Discrete Mathematics II

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I. Course Information

1. Course Code: M202204W
2. Course platform and modules: Specialty Basic Course
3. Course Nature：Compulsory
4. Hours / Credits: 48/3
5. Prerequisite(s): Discrete Mathematics I
6. Specialty: Computer Science and Technology

II. Course Description and Objectives

Discrete mathematics is an important branch of modern mathematics, is the theoretical basis of computer science and technology, and is also a professional basic discipline gradually built and improved with the development of computer science and technology. The research method of discrete mathematics fully embodies the discrete characteristics of computer science and technology when dealing with problems, and it is also an effective tool for the application of computer theory and technology.

This course is the second part of discrete mathematics, and it includes algebraic structure and graph theory. The objectives of this course are as follows.

1. Cultivate and train students' ability of mathematical abstract thinking and rigorous logical reasoning.

2. Understand and master the basic concepts and theorems in algebraic structure and graph theory.

3. Understand the role of discrete mathematics in computer science and daily life, and be able to solve some practical problems in daily life.

4. It will lay a solid foundation for dealing with discrete information in the future, dealing with a large number of daily things and scientific research projects with computers, and engaging in computer science and application.

III. Correspondence between Course Objectives and Graduation Requirements

Requirements for Graduation	Graduation Requirements Index Point	Course Objectives
1. Engineering knowledge	1.1 Understand and mater the basic knowledge of mathematics, physics and other natural sciences. Have a certain degree abilities of using modern scientific and technical methodology.	1
	1.2 Understand and master the basic knowledge and basic methods of computer science and technology, understand the basic engineering knowledge in computer application systems. Have some abilities of calculating thinking.	2
2. Problem analysis	2.1 Through the applications of mathematics, natural science, computer science and technology of the basic theory and methods, students can analyze and identify the complexity of practical engineering applications, and give clear description and representation.	3
3. Scientific research	3.1 Understand and master the basic theories and methods of	4

computer science and technology, and understand the professional basic research methods from scientific and technical methodology aspect.

IV. Teaching Content and Arrangement

No.	Knowledge chapter	points	requirement	hours	Index Points
1	Algebraic system	Concepts of algebraic system	understand	2	1.1
		Properties of isomorphism and homomorphism	master		
		Algebraic system isomorphism and homomorphism decision provement	master		
2	Semigroup and monoid	Concepts of semigroup and monoid	understand	2	1.1,1.2
		Properties and decision methods of semigroup and monoid	master		
3	Group	Concepts of group, subgroup, Abel group, cyclic group, permutation group	understand	10	1.1,1.2,2.1
		Properties and decision method of group and subgroup	master		
		Equivalence definitions of group	known		
		Properties of cyclic group	master		
		Different representations of permutation group	master		
		Properties and concepts of coset, and the properties' provement of finite group	master		
		Construction and properties of factor group	understand		
		Decision and provement of group isomorphism and homomorphism	known		
4	Ring & Field	Concepts of ring, subring, integral ring, field	understand	4	1.2,3.1
		Concepts and properties of factor ring	known		
		Concepts of ring homomorphism	understand		
5	Lattice & Boolean algebra	Definition and properties of lattice	master	6	1.1,1.2
		Definition, properties and decisions of sublattice	master		
		Lattice homomorphism	understand		
		Properties and decision of modular lattice, distribute lattice, complement lattice	master		
		Structure and properties of finite	master		

		Boolean Algebra			
6	Graph	Definition and concepts of directed and undirected graph	understand	6	1.1,1.2,2.1,3.1
		Handshaking theorem and inferences, and their applications	master		
		Concepts of walks and closed walks	understand		
		Matrix representation of graph, and its applications	master		
		Dijkstra algorithm	master		
7	Euler graph& Hamilton graph	Euler graph, Euler walk, Euler closed walks	understand	6	1.1,1.2,2.1,3.1
		Properties and decision method of Euler graph	master		
		Hamilton graph, Hamilton graph, Hamilton closed walk	understand		
		Hamilton graph properties and some decision methods	master		
		Chinese postman problem, traveling salesman problem	understand		
8	Tree	Undirected tree and its properties	master	6	1.1,1.2,2.1,3.1
		Minimal spanning tree algorithms	master		
		Concepts of rooted tree	master		
		Traversal of rooted tree	master		
		Optimal binary tree and Huffman algorithms	master		
9	Planar graph	Concept of planar graph	understand	3	1.1,1.2,2.1
		Dual graph and its applications	understand		
		Euler formula and theory applications	master		
		Planar graph and maximal planar graph properties and decision conditions	master		
10	Graph coloring	Concepts of vertex coloring, vertex color number	understand	3	1.1,1.2
		Conclusions of chromatic number	known		
		Four color guess of planar graph	known		

V. Basic Requirements of Teaching

1. Courses. This course arranges 48 hours. The electronic teaching plans, are mainly used, and writing on the blackboard as supplement.

2. Homeworks. Includes the exercises of the chapter and exercises in the class, submit in writing.

VI. Courses Assessment

Assessment Content	Score	Assessment /Evaluation Rules	Course Objectives
Homework	10%	(1) To test students' understanding and mastery of the knowledge points in each chapter.	1,2
Peacetime test	40%	(1) It is recommended to arrange 2-4 tests. (2) Includes the basic concepts, basic theories and applications of algebraic structure.	2,3,4
Final test	50%	(1)The total score is 100, and it is counted as 20 percentage of the overall score. The score accounted for 50% of the total evaluation. (2) Includes the basic concepts, basic theories and applications of algebraic structure and graph theory.	1,2,3,4

VII. Relation with Other Courses and Respective Responsibility of Each Course

Prerequisites: Discrete Mathematics I

Followups: Data structure, Database, Compilation principle, Algorithm analysis and design, computer network

VIII. Textbooks and Reference Books

[1]Kenneth H. Rosen, Discrete Mathematics and Its Applications (7th Edition). Beijing. China Machine Press. 2016.

[2] B.KOLMAN. Discrete Mathematical Structures (6th Edition). Prentice-Hall International, Inc..（China Higher Education Press,2010）.