

MATH 3310: Discrete Mathematics

Rio Grande College, Sul Ross State University
Fall 2016

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Course Description MTH 3310 is intended as an introduction to discrete mathematics.

Course Objectives Students will learn how to use formal logic in arguments; relate logic to the theory of sets; explore the basic theorems of number theory and mathematical induction; be introduced to graph theory and other combinatorial topics; and learn how these topics are related to other branches of mathematics, including abstract algebra and real variables.

Mathematics Program Outcomes The graduating student will be able to demonstrate content knowledge in mathematics including arithmetic, algebra, geometry, probability, statistics, and calculus.

Class Time Monday and Wednesday, 2:00 – 3:15 p.m.

Class Location Del Rio 106; Eagle Pass D201; Uvalde B108

Required Texts There are no required texts. All necessary material will be provided in the lecture. If you would like a textbook as an additional resource, I recommend Brawner and Wheeler's *Discrete Mathematics for Teachers* or Susanna Epp's *Discrete Mathematics*.

Office Hours M/W, 12:00 – 2:00; T/Th, 10:30– 12:30

Course Policies

Attendance Policy

Attendance is mandatory. You will be held responsible for all material covered in class or in the reading assignments. If you have to miss a class, it is your responsibility to obtain all notes, assignments, and announcements from someone else in the class. Make-up exams will be given only in the event of an emergency, in which case written justification and/or documentation must be provided and approved.

Communication

I will post course documents, reminders, announcements, and assignments on the Blackboard system. You will also turn in homework via Blackboard. I may also occasionally send announcements via e-mail. You should make sure you know how to access and use these tools.

E-mail is the best way to contact me.

You are welcome to stop by my office if you need help with the homework or wish to speak about your progress in the course. If you would like to meet with me and can't travel to Uvalde, please let me know, and we will try to arrange an appointment.

I am here to help you. Ask questions in class, call me, e-mail me, or come to my office. If you don't communicate with me, then I can't help you.

Grading Policy

Your grades will be weighted as follows:

Homework	30%
Midterm Exam	30%
Final Exam	40%

A student who averages at least 90% will receive an A; at least 80% will receive at least a B; at least 70% will receive at least a C; at least 60% will receive at least a D.

Homework

Homework will be assigned for each section that we cover. Assignments will be made available for download on Blackboard. Completed assignments will be submitted as Microsoft Word documents (.docx) on Blackboard. A sample assignment and template will be provided for your convenience. Each problem will be worth 2 points unless otherwise noted. **ALWAYS TURN IN THE HOMEWORK. LATE WORK WILL NOT BE ACCEPTED.**

Exams

There will be one midterm exam. Its tentative date is October 10. This is subject to change. You will be notified of a change at least one week in advance. Make-up exams will be given only in the event of an emergency, in which case written justification and/or documentation must be provided and approved.

Implicit in registering for this course is your agreement that you will be present to take the final exam at the time determined by the University, which is Wednesday, December 7, from 2:00 – 4:45 p.m. The final exam will be comprehensive.

Subject Outline

Below is a tentative outline of the subjects we will cover in this course.

I. Formal Logic

1. Statements and Logical Equivalence: *statements – negation – conjunction – disjunction – equivalence – De Morgan's laws – distributive laws*
2. Conditional Statements: *conditional statements – negating conditionals – the contrapositive, the converse, and the inverse – biconditional statements*

3. Valid and Invalid Arguments: *syllogisms – validity – modus ponens – modus tollens – the transitive rule – other rules of inference – arguments*
4. Quantified Statements: *universal and existential quantifiers – negating statements with quantifiers*

II. Set Theory

1. Sets: *notation – set relations – set operations – Venn diagrams – the power set – limitations of set theory*
2. Properties of Sets: *relation to formal logic – proofs concerning set inclusion – the transitive property – proofs concerning set equality – properties of set operations – Boolean algebra and computer science*
3. Relations: *Cartesian products – relations and diagrams – equivalence relations – basic examples*
4. Functions: *functions and relations – graphs and diagrams – composition – onto and one-to-one functions – bijection*
5. Cardinality: *equivalence of sets – cardinality – countability – Cantor's theory of infinite sets*

III. Number Theory

1. The Natural Number System: *the natural numbers – the Peano axioms – arithmetic sequences – geometric sequences – recursive sequences – the Fibonacci sequence – triangular numbers*
2. Mathematical Induction
3. Divisibility: *the integers – divisibility and divisors – the division algorithm – long division – the greatest common divisor – the Euclidean Algorithm*
4. The Fundamental Theorem of Arithmetic: *primes and composites – the Fundamental Theorem – prime factorizations – the Sieve of Eratosthenes – primality tests*

IV. Graph Theory

1. Introduction to Graphs: *the Seven Bridges of Königsberg – graphs – traveling salesmen and highway inspectors – Euler paths and Euler circuits – Hamilton paths – the Icosian Game*
2. Euler's Theorem: *simple graphs – complete graphs – bipartite graphs – the Three Utilities – planar graphs – Euler's Theorem – Kuratowski's Theorem – polyhedra*
3. Coloring Graphs: *graph-coloring – the chromatic number – logic puzzles – maps – the Four Color Theorem*

V. Combinatorics

1. Basic Principles of Counting: *the addition principle – the inclusion-exclusion principle – the multiplication principle – permutations*

2. Combinations: *combinations – the leftover principle – Pascal's Triangle – binomial coefficients – advanced combinatorial problems*

Schedule

This schedule is tentative only. The section numbers refer to the outline above.

Unit I	August 22 – September 12
<i>Labor Day Holiday</i>	<i>September 5</i>
Unit II	September 12 – October 5
Midterm Exam	October 10
Unit III	October 12 – 24
Unit IV	October 24 – November 14
Unit V	November 14 – 30
<i>Thanksgiving Holiday</i>	<i>November 23 – 25</i>
Final Exam	December 7

Americans With Disabilities Act

Sul Ross State University is committed to equal access in compliance with the Americans With Disabilities Act of 1973. It is the student's responsibility to initiate a request for accessibility services. Students seeking accessibility services must contact Kathy Biddick, Student Services Administrative Secretary.