MATH 2305
Discrete Mathematics

Instructor: Mario Barrientos
Email: mario.barrientos@angelo.edu
Phone: 325 486-5427
Office: MCS 209

Office Hours: MWF 10AM to 11AM, 12 noon to 1PM.
T-Tr 11AM to 12 noon, 2PM to 3 PM
or by appointment.

Course Information

Textbook
Discrete Mathematics:Elementary and Beyond by L. Lovász and K. Vesztergombi

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**

**Statement for Synchronous Remote Sessions**

To maintain academic quality while accommodating social distancing needs this semester, this course will use a split delivery model that combines face-to-face teaching with remote instruction.

The goal is to provide face-to-face instruction to students who want to return to campus, while also allowing students who may need to learn remotely to participate via virtual class sessions.

**How Does It Work?**

Your class will be divided and you will be placed into a smaller group of students to maintain physical distancing requirements in our assigned classroom space.

Your assigned group will receive a schedule of in-person class meetings. This schedule is not flexible. For instance, if you are supposed to attend class on a Monday, you cannot elect to go on Wednesday with another class group instead.

When you are not in the physical class, you will attend live remote sessions at the same time as our scheduled course. You will also be expected to complete coursework via Blackboard.¹

Please refer to this Health and Safety web page² for updated information about campus guidelines as they relate to the COVID-19 pandemic.

**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.

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Percent of Total Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>homework</td>
<td>20</td>
</tr>
<tr>
<td>exams</td>
<td>80</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
</tr>
</tbody>
</table>

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: Feb 18, Mar 18, Apr 15 and the final on May 13. All exams are mandatory.

General Policies Related to This Course
All students are required to follow the policies and procedures presented in these documents:
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 to disciplinary action and possible expulsion from ASU.

The College of Science and Engineering adheres to the university’s Statement of Academic Integrity.\(^5\)

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.\(^6\) The employee charged with the responsibility of reviewing and authorizing accommodation requests is:

Dallas Swafford
Director of Student Disability Services
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 for more information.

Plagiarism

Plagiarism is a serious topic covered in ASU’s Academic Integrity policy 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.

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 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 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.

**Required Use of Masks/Facial Coverings by Students**
As a member of the Texas Tech University System, Angelo State University has adopted the mandatory Facial Covering Policy to ensure a safe and healthy classroom experience. Current research on the COVID-19 virus suggests there is a significant reduction in the potential for transmission of the virus from person to person by wearing a mask/facial covering that covers the nose and mouth areas. Therefore, in compliance with the university policy students in this class are required to wear a mask/facial covering before, during, and after class. Faculty members may also ask you to display your daily screening badge as a prerequisite to enter the classroom. You are also asked to maintain safe distancing practices to the best of your ability. For the safety of everyone, any student not appropriately wearing a mask/facial covering will be asked to leave the classroom immediately. The student will be responsible to make up any missed class content or work. Continued non-compliance with the Texas Tech University System Policy may result in disciplinary action through the Office of Student Conduct.

**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. 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://angelo.blackboard.com/
2 https://www.angelo.edu/covid-19/returning-to-campus/health-and-safety.php
3 https://www.angelo.edu/current-students/student-handbook/
4 https://www.angelo.edu/academics/catalog/
5 https://www.angelo.edu/live/files/27603-student-handbook-2020-21#page=96
6 https://www.angelo.edu/current-students/disability-services/