



Nanchang University

MATH 25: Introductory Discrete Mathematics

Credit: 4

Contact Hours

This course is composed of 24 lecture sessions, 3 tutorial sessions and 9 office contact hours. Each lecture session takes 2 contact hours in length; each tutorial session takes 3 contact hours in length; There will be a Q-A review session (3 contact hours) and Final Exam (3 contact hours) at the end of this term. This course has 72 contact hours in total.

Course Description

This course is an introduction to discrete mathematics with an emphasis on the understanding of logic, relations, functions, algorithm, basic set theory, countability and counting arguments, proof techniques, mathematical induction, graph theory, combinatorics, discrete probability, recursion, recurrence relations, and number theory. During this course, we will summarize the importance of discrete mathematics related to real-world problems and problem solving with discrete data.

Required Textbook

Discrete Mathematics

Editor: S. Axler, F. W. Gehring, K. A. Ribet

Publisher: Springer Science+Business Media

Grading

- Participation 10%
- Homework Assignment 20%
- Quizzes 20%
- Midterm Exam 25%
- Final Exam 25%

A+ 96-100	A 90-95	A- 85-89
B+ 82-84	B 78-81	B- 75-77
C+ 71-74	C 66-70	C- 62-65
D 60-61	F < 60	



Course Schedule

The course has 24 class sessions in total. All sessions are 2 contact hours in length. At the end of this term, there will be a Q-A review session(3 contact hours) and Final Exam (3 contact hours).

Note: the course outline and required readings are subject to change.

Class 1:

Introduction

A Party; Sets and the Like

The Number of Subsets;The Approximate Number of Subsets

Reading: Chapter 1 Let's Count

Class 2:

Sequences; Permutations

The Number of Ordered Subsets;The Number of Subsets of a Given Size

Reading: Chapter 1 Let's Count

Class 3:

Comparing and Estimating Numbers; Inclusion-Exclusion

Pigeonholes; The Twin Paradox and the Good Old Logarithm

Reading: Chapter 2 Combination Tools

Quiz 1

Class 4:

The Binomial Theorem; Distributing Presents

Anagrams;Distributing Money

Reading: Chapter 3 Binomial Coefficients and Pascal's Triangle

Class 5:

Pascal's Triangle; Identities in Pascal's Triangle

A Bird's-Eye View: Fine Details; An Eagle's-Eye View; Fine Details

Reading: Chapter 3 Binomial Coefficients and Pascal's Triangle

Class 6:

Fibonacci's Exercise

Lots of Identities; A Formula for the Fibonacci Numbers

Reading: Chapter 4 Fibonacci Numbers

Quiz 2

Class 7:

Events and Probabilities

Independent Repetition of an Experiment

Reading: Chapter 5 Combinatorial Probability



Class 8:

The Law of Large Numbers; The Law of Small Numbers and the Law of Very Large Numbers

Reading: Chapter 5 Combinatorial Probability

Class 9:

Divisibility of Integers; Primes and Their History

Factorization into Primes; On the Set of Primes

Fermat's "Little" Theorem

Reading: Chapter 6 Integers, Divisors and Primes

Class 10:

The Euclidean Algorithm; Congruences

Strange Numbers; Number Theory and Combinatorics

How to Test Whether a Number is a Prime?

Reading: Chapter 6 Integers, Divisors and Primes

Quiz 3

Class 11:

Even and Odd Degrees

Paths, Cycles and Connectivity

Eulerian Walks and Hamiltonian Cycles

Reading: Chapter 7 Graphs

Class 12:

How to Define Trees; How to Grow Trees

How to Count Trees; How to Store Trees

The Number of Unlabeled Trees

Reading: Chapter 8 Trees

Class 13:

Review and Midterm

Class 14:

Finding the Best Tree

The Traveling Salesman Problem

Reading: Chapter 9 Finding the Optimum

Class 15:

A Dancing Problem

Another Matching Problem

Reading: Chapter 10 Matchings in Graphs

Quiz 4



Class 16:

The Main Theorem

How to Find a Perfect Matching

Reading: Chapter 10 Matchings in Graphs

Class 17:

Intersections of Diagonals

Counting Regions; Convex Polygons

Reading: Chapter 11 Combinatorics in Geometry

Class 18:

A Planet Under Attack

Planar Graphs; Euler's Formula for Polyhedra

Reading: Chapter 12 Euler's Formula

Class 19:

Coloring Regions with Two Colors; Coloring Graphs with Two Colors

Coloring Graphs with Many Colors; Maps Coloring and the Four Color Theorem

Reading: Chapter 13 Coloring Maps and Graphs

Class 20:

Small Exotic Worlds

Finite Affine and Projective Planes; Block Designs

Reading: Chapter 14 Finite Geometries, Codes, Latin Squares and Other Pretty Creatures

Class 21:

Steiner Systems

Latin Squares; Codes

Reading: Chapter 14 Finite Geometries, Codes, Latin Squares and Other Pretty Creatures

Class 22:

A Connecticut Class in King Arthur's Court

Classical Cryptography; How to Save the Last Move in Chess

Reading: Chapter 15 A Glimpse of Complexity and Cryptography

Class 23:

How to Verify a Password - Without Learning it

Reading: Chapter 15 A Glimpse of Complexity and Cryptography

Class 24:

How to Find These Primes; Public Key Cryptography

Attending Policy



Regular and prompt attendance is required. Under ordinary circumstances, you may miss two times without penalty. Each absence over this number will lower your course grade by a third of a letter and missing more than five classes may lead to a failing grade in the course. Arriving late and/or leaving before the end of the class period are equivalent to absences.

Policy on "Late Withdrawals"

In accordance with university policy, appeals for late withdrawal will be approved **ONLY** in case of medical emergency and similar crises.

Academic Honesty

Nanchang University expects all students to do their own work. Instructors will fail assignments that show evidence of plagiarism or other forms of cheating, and will also report the student's name to the University administration. A student reported to the University for cheating is placed on disciplinary probation; a student reported twice is suspended or expelled.

General Expectations:

Students are expected to:

- Attend all classes and be responsible for all materials covered in class and otherwise assigned;
- Complete the day's required reading and assignments before class;
- Review the previous day's notes before class and make notes about questions you have about the previous class or the day's reading;
- Participate in class discussions and complete required written work on time;
- Refrain from texting, phoning or engaging in computer activities unrelated to class during the class period;
- While class participation is welcome, even required, you are expected to refrain from private conversations during the class period.

Special Needs or Assistance

Please contact the Administrative Office immediately if you have a learning disability, a medical issue, or any other type of problem that prevents professors from seeing you have learned the course material. Our goal is to help you learn, not to penalize you for issues which mask your learning.