

MATH 2305

Discrete Mathematics

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Office: MCS 209

Office Hours: M-F 10AM to 12 noon
or by appointment.

Course Information

Textbook

Discrete Mathematics: Elementary and Beyond by L. Lovász and K. Vesztegombi
ISBN 0-387-95585-2.

Student Learning Outcomes

Upon completion of this course, students will be able to:

1. **Students will demonstrate factual knowledge of the mathematical notation and terminology used in this course.** Students will demonstrate the ability to read, interpret, and use the vocabulary and methods related to weak and strong induction, algorithms, set theory, combinatorics, probability, and graph theory.
2. **Students will demonstrate knowledge of fundamental principles used in counting and problem solving.** Students will demonstrate the ability to read and comprehend combinatoric methods applied to problems in probability and counting. Students will also demonstrate the ability to apply combinatoric methods as well as weak and strong induction to develop algorithms and basic mathematical proofs.
3. **Students will apply course material along with techniques and procedures covered in this course to solve problems.** Students will use the knowledge

gained in this course to determine appropriate techniques for specific problems in probability and graph theory and to develop and apply algorithms to those problems.

4. **Students will develop specific skills, competencies, and thought processes sufficient to support further study or work in this field or related fields.**

Students will acquire proficiency in the fundamental concepts of graph theory, induction, probability, and combinatorics, at a level necessary for more advanced mathematics courses such as Discrete Mathematics 2, and Probability & Statistics.

Communication

Faculty will respond to email and/or telephone messages within 24 hours during working hours Monday through Friday. Weekend messages may not be returned until Monday.

Written communication via email: All private communication will be done exclusively through your ASU email address. Check frequently for announcements and policy changes. In your emails to faculty, include the course name and section number in your subject line.

Virtual communication: Office hours and/or advising may be done with the assistance of the telephone, Collaborate, Skype, etc.

Grading

Evaluation and Grades

Course grades will be determined as indicated in the table below.

Assessment	Percent of Total Grade
homework	20
exams	80
Total	100%

Grading System

Course grades will be dependent upon completing course requirements and meeting the student learning outcomes.

The following grading scale is in use for this course:

- A = 90.00-100 points
- B = 80.00-89.99 points
- C = 70.00-79.99 points

D = 60.00-69.99 points

F = 0-59.99 points (Grades are not rounded up)

Assignment and Activity Descriptions

You will be assigned daily homework assignments which are generally due the next class day. I will not accept late assignments; however, I will drop two of your lowest homework grades. No exam grades will be dropped. Exam dates are: July 22, July 29, August 5 and the final on August 12. All exams are mandatory.

General Policies Related to This Course

All students are required to follow the policies and procedures presented in these documents:

- [Angelo State University Student Handbook](#)¹
- [Angelo State University Catalog](#)²

Academic Integrity

Students are expected to maintain complete honesty and integrity in all work. Any student found guilty of any form of dishonesty in academic work is subject of disciplinary action and possible expulsion from ASU.

The College of Science and Engineering adheres to the university's [Statement of Academic Integrity](#).³

Class Policies

I don't allow the use of cell phones in class, also no eating is allowed in class.

Accommodations for Students with Disabilities

ASU is committed to the principle that no qualified individual with a disability shall, on the basis of disability, be excluded from participation in or be denied the benefits of the services, programs or activities of the university, or be subjected to discrimination by the university, as provided by the Americans with Disabilities Act of 1990 (ADA), the Americans with Disabilities Act Amendments of 2008 (ADAAA) and subsequent legislation.

Student Disability Services is located in the Office of Student Affairs, and is the designated campus department charged with the responsibility of reviewing and authorizing requests for reasonable accommodations based on a disability. It is the student's responsibility to initiate such a request by contacting an employee of the Office of Student Affairs, in the Houston Harte University Center, Room 112, or contacting the department via email at ADA@angelo.edu. For more information about the application process and requirements, visit the [Student Disability Services website](#).⁴ The employee charged with the responsibility of reviewing and authorizing accommodation requests is:

Dallas Swafford
Director of Student Disability Services
Office of Student Affairs
325-942-2047
dallas.swafford@angelo.edu
Houston Harte University Center, Room 112

Incomplete Grade Policy

It is policy that incomplete grades be reserved for student illness or personal misfortune. Please contact faculty if you have serious illness or a personal misfortune that would keep you from completing course work. Documentation may be required. See ASU Operating Policy 10.11 [Grading Procedures](#)⁵ for more information.

Plagiarism

Plagiarism is a serious topic covered in ASU's [Academic Integrity policy](#)⁶ in the Student Handbook. Plagiarism is the action or practice of taking someone else's work, idea, etc., and passing it off as one's own. Plagiarism is literary theft.

In your discussions and/or your papers, it is unacceptable to copy word-for-word without quotation marks and the source of the quotation. It is expected that you will summarize or paraphrase ideas giving appropriate credit to the source both in the body of your paper and the reference list.

Papers are subject to be evaluated for originality. Resources to help you understand this policy better are available at the [ASU Writing Center](#).⁷

Student Absence for Observance of Religious Holy Days

A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence. See ASU Operating Policy 10.19 Student Absence for [Observance of Religious Holy Day](#)⁸ for more information.

Title IX at Angelo State University

The University prohibits discrimination based on sex, which includes pregnancy, sexual orientation, gender identity, and other types of Sexual Misconduct. Sexual Misconduct is a broad term encompassing all forms of gender-based harassment or discrimination including: sexual assault, sex-based discrimination, sexual exploitation, sexual harassment, public indecency, interpersonal violence (domestic violence and/or dating violence), and stalking. As a faculty member, I am a Responsible Employee meaning that I am obligated by law and ASU policy to report any allegations I am notified of to the Office of Title IX Compliance.

Students are encouraged to report any incidents of sexual misconduct directly to ASU's Office of Title IX Compliance and the Director of Title IX Compliance/Title IX Coordinator at:

Michelle Miller, J.D.

Special Assistant to the President and Title IX Coordinator

Mayer Administration Building, Room 210

325-486-6357

michelle.boone@angelo.edu

You may also [file a report online](#)⁹ 24/7.

If you are wishing to speak to someone about an incident in confidence you may contact the University Health Clinic and Counseling Center at 325-942-2173 or the ASU Crisis Helpline at 325-486-6345.

For more information, visit the [Title IX website](#).¹⁰

Modifications to the Syllabus

This syllabus, including grade evaluation and course schedule, is subject to modification. In particular, the COVID-19 pandemic may require significant changes in course delivery and content on potentially short notice.

Course Schedule

All items contained in this syllabus are subject to change as the semester progresses. Students will be notified of any changes.

Course Content

Ch 1 Let's Count Sets and Subsets, Sequences, Permutations.

Ch. 2, Combinatorial Tools Induction, Inclusion-Exclusion.

Ch. 3, Binomial Coefficients and Pascal's Triangle Binomial Theorem.

Ch. 4, Fibonacci Numbers Identities, A formula for the Fibonacci numbers.

Ch. 5, Combinatorial Probability Events and Probabilities, Independence, The Law of Large Numbers.

Ch. 6, Integers, Divisors, and Primes: Divisibility, The history of the primes, Factorization, Fermat's Little Theorem, The Euclidean Algorithm, Primality testing .

Ch. 7, Graphs Paths and cycles, Hamilton Circuits.

Ch. 8, Trees How many trees are there? How to store a tree.

Ch. 9, Finding the Optimum Minimal spanning trees .

Ch. 10 Matchings in Graphs Matching Theorems.

Ch. 11 Combinatorics in Geometry Intersections, Counting Regions.

Ch. 12 Euler's Formula Planar Graphs, Formula for Polyhedra.

Ch. 13 Coloring Maps and Graphs Four Color Theorem.

Ch. 14 Finite Geometries Finite Affine and Projective Planes.

Ch. 15, Cryptography Classical Cryptography, Public Key Cryptography.

Additional Topics; Arithmetic and Geometric Sequences

Schedule (subject to revision)

Topic

Set Theory

Set Theory

Counting

Counting

Counting Applications

Induction

Induction

The Fibonacci Sequence

The Golden Ratio

Arithmetic Sequences

Geometric Sequences

Introduction to Probability

Test 1

Combinatorial Probability

Combinatorial Probability

Conditional Probability

The Law of Large Numbers
Probability Mass Functions
Expectation and Variance
Divisibility
The Fundamental Theorem of Arithmetic
The Euclidean Algorithm
Test 2
Introduction to Graph Theory
Euler's Theorem
subgraphs
Trees
Trees
Graph Optimization Problems
Optimization (cont.)
Test 3
Bipartite Graphs
Graph Coloring
Modular Arithmetic
Affine Codes
RSA Public Encryption
Final Exam

¹ <https://www.angelo.edu/current-students/student-handbook/>

² <https://www.angelo.edu/academics/catalog/>

³ <https://www.angelo.edu/live/files/27603-student-handbook-2020-21#page=96>

⁴ <https://www.angelo.edu/current-students/disability-services/>

⁵ <https://www.angelo.edu/content/files/14197-op-1011-grading-procedures>

⁶ <https://www.angelo.edu/live/files/27603-student-handbook-2020-21#page=96>

⁷ https://www.angelo.edu/current-students/writing-center/academic_honesty.php

⁸ <https://www.angelo.edu/content/files/14206-op-1019-student-absence-for-observance-of>

⁹ <http://www.angelo.edu/incident-form>

¹⁰ <https://www.angelo.edu/title-ix>