MATH 2305-020
Discrete Mathematics

MWF: 11:00am – 11:50am, MCS 212

Instructor: Dr. Simon Pfeil

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Office: MCS 219C

Office Hours:
   Monday 2:00pm – 3:00pm
   Tuesday 8:30am – 9:30am and 11:00am – 3:00pm
   Wednesday 2:00pm – 3:00 pm
   Thursday 8:30am – 9:30am
   Friday 9:00am – 10:00am and 2:00pm – 3:00pm
           …or by appointment via email.

Course Information

Course Description

An introduction to discrete mathematics including counting principles, combinatorics, discrete probability, sequences, series, and binomial theorem.

Prerequisite and Co-requisite Courses
None.

Prerequisite Skills

The most important prerequisite skills are perseverance and the willingness to seek help when it is needed. Also, some high school algebra, and the ability to navigate Blackboard for information and supplemental materials will be useful.

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.

Course Delivery

This is a face-to-face course with online components that students are expected to access in Blackboard.[1]

Required Texts and Materials

This text is free and will be made available as a pdf in Blackboard.
Discrete Mathematics: Elementary and Beyond by L. Lovász and K. Vesztergombi
ISBN 0-387-95585-2.

Technology Requirements

To successfully complete this course, students will need to be able to access Blackboard. Students must also have access to a webcam and computer microphone to attend online office hours.
If the course transitions to online delivery, Blackboard Collaborate will be used to provide lectures. Interaction with the lecture will require a microphone or webcam.

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, etc.

Grading

Evaluation and Grades

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

Assessment	Percent of Grade
1: Set Theory	6.5%
2: Counting	6.5%
3: Induction	6.5%
4: Sequences	6.5%
5: Combinatorial Probability	6.5%
6: Primes	6.5%
7: Number Theory	6.5%
8: Introductory Graph Theory	6.5%
9: Trees and Optimization	6.5%
10: Graph Matching and Coloring	6.5%
11: Modular Arithmetic	6.5%
12: Cryptography	6.5%
Attendance	5%
Weekly Update	3%
Homework	15%
Final Presentation	+ or – one letter grade
Total	100%

Grading System

Course grades will depend on completing course requirements and meeting the student learning outcomes.

This course uses the following grading scale:
    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

Homework will be issues daily and is due by the next class period. Late homework will not be accepted. The lowest two homework grades will be dropped.

The course grade will be based on the average of all assessment grades, plus homework, attendance, and weekly reflections. Assessments will reflect the homework. Each assessment will be graded for accuracy with no partial credit. Furthermore, any score below 60% on an assessment will be treated as a 0% score for that assessment.

However! Each assessment may be retaken as many times as necessary, at the convenience of the professor. The retake policy for assessments is as follows:
- First attempt: In class, as scheduled.
- Second attempt and on: Must meet with professor in office hours to discuss previous attempts. Scheduled with professor during this meeting.

The final score on each assessment will be the score of the most recent attempt. Retakes must be taken within two weeks of the previous attempt on that assessment.

Example 1: Student takes Assessment 1 in class and scores 75%. The student's score in the gradebook is 75%. Unsatisfied, the student schedules a retake for Assessment 1. On the retake, the student scores 95%. The student's new score on the assessment is 95%.
Example 2: Student takes Assessment 1 in class and scores 55%. This score counts as 0% in the gradebook. The student schedules a retake and scores a 70%. The student's new score for the assessment is 70%. Wishing to improve their score further, the student meets with the professor, discusses the two previous attempts, and schedules a third attempt. On the third attempt, the student scores a 75%. The student's score on the assessment is 75%.
Example 3: Student takes Assessment 1 and scores 70%. The student schedules a retake and scores 55%. The student's new score for the assessment is 0%.

The final presentation will be held in class on Wednesday, May 11 from 10:30am – 12:30pm. It will not be an exam, but rather a group poster presentation. Groups will be chosen and topics will be assigned mid-semester.

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](#)[2]
- [Angelo State University Catalog](#)[3]

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](#)[4] (Page 97).

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](#).[5] The employee charged with the responsibility of reviewing and authorizing accommodation requests is:

Dr. 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](#)[6] for more information.

Plagiarism

Plagiarism is a serious topic covered in ASU's [Academic Integrity Statement](#)[7] 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](#).[8]

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](#)[9] for more information.

Title IX at Angelo State University

Angelo State University is committed to providing and strengthening an educational, working, and living environment where students, faculty, staff, and visitors are free from sex discrimination of any kind. In accordance with Title VII, Title IX, the Violence Against Women Act (VAWA), the Campus Sexual Violence Elimination Act (SaVE), and other federal and state laws, the University prohibits discrimination based on sex, which includes pregnancy, and other types of Sexual Misconduct. Sexual Misconduct is a broad term encompassing all forms of gender-based harassment or discrimination and unwelcome behavior of a sexual nature. The term includes sexual harassment, nonconsensual sexual contact, nonconsensual sexual intercourse, sexual assault, sexual exploitation, stalking, public indecency, interpersonal violence (domestic violence or dating violence), sexual violence, and any other misconduct based on sex.

You are encouraged to report any incidents involving sexual misconduct to the Office of Title IX Compliance and the Director of Title IX Compliance/Title IX Coordinator, Michelle Miller, J.D. You may submit reports in the following manner:

Online: [Incident Reporting Form][10]
Face to Face: Mayer Administration Building, Room 210
Phone: 325-942-2022
Email: michelle.miller@angelo.edu

Note, as a faculty member at Angelo State, I am a mandatory reporter and must report incidents involving sexual misconduct to the Title IX Coordinator. Should you wish to speak to someone in confidence about an issue, you may contact the University Counseling Center (325-942-2371), the 24-Hour Crisis Helpline (325-486-6345), or the University Health Clinic (325-942-2171).

For more information about resources related to sexual misconduct, Title IX, or Angelo State's policy please visit the [Title IX website].[11]

Information About COVID-19

Please refer to ASU's [COVID-19 (Coronavirus) Updates][12] web page for current information about campus guidelines and safety standards as they relate to the COVID-19 pandemic.

Modifications to the Syllabus

This syllabus, including grade evaluation and course schedule, is subject to modification on potentially short notice based on developing circumstances.

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 Clasical Cryptography, Public Key Cryptography.
Additional Topics; Arithmetic and Geometric Sequences

Schedule (subject to revision)
Week 1: Course Introduction
Week 2: Set Theory, Counting
Week 3: Counting Applications, Assessments 1 and 2
Week 4: Induction, the Fibonacci Sequence
Week 5: Golden Ratio, Arithmetic and Geometric Sequences, Assessments 3 and 4
Week 6: Introduction to Probability, Combinatorial Probability
Week 7: Integers, Divisibility, Primes, Assessments 5 and 6
Week 8: Fundamental Theorem of Arithmetic, Fermat's Theorems, Euclidean Algorithm
Week 9: Introduction to Graph Theory, Euler's Theorem, Assessments 7 and 8
Week 10: Subgraphs, Trees, Graph Optimization Problems
Week 11: Bipartite Graphs, Graph Coloring, Assessments 9 and 10
Week 12: Modular Arithmetic
Week 13: Affine Codes, RSA Public Encryption, Assessments 11 and 12
Week 14: Flex Time, Bonus Topics
Week 15: Bonus Topics

Final Exam: Wednesday, May 11 from 10:30am – 12:30pm

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[1] https://blackboard.angelo.edu/
[2] https://www.angelo.edu/current-students/student-handbook/
[3] https://www.angelo.edu/academics/catalog/
[4] https://www.angelo.edu/live/files/27603-student-handbook-2020-21#page=97
[5] https://www.angelo.edu/current-students/disability-services/
[6] https://angelo.policystat.com/policy/10659448/latest/
[7] https://www.angelo.edu/live/files/27603-student-handbook-2020-21#page=97
[8] https://www.angelo.edu/current-students/writing-center/academic_honesty.php
[9] https://angelo.policystat.com/policy/10659368/latest/
[10] https://www.angelo.edu/incident-form
[11] https://www.angelo.edu/title-ix
[12] https://www.angelo.edu/covid-19/