Math 4322: A Survey of Mathematics with Applications

Disclaimer
This syllabus is current and accurate as of its posting date, but will not be updated. For the most complete and up-to-date course information, contact the instructor.

Instructor Information
Dr. Dionne T. Bailey
Office: MCS 220G
Phone: 325-486-5425
Email: Dionne.Bailey@angelo.edu

Office Hours
<table>
<thead>
<tr>
<th>Day</th>
<th>Time</th>
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<tbody>
<tr>
<td>Monday</td>
<td>1:30-3:30 in Math Lab</td>
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<tr>
<td>Tuesday</td>
<td>8:00-9:30; 11:00-12:30</td>
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<tr>
<td>Wednesday</td>
<td>1:00-3:00</td>
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<tr>
<td>Thursday</td>
<td>8:00-9:30; 11:00-12:30</td>
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Tests
We will have four cumulative tests and a cumulative final examination. The exact dates and coverage of these tests will be announced in class. However, as a planning guide, you may expect to take the first test during the fifth week of classes, the second test during the ninth week of classes, the third test during the twelfth week of classes, and the fourth test during the fourteenth week of classes. The final exam will be held as specified in the course schedule. I do not intend to give makeup tests. That means you need to be present and ready to do your best each day, but especially on test days.

Daily Work
Daily work will consist primarily of homework problems from the textbook, supplemented by some in-class quizzes. Late work, including in-class quizzes for which you were absent, is not accepted.

Grade Calculations
Your grade on the daily work will count for 10%, your geometry lessons will count for 10%, your test average will count for 60%, and the cumulative final examination will count for 20%; then the usual grades (90 and above ↔ A, 80-89 ↔ B, 70-79 ↔ C, 60-69 ↔ D, and less than 60 ↔ F).
Student Learning Outcomes

1. The students will demonstrate factual knowledge including the mathematical notation and terminology used in this course. Learn the vocabulary, symbolism, and basic definitions used in this course including definitions and terminology used in algebra; plane geometry; trigonometry; analytic geometry; logic; transformational geometry; calculus; probability and statistics; finance; linear programming; and graph theory.

2. The students will describe the fundamental principles including laws and theorems arising from concepts covered in this course. Become familiar with the laws and formulas that result directly from the definitions used in algebra; plane geometry; trigonometry; analytic geometry; logic; transformational geometry; calculus; probability and statistics; finance; linear programming; and graph theory.

3. The students will apply course material along with techniques and procedures covered in this course to solve problems. Use the facts, formulas, and techniques learned in this course to solve application problems in a variety of fields to include physics; chemistry; business; life sciences; and social sciences.

4. The students will develop specific skills, competencies, and thought processes sufficient to support further study or work in this field or related fields. Acquire a level of proficiency in the fundamental concepts and applications necessary for further study in academic fields requiring a solid background in mathematics as a prerequisite, or for work in occupational fields requiring a solid background in mathematics. These fields might include teaching mathematics in the secondary schools; engineering; physics; business; life sciences; and social sciences.

Required Texts and Readings


Subject Matter

**P. Prerequisites.** Real numbers; Cartesian coordinates; lines; graphing

1. **Functions and Graphs.** Linear functions and their graphs; using graphs to study the characteristics of functions; applications.

2. **Polynomial Functions, Power and Rational Functions.** Quadratic functions; power functions with modeling; polynomial functions of higher degree; remainder theorem; factor theorem; fundamental theorem of algebra; complex numbers; applications; rational functions, inequalities.

3. **Exponential, Logistic, and Logarithmic Functions.** Comparison of exponential functions, logistic functions, and power functions; properties of logarithmic functions; modeling, mathematics of finance.

4. **Trigonometric Functions.** Trigonometric functions; graphs of the trigonometric functions; advanced trigonometric graphs; inverse trigonometric functions; applications.
5. **Analytic Trigonometry.** Identities, law of sines; law of cosines; solving trigonometric equations; applications.

6. **Applications of Trigonometry.** Vectors in a plane, dot products, parametric equations, polar coordinates, De Moivre’s Theorem

7. **Systems of Equations and Matrices.** Solving systems of equations with matrices; linear programming.

8. **Analytic Geometry in Two and Three Dimensions.** Parabolas, Ellipses, Hyperbolas, polar equations of conics; 3-D Cartesian coordinate system.

9. **Discrete Mathematics.** Probability; statistics; sequences and series; mathematical induction.

10. **An Introduction to Calculus.** Limits; derivatives; and integrals.

**Additional Topics taught by Unit Modules; Preparation Manual for TExES Math 7-12 (#235)**

1. **Logic.** Conjunction; disjunction; implication; biconditional; negation; simple statements; compound statements; truth tables; tautology; inverse; converse; contrapositive; quantifiers.

2. **Curriculum Standards for Grades 9 through 12.** Mathematics as problem solving; mathematics as communication; mathematics as reasoning; mathematical connections; algebra; functions; geometry from a synthetic perspective; geometry from an algebraic perspective; trigonometry; statistics; probability; discrete mathematics; conceptual underpinnings of calculus; mathematical structure.

3. **Additional Mathematics of Finance.** Simple interest; compound interest; annuities; amortization schedules.

4. **Transformational Geometry.** Reflections; translations; rotations; dilations; isometries; composite transformations.

5. **Graph Theory.** Simple graphs; connected graphs; disconnected graphs; edges; loops; vertices; traceable graphs; walk; trail; path; Euler Circuit; Hamilton Circuit; weighted graph; network; tree; spanning tree; digraph.

6. **Additional Calculus.** Derivatives; integrals; applications of derivatives and integrals; limits.

7. **Set Theory.** Union; intersection; subsets; disjoint sets; Venn diagrams.

8. **Additional Probability and Statistics.** Multiplication Principle; permutations; combinations; general and special addition rule; general and special multiplication rule; mutually exclusive events; independent events; conditional probabilities; probability distributions and their means and standard deviations; odds; measures of central tendency; standard deviation; normal distribution; percentile; percentile rank; linear regression, confidence intervals, hypothesis tests.

9. **Technology.** Graphing calculators; CBL; CBR; Geometer’s Sketchpad; graph link; TI presenter, TI Interactive.

10. **Number Theory.** Properties of real numbers, complex numbers, matrices, and vectors; place value; base arithmetic; groups; fields; Fundamental Theorem of Arithmetic; prime numbers; least common multiples; greatest common factors; Euclidean Algorithm; Rules for Divisibility; Modular Arithmetic.
11. **Euclidean Geometry.** Parallel lines cut by a transversal; congruent figures; inequalities in triangles; quadrilaterals; similar figures; right triangles; circles; constructions and loci; area and volumes of solids; coordinate geometry; geometry in 3-D.

12. **Non-Euclidean Geometry.** Riemannian Geometry; Lobachevsky Geometry.

13. **Mathematical Processes and Perspectives.** Mathematical reasoning and problem solving; Polya’s problem solving steps; mathematical connections; mathematical communication.

14. **Mathematical Learning, Instruction, and Assessment.** Understanding of how children learn mathematics; understanding of how to plan, organize, and implement instruction using knowledge of students, subject matter, and statewide curriculum; understanding assessment both formal and informal.

**Prerequisite**

Mathematics 2312, 2305, 2313, 2314, 3300, 3301, 3307, 3310, 3333, 4321; Mathematics 4301, 4331, or 4351; 2.75 GPA, with no grade lower than “C” in all required mathematics courses attempted, cumulative and in residence; admission to the Educator Preparation Program

**Course Schedule**

The subject matter schedule listed below is tentative, and subject to change and adaptation. For current, updated information about course topics, contact the instructor.

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<thead>
<tr>
<th>Week</th>
<th>Topics</th>
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<tbody>
<tr>
<td>1</td>
<td>Algebra, Geometry</td>
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<td>2</td>
<td>Algebra, Geometry</td>
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<td>3</td>
<td>Algebra, Geometry</td>
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<td>4</td>
<td>Algebra, Geometry</td>
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<td>5</td>
<td>Math of Finance, Geometry, Exam 1</td>
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<td>6</td>
<td>Trigonometry, Geometry</td>
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<td>7</td>
<td>Trigonometry, Geometry</td>
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<tr>
<td>8</td>
<td>Trigonometry, Algebra, Geometry</td>
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<tr>
<td>9</td>
<td>Algebra, Conics, Geometry, Exam 2</td>
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<tr>
<td>10</td>
<td>Conics, Calculus, Geometry</td>
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<td>11</td>
<td>Calculus, Geometry, Transformation Geometry, Discrete Math</td>
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<tr>
<td>12</td>
<td>Discrete Math, Probability and Statistics, Geometry, Exam 3</td>
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<tr>
<td>13</td>
<td>Probability and Statistics, Number Theory, Learning, Instruction, and Assessment</td>
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<tr>
<td>14</td>
<td>Learning, Instruction, and Assessment, Exam 4</td>
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<tr>
<td>15</td>
<td>History of Math, Mathematical Processes &amp; Perspectives, TExES Paperwork and Rules</td>
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Student Disability Services

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.

The Office of Student Affairs is the designated campus department charged with the responsibility of reviewing and authorizing requests for reasonable accommodations based on a disability, and it is the student’s responsibility to initiate such a request by contacting:

Dallas Swafford  
Director of Student Disability Services  
Office of Student Affairs  
325-942-2047  
dallas.swafford@angelo.edu

Title IX

Angelo State University is committed to the safety and security of all students. If you or someone you know experience sexual harassment, sexual assault, domestic or dating violence, stalking, or discrimination, you may contact ASU’s Title IX Coordinator:

Michelle Boone  
Director of Title IX Compliance  
325-486-6357  
michelle.boone@angelo.edu

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. The full details can be found in ASU Operating Policy OP 10.19 Observance of Religious Holy Days

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.
Student Conduct Policies

**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 Statement of [Academic Integrity](http://www.angelo.edu/student-handbook/community-policies/academic-integrity.php)iii.

**Plagiarism**

Plagiarism is a serious topic covered in ASU’s [Academic Integrity policy](http://www.angelo.edu/student-handbook/community-policies/academic-integrity.php)iv 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 via Turnitin. Resources to help you understand this policy better are available at the [ASU Writing Center](http://www.angelo.edu/dept/writing_center/academic_honesty.php)v.

**Copyright Policy**

Students officially enrolled in this course should make only one printed copy of the given articles and/or chapters. You are expressly prohibited from distributing or reproducing any portion of course readings in printed or electronic form without written permission from the copyright holders or publishers.

**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](http://www.angelo.edu/student-handbook/)vi
- [Angelo State University Catalog](http://www.angelo.edu/catalogs/)vii

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i http://www.angelo.edu/content/files/14206-op-1019-student-absence-for-observance-of  
ii http://www.angelo.edu/content/files/14197-op-1011-grading-procedures  
iii http://www.angelo.edu/student-handbook/community-policies/academic-integrity.php  
iv http://www.angelo.edu/student-handbook/community-policies/academic-integrity.php  
v http://www.angelo.edu/dept/writing_center/academic_honesty.php  
vi http://www.angelo.edu/student-handbook/  
vii http://www.angelo.edu/catalogs/