环、弱逼近定理、完备离散赋值域及其扩张、局部域、类域论简介等。

This course is a subsequent course to the Abstract Algebra course for students majored in pure and applied mathematics. It aims at leading students into selected topics in modern number theory, and for those who are interested in further study and research in number theory or algebraic geometry, the course will help them to lay down a solid foundation in background knowledge. As a course in selected topics, the contents may vary slightly each year according to the instructor. The main topics to be covered include: Number fields, algebraic integers, discrete valuations and discrete valuation rings, weak approximation theorem, complete discrete valuation fields and their extensions, local fields, introduction to class field theory, etc.

16. **预达学习成果 Learning Outcomes**

通过对本课程的学习，学生能够理解和掌握现代数论的若干重要理论，包括代数数域，局部域，分歧理论等。同时，学生应当逐渐培养出较好的深入自学能力以及独立钻研科研课题的能力。

An adequate training through this course should help the students to understand some important theories in modern number theory, such as algebraic number fields, local fields and ramification theory. Also, students are expected to gradually foster the ability of deep self-teaching and independent, innovative study of research topics.

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.)

第一章 环论和域论补遗 (8h)

- 1.1 诺特环
- 1.2 模论基础
- 1.3 局部环与局部化
- 1.4 域扩张及其迹与范数
- 1.5 Galois 理论

第二章 域的绝对值与离散赋值 (14h)

- 2.1 域的绝对值及其等价类
- 2.2 离散赋值
- 2.3 有理数域的绝对值
- 2.4 弱逼近定理
- 2.5 赋值域的完备化
- 2.6 Hensel 引理
- 2.7 非阿绝对值的扩张
- 2.8 Newton 折线

第三章 局部域及其扩张 (10h)

- 3.1 局部域的定义和性质
- 3.2 非分歧扩张
- 3.3 完全分歧扩张
- 3.4 分歧子群
- 3.5 Krasner 引理
- 3.6 局部类域论简介

Chapter 1 Complements in ring theory and field theory (8h)

- 1.1 Noetherian rings
- 1.2 Introduction to module theory
- 1.3 Local rings and localization
- 1.4 Field extensions and their traces and norms
- 1.5 Galois theory

Chapter 2 Absolute values and discrete valuations of fields (14h)

- 2.1 Absolute values of fields and their equivalence classes
- 2.2 Discrete valuations
- 2.3 Absolute values of the field of rational numbers
- 2.4 Weak approximation theorem
- 2.5 Completions of valued fields
- 2.6 Hensel's lemma
- 2.7 Extensions of non-archimedean absolute values
- 2.8 Newton's polygon

Chapter 3 Local fields and their extensions (10h)

- 3.1 Definition and properties of local fields
- 3.2 Unramified extensions
- 3.3 Totally ramified extensions
- 3.4 Ramification subgroups
- 3.5 Krasner's lemma
- 3.6 Introduction to local class field theory

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

教材 Textbook:

J. S. Milne's notes: Algebraic Number Theory, available at <https://www.jmilne.org/math/CourseNotes/ant.html>

推荐参考书 Supplementary Readings:

J.-P. Serre, Local Fields, Graduate Texts in Math. no.67, Springer, 1979

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				
期末考试		70		

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

