# CS 0441: Discrete Structures

Fall, 2023-2024

**Instructor**: Kunpeng Wang

E-mail: **kunpeng.wang@scupi.cn**

**Section**: 02

Office Hours: Tue./Wed. 8-11 am, Tue. 12:30-5 pm, Fri. 12:30-2 pm

Office: Room **3-317A** SCUPI Building

## Course Description

This course offers a survey of the following areas: set theory, mathematical induction, number theory, relations, functions, algebraic structures, and introductory graph theory. The topics to be discussed are fundamental to most areas of Mathematics and have wide applicability to Computer Science.

Class Room: Room **3-106** SCUPI Building

Class Hours: Thursday 1:50-2:35 pm, 2:45-3:30 pm, 3:40-4:25 pm

**Teaching Assistant**: Tongkai Xu

QQ Group: 870611926

Email: **2021141520104@stu.scu.edu.cn**

Tutorials: Tuesday 12:40 pm, 3-106 SCUPI Building, or,

Wednesday 11:10 am, 3-106 SCUPI Building

## Prerequisites

MATH 0220 Analytic Geometry and Calculus 1 or MATH 0230 Analytic Geometry and Calculus 2 or MATH 0235 Honoured Analytic Geometry and Calculus

## Course Objectives

This course presents the theory and applications of discrete mathematics. In this course, students will be able to:

1. Understand the structure of logical arguments and mathematical proofs.
2. Become familiar with the basic concepts of logic, set theory, number theory, and combinatorics.
3. Perform computations in modular arithmetic and to understand the relevant number systems.
4. Calculate the number of possible outcomes for problems involving combinations and permutations.
5. Know the basics of the graph theory.

## Course Content

We will cover most of the material from Chapters 1-2 & 4-7 & 9-10 in the textbook.

# Class Structure

Lectures.

# Tutorials

Tutorials run by our TA will start in Week 03.

# Course Materials

**Textbook:** Discrete Mathematics and Its Applications, 7th Edition, by Kenneth H. Rosen, McGraw-Hill, 2012.

# Blackboard

Please regularly log on and check https://learn.scupi.cn/. We will upload there lecture notes, assignments, projects, announcements and your grades.

# Course Assessment

Biweekly assignments, quizzes, class activities, midterm and final exams.

# Schedule of Exams, Assignments and Quizzes

## Exams

| Date | Time | Component |
|---|---|---|
| Week 9 | 2 hours | Midterm exam |
| Final exam week (Dec 23 to Dec 29) | 2 hours | Final exam |

## Assignments

Homework assignments will be given out biweekly. They will be due by the following two weeks at the beginning of the class, 1:50 pm. Plagiarism will not be tolerated. However, discussions of the assignment problems will be permited. Please also note each student must submit his/her individual assignment.

### Quizzes

Students will be asked to complete a quiz in tutorials each week. Normally, a quiz will consist of a short question.

## Grading Policy

The final grade will be computed according to the following scheme:

**Scheme**: Total grade = 20 % Assignments + 30 % Midterm Exam + 30 % Final Exam + 10 % Quizzes + 10 % Class Activities and Attendance.
**Note**: All tests and final exam will be closed-book.

## Conversion of Numerical Grades to Final Letter Grades Follows the SCUPI Common Grade

A $[90, 100]$ A- $[85, 90)$ B+ $[80, 85)$ B $[76, 80)$ B- $[73, 76)$ C+ $[70, 73)$ C $[66, 70)$
C- $[63, 66)$ D+ $[61, 63)$ D $[60, 61)$ F $(60, 0)$

## Schedule and weekly learning goals

The schedule is tentative and subject to change. The listed objects below should be viewed as the key concepts you should grasp after each week, and also as a study guide before each exam, and at the end of the semester. Each test will base on material that was taught up until the second last week prior to the test, namely, Test 1 covers Weeks 02-07, Test 2 is based on Weeks 8-12. The final exam will cover all topics taught in this semester.

**Week 01, 09/04-09/08**

- Cover Sections 1.1-1.2
- Course introduction.
- Propositional logic.

**Week 02, 09/11-09/15**

- Cover Sections 1.1-1.2
- Propositional logic continued.

**Week 03, 09/18-09/22**

- Cover Sections 1.3-1.4
- Propositional equivalence.
- Predicates and quantifiers.

**Week 04, 09/25-09/29**

- Cover Section 1.5
- Nested quantifiers.

**Week 05, 10/02-10/08**

- National Day Holiday.
- Cover Sections 1.6-1.7
- Rules of inference, proofs.

**Week 06, 10/09-10/13**

- Cover Sections 1.8, 2.1-2.2
- Proof strategies.
- Sets.

**Week 07, 10/16-10/20**

- Cover Section 2.3
- Set identities, functions.

**Week 08, 10/23-10/27**

- Cover Sections 2.4-2.5
- Sequences and summations.

**Week 09, 10/30-11/03**

- **Midterm Exam**.
- Cover Section 4.1
- Number theory.

**Week 10, 11/06-11/10**

- Cover Section 4.3
- Primes, GCDs.

**Week 11, 11/13-11/17**

- Cover Section 5.1
- Proof by induction.

**Week 12, 11/20-11/24**

- Cover Section 5.2.
- Strong induction.

**Week 13, 11/27-12/01**

- Cover Section 5.3
- Recursive definitions, structural induction.

**Week 14, 12/04-12/08**

- Cover Sections 6.1-6.2
- Combinatorics.
- Pigeonhole principle.

**Week 15, 12/11-12/15**

- Cover Sections 9.1 and 9.3
- Relations.

**Week 16, 12/18-12/22**

- Cover Section 9.2
- N-ary relations.

**Weeks 17 & 18, 12/25-01/05 Final Exam Week**

# Course Policies

**There will be no special treatments for any students in this course!** For example, if you have a heavy course load, you should expect a steep learning curve and be prepared for it. You will not be exempted from any assignments.

## During Class

Computers may be allowed in class for the electronic recording of notes. But please refrain from using computers for any activities that are unrelated to the course. Phones are prohibited as they are rarely useful for anything in the course. Eating and drinking are allowed in class but please keep from it affecting the course.

## Attendance Policy

Attendance is expected in all lectures. Valid excuses for absence will be accepted before class. In extenuating circumstances, valid excuses with proof will be accepted after class.

## Policies on Late Assignments and Exams

Students should start their homework assignments immediately after the assignments are given, and DO NOT wait until the last minute to meet the deadlines. **Late assignments will be NOT accepted except for emergencies and health issues. Any other late assignments handed in will be marked but will be given 0**. At most **Two** extensions for assignments will be given in this course. All assignments will be counted in your total grade. **Late submission for previous assignments during the final exam period will NOT be accepted in any form for any excuses**.

All tests and the final exam are mandatory. There will be absolutely no makeup exam for each test. If you miss the final, a makeup exam may be given for the final exam if the student has the approval from the instructor or emergencies and health issues **with a valid proof**. I will not accept the student deceleration for absence form for the final exam.

## Academic Integrity

At Sichuan University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect (The Center for Academic Integrity, Duke University, 1999). As a student, you are required to demonstrate these values in all of the work you do.

Everyone at SCUPI is expected to treat others with dignity and respect. The Code of Student Conduct allows Sichuan University to take disciplinary action if students don't follow this community expectation.