MATH 3310: Discrete Mathematics

Rio Grande College, Sul Ross State University
Fall 2014

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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 combinatorical 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 107; Eagle Pass B112; Uvalde B114c
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	Monday – Thursday, 10:00 a.m. – 12:00 p.m., or by appointment, or basically whenever I'm in my office and not too busy.

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. 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 at your site.

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	15%
Midterm Exam	35%
Final Exam	50%

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 and printing on Blackboard. Homework must be completed and handed in to me or to the faculty secretary at your site (Chelsea Garrett in Del Rio, Connie Esparza in Eagle Pass) by the stated due date. It will be graded and returned.

Exams

There will be one midterm exam. Its tentative date is October 8. 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 10, 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.

August 25 – September 10	Unit I
September 12 – October 6	Unit II
October 8	Midterm Exam
October 13 – October 24	Unit III
October 29 – November 17	Unit IV
November 19 – December 1	Unit V
November 26	Thanksgiving Break
December 3	Review
December 10	Final Exam

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.