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**	金融科技数学基础 Fintech Mathematics
2.	**授课院系 Originating Department**	金融系 Department of Finance
3.	**课程编号 Course Code**	FET203
4.	**课程学分 Credit Value**	3
5.	**课程类别 Course Type**	专业基础课 Major Foundational 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）**	伍继松, 金融系, 13760303662 Jisong WU, Department of Finance, 13760303662
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				
48				48

12.	先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	MA103 线性代数 1 Linear Algebra
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**

本课程将详细讲解 1. 数学思维推理; 2.组合分析; 3.多种离散结构; 4. 建模和实际背景. 通过此课程的学习, 学生将会扎实地掌握相应的知识、方法、能力, 利于其在金融数学和工程的工作和学习研究。

This course will elaborate on 1 Mathematical logics; 2 Combinational Analysis; 3 Multiple Discrete Structures; 4 Modeling and Actual Background. Through the study of this course, students should be able to establish solid foundation of the corresponding knowledge, methodology and ability to apply them in their study and research in financial engineering and financial mathematics.

16. **预达学习成果 Learning Outcomes**

学生应能掌握以下学科分支的基本的理论和方法: (1) 逻辑和证明论基础, 命题逻辑, 谓词逻辑, 推理规则, 证明方法和战略; (2)代数和数的理论基础, 群, 环, 域和扩张; (3) 图论, 欧拉路径, 哈密顿路径, 树, 树的遍历; (4)置换, 组合, 和递归。

Students should be able to master the basic theory and methodology of the following subjects: (1) Propositional Logic, Proof Basics, Propositional Logics, Predicate logic, Rules of Inference, Proof Methods and Strategy;(2) Algebra and number theory, Groups, Rings, Fields and extentions; (3) Graphs, Euler and Hamilton Paths, Trees, Tree Traversal; (4) Permutations and Combinations, Recursive and Structural Induction.

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：逻辑和证明论基础(6 学时)

在本章节中， 侧重在概念，定义和法则，包括：命题逻辑, 谓词逻辑，推理规则和证明方法和战略;

第二章：基本的离散结(2 学时)

在本章节中， 侧重概念，主要内容包括：集合，函数，序列，总数和矩阵

第三章：搜索和分类算法(2 学时)

在本章节中， 介绍算法规则和范式，讨论暴力算法和贪婪算法

第四章：学习整数和它的性质(2 学时)

在本章节中，介绍数论的几个重要应用， 包括随机数的产生，内存分配，错误检测，介绍数论在经典加密血中的应用以及现代加密在电子通讯中的应用

第五章：归纳和递归(4 学时)

在本章节中，介绍数学归纳法和它在证明中的应用，递归方法定义序列以及递归算法， 侧重方法的应用

第六章：计数(2 学时)

在本章节中，介绍计数基础，包括排列和组合方法，二项系数和等式，通用排列和组合方法

第七章：离散概率(2 学时)

在本章节中，介绍离散概率的基础，包括概率理论，贝叶斯定理，期望值和方差

第八章：高级计数技术(2 学时)

在本章节中，重复关系的应用，线性重复关系的求解，分割征服算法和重复关系，产生函数，包含和排除的方法及应用

期中考试(1-8 章) (2 学时)

第九章：关系(4 学时)

在本章节中，关系的定义和属性，n 层关系及应用，代表关系，关系的闭合性，等价关系及部分排序

第十章：图论(4 学时)

在本章节中，图的定义和图论模型, 欧拉路径, 哈密顿路径

第十一章：树(4 学时)

在本章节中，树的简介和应用, 树的遍历, 生成树， 最小生成树

第十二章：波尔函数(4 学时)

在本章节中，波尔函数, 波尔函数的表现，逻辑门和最小电路

第十三章：模型计算(4 学时)

在本章节中，语言和文法，有输出的有限状态机器，没有输出的有限状态机器，语言识别，图灵机

总复习(2 学时)

Chapter 1: Logic and proofs basics（6Hours）

In this chapter, focus on concepts, definition and rules, include: propositional and predicate logic, rules of inference, proof methods and strategy

Chapter 2: Basic Discrete Structures（2 Hours）

In this chapter, focus on concepts, main content include: Sets, Functions, Sequences, Sums and Matrices

Chapter 3: Searching and sorting algorithms,（2 Hours）

In this chapter, Introduction to rules and paradigm of algorithms, with discussion on brute-force algorithms and greedy algorithms.

Chapter 4: Study of the set of integers and their properties（2 Hours）

In this chapter, introduction to several important application of number theory, include generating pseudorandom numbers, assigning memory locations, error detection, introduction to application of number theory in classical cryptography and application of modern cryptography in electronic communication

Chapter 5: Induction and Recursion（4 Hours）

In this chapter,Introduction to mathematic induction and its application in proofs, recursive definition in sequences and recursive algorithms， focus on the application of methodologies.

Chapter 6: Counting（2 Hours）

In this chapter, Introduction to the basics of counting, include permutations and combinations, binomial coefficients and identities, generalized permutations and combinations

.Chapter 7: Probability （2 Hours）

In this chapter, Introduction to the basics of discrete probability, include probability theory, Bayes's theorem, expected value and variance

Chapter 8: Advanced Counting Techniques（2 Hours）

In this chapter,Applications of recurrence relations, solving linear recurrence relations, divide-and-conquer algorithms and recurrence relations, generating functions, inclusion- exclusion and its applications

Mid-term evaluation course（2 Hours）

Chapter 9: Relations（4 Hours）

In this chapter, Definition of relations and their properties, n-ary relations and their applications, representing relations, closure of relations, equivalence relations and partial orderings

Chapter 10: Graphs（4Hours）

In this chapter, Definition of graph and graph models, Euler Paths , Hamilton Paths

Chapter 11: Trees（4 Hours）

In this chapter, Introduction to trees and applications, tree traversal, spanning trees and minimum spanning trees.

Chapter 12: Boolean Algebra（4 Hours）

In this chapter, Boolean functions, representing Boolean functions, logic gates, minimization of circuits

Chapter 13: Modelling Computation（6Hours）

In this chapter, Language and grammars, finite state machines with output, finite state machines without output, language recognition, Turing machine

Final evaluation course（2 Hours）

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

教材 Textbook：

[1] Kenneth H. Rosen: Discrete Mathematics and Its Applications, 7th Edition,2012, McGraw-Hill Education,

[2] Concrete Mathematics: A Foundation for Computer Science (2nd Edition)by Ronald L. Graham, Donald E. Knuth

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		10		
课堂表现 Class Performance				
小测验 Quiz				
课程项目 Projects				
平时作业 Assignments		20		
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