MATH 3302.500 - Concepts in Geometry - Fall 2020 - Syllabus

Instructor and Class Information

- Instructor: Dr. Brian Beavers, Department of Mathematics and Statistics, Stephen F. Austin State University
- Office: Math Building 310, STEM Building 310
- ZOOM Office: https://sfasu.zoom.us/my/drbeaverssfa
- Email: beaversbd@sfasu.edu
- Telephone: 936.468.1433 (Math 310) and 936.587.9798 (Google Voice)
- Office Hours: 10-11am MWF, 2:30-3:30pm TR

Class Meeting Information

Class Meetings and Location: This is primarily an online class, but there will be an optional live 60-90 minute weekly class meeting, time TBA. Students may participate in the weekly class meeting live in the ZOOM video conference platorm (link TBA) or by watching the recording (link to be posted in D2L after the meeting). We may add a third option of meeting face-to-face depending on interest and how the pandemic progresses this semester.

Should we meet in person at some point during the semester, we will follow the university requirements for wearing masks in the classroom: masks (cloth face coverings) must be worn over the nose and mouth at all times in this class and appropriate physical distancing must be observed. Students not wearing a mask and/or not observing appropriate physical distancing will be asked to leave the class. All incidents of not wearing a mask and/or not observing appropriate physical distancing will be reported to the Office of Student Rights and Responsibilities. Students who are reported for multiple infractions of not wearing a mask and/or not observing appropriate physical distancing may be subject to disciplinary actions.

Unless you hear from me otherwise, I will be on the main SFA campus during the semester and available to meet face-to-face. Should we meet in my office, face coverings will be required for the duration of our meeting. My preferred method of meeting will be in ZOOM; you can use the link in my contact information above to access my personal meeting room. I will be in my personal meeting room during my regular schedule office hours and you can drop in without advance notice. For times outside our weekly class meeting or my regularly scheduled office hours, please email or call me to set up an appointment.
Course Expectations:

The following is an excerpt from SFA Policy 5.4:

*The federal definition of a credit hour is an amount of work represented in intended learning outcomes and verified by evidence of student achievement that is an institutionally established equivalency that reasonably approximates:*

1. *Not less than one hour of classroom or direct faculty instruction and a minimum of two hours out-of-class student work each week for approximately fifteen weeks for one semester or trimester hour of credit, or 10 to 12 weeks for one quarter hour of credit, or the equivalent amount of work over a different amount of time, or;*

2. *At least an equivalent amount of work as outlined in item 1 above for other academic activities as established by the institution including laboratory work, internships, practica, studio work, and other academic work leading to the award of credit hours.*

To this end, all students in online courses offered by the Department of Mathematics and Statistics that wish to be successful should plan to spend a minimum of three hours of work for every credit hour associated with this course.

Expected activities to be completed in the time include reviewing course content, reading assigned course resources, completing all assigned exercises and projects, and performing periodic assessment preparation. Students should check *daily* for course announcements. In order to effectively participate in the course, students should log in and participate in the course at least four days each week, not just during weekends, and preferably daily.

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**Required Materials**

- No required textbook
- Functional computer and internet connectivity, preferably high-speed
- Microsoft Office (available from SFA via mySFA and Office 365)
- ZOOM Video Conferencing (available from sfasu.zoom.us)
- Geogebra software (available from geogebra.org)
- At least a handheld scientific calculator is required. Handheld graphing calculators are permitted on exams.

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**Course Description**

Survey of geometric topics with an emphasis on trigonometry and Euclidean geometry. Includes historical and grades 4-8 classroom connections. Prerequisites: C or higher in MATH 3300 (MTH 300).
Learning Objectives

1. Develop, perform, and justify basic geometric constructions using a variety of tools, including dynamic geometry software such as Geometer's Sketchpad.
2. Develop and prove conjectures concerning basic geometric relationships within the axiomatic structure of Euclidean geometry.
3. Demonstrate an understanding of the significance of the parallel postulate on the development of Euclidean and non-Euclidean geometries.
4. Demonstrate an understanding of the basic trigonometric functions as well as their graphs and properties.
5. Relate geometry to algebra and trigonometry by using the Cartesian coordinate system in the study of trigonometric functions and a geometric development of the conic sections.
6. Apply knowledge of trigonometric ratios and functions to model and solve problems in mathematics and other disciplines.
7. Prove and apply basic trigonometric identities.
8. Communicate orally and in written form an understanding of the connections among geometric, graphic, numeric, and algebraic solutions to problems.
9. Demonstrate an understanding of the historical development of geometric ideas.

Course Requirements

The three foundational areas of elementary mathematics are arithmetic, algebra, and geometry; in this class we will focus on that third foundational area. Geometry has been an important part of human knowledge for thousands of years. Humans have always needed to measure and construct various shapes, not just for practical purposes, but also for art and for enjoyment. We even see the beginning of trigonometry in ancient Egypt, where the ratios of sides of triangles played an important role in the building of the Pyramids. For thousands of years, Geometric concepts have been one of the primary ways to help students get used to abstract reasoning. In this class, we will take full advantage of the richest of geometric reasoning to help prepare you to then take these riches to your future classroom.

In this class, we have a variety of activities: readings, assignments, discussions and projects, both as an individual and in groups, to help you understand the concepts and develop necessary skills. Your course letter grade will be calculated as a weighted average of a series of assignments, a series of quizzes, a two written tests, and an oral final exam. These four components will be more carefully defined in the Grading Policy below.

This course is dependent on technology and making machines do what we need them to do when we need them to do it. If you find a glitch in anything, it is your responsibility to inform me immediately! If it is something that I can fix, I will do so ASAP. Otherwise, I will direct
you to other means of help. Only with such notifications will I consider extending deadlines as a result of technical difficulties.

**Getting Started**

The first requirement is to complete the activities in the first module. The information and activities in this module give you the information that you will need to be prepared to get started in this online course. In this module is a tentative timeline of assignments as well as their due dates. Not everything is on this timeline now; I will be updating it as the semester proceeds. My main method of announcement to the whole class is the News tool. Typically, I will give updates at least once a week on what you should be working on if you are on pace with the rest of the class.

Again, the first module includes all the basic course information such as this syllabus, the departmental course description, an introduction assignment, etc. Note that successful completion of the module includes a quiz designed to reinforce the important points in this document and the other materials in the module. **You must receive a perfect score (100%) on the quiz before any other modules will be available to you, starting with Module 02 on Tuesday, August 25. You may retake the quiz until you receive the required score.**

**About the Content Modules**

The main mathematical content of the course are in the eleven modules that follow the first introductory module. The first five of these cover the fundamentals of geometry from a modern perspective but with discussion of the historical development of geometric ideas. The next two modules marry ideas from algebra and geometry to form analytic geometry. The final four modules introduce you to the fundamental ideas of trigonometry. Each module includes Stop & Think exercises; solutions to these are provided. Each module with have a certain number of assignments that you will work on and submit your work in the Dropbox tool here in D2L. Each module will also have a number of quizzes to assess your understanding of the fundamental concepts and skills covered in the module. Be sure to read the content pages thoroughly and get help as you work on the assignments and prepare for the quizzes.

**The Discussion Board**
The discussion board is the location where you and your classmates will see any discussion assignments and post discussion responses that are to be shared with the whole class. Discussion assignments count toward the assignments portion of your grade. If you click the discussion tool, you will see that there are four items available to you on day one: Student Introductions, Classroom Discussion, Errata Discussion, and Free Discussion. If you have already completed your student introduction, you should see that post as well as postings from your classmates. (Be sure to revisit this link so that you can find out who else is in the course with you!) The Free Discussion category is a place where we can talk in general about anything regarding the course. This is a place where you can post a question that you have about the course, whose answer might also serve other students.

You should see a discussion topic entitled "Errata Discussion". Although I have tried to make sure that all information is correct, it is always possible to find errors. For example, if you find a link that is not working or a typo, please post that information to the Errata Discussion board including where the link is located in the module. All error captures to this board are greatly appreciated by the designer of the course!

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Course Outline

Here is a tentative outline by topic of the contents of this course. Log at the timeline in D2L for a more up-to-date schedule of assignments and due dates.

- **Module 01: Getting Started**
- **Geometry (approx. 45%)**
  - Module 02: Geometric Learning
    - Review of elementary geometry
    - Learning frameworks for geometry
  - Module 03: Compass and Computer
    - Euclid's Elements and geometric constructions
    - Dynamic geometry software
  - Module 04: Lines and Triangles
    - Parallel lines and their properties
    - Triangles and their properties
    - Proof involving parallel lines and triangles
  - Module 05: Quadrilaterals and Circles
    - Quadrilaterals and their properties
    - Circles and their properties
    - Proof and conjecture involving quadrilaterals and circles
  - Module 06: Non-Euclidean Geometries
    - Euclid's Parallel Postulate, its history, and consequences of its alternatives
    - Other non-Euclidean geometries
    - Axioms and models
- **Analytic Geometry (approx. 15%)**
• Module 07: Fundamentals of Analytic Geometry
  ▪ Number line model of the real numbers
  ▪ Coordinate systems of the Cartesian plane and Euclidean space
  ▪ Equations for lines and circles

• Module 08: Applications of Analytic Geometry
  ▪ Parabolas, Ellipses, and Hyperbolas
  ▪ Computer graphics
  ▪ Parametric equations and graphs

• **Trigonometry (approx. 40%)**
  ○ Module 09: Right Triangle Trigonometry
    ▪ Trigonometric ratios for right triangles
    ▪ Historic and modern applications of trigonometric ratios
  ○ Module 10: Angles and their Measurement
    ▪ Radian and degree measure
    ▪ Standard position of angles
    ▪ Trigonometric ratios for any angle
    ▪ Angular and linear velocity
  ○ Module 11: Trigonometric Functions
    ▪ Definition of the trigonometric functions using radians and the unit circle
    ▪ Trigonometric identities
    ▪ Graphs of the trigonometric functions
    ▪ Solving trigonometric equations
  ○ Module 12: Applications of Trigonometry
    ▪ Solving oblique triangles using the Law of Sines and Law of Cosines
    ▪ Area formulas for oblique triangles
    ▪ Polar coordinate system
    ▪ Rigid transformations using matrices

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**Grading Policy**

**Computation of Course Grade**

Your course grade will be determined by your performance on graded work in the following categories: (1) assignments (both individual and group), (2) quizzes, (3) two written tests, and (4) an oral final exam. Each of these four components will be scored as a percentage between 0 and 100 percent. Your final course grade will be the weighted mean as follows:

- **Assignments** - 20%. This is the mean of your scores, equally weighted, on the various assignments that I will collect during the course. Most assignments will be turned in to D2L's Dropbox feature, but some will be discussions in D2L. All assignments will be detailed in the module and timeline in D2L. Deadlines will be given to help keep you on
track, but assignments may be turned in late without penalty. At the instructor's discretion, students may be allowed to resubmit assignments for a higher grade.

- **Quizzes** - 30%. You will have several quizzes in D2L for each module. These quizzes will assess individual objectives of knowledge or skill. These quizzes will be graded pass/fail and you may have up to three attempts to pass each quiz. You may ask to be assessed live in ZOOM or face-to-face instead of in D2L. This most heavily weighted portion of your course grade is the percentage of quizzes that you passed out of the total number of quizzes across the course.

- **Written Tests** - 15% each. There will be two written tests during the geometry modules. You will be given the questions in D2L and have a limited time to complete the test, scan, and submit while I proctor you through ZOOM; you may also schedule to take the test in person on campus. Details will be discussed later as we get closer to these tests and individualized to meet the needs and time constraints of each student while preserving equity and fairness. Your score will be a percentage of the available points on the exam (with partial credit).

- **Oral Final Exam** - 20%. This will be an oral exam through ZOOM, over the phone, or in my office. Students will individually schedule a 30-minute window during finals week to answer some summary questions about the course content, scored as a percentage of the questions answered satisfactorily.

**Score Descriptors**

The written tests, final exams, assignment average, quiz average, and your final course letter grade will be graded on the "standard 10-point" scale based on the percentage (rounded to the nearest percent) of total points earned by the student on the exam or assignment:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>[90%,100%]</td>
</tr>
<tr>
<td>B</td>
<td>[80%,90%)</td>
</tr>
<tr>
<td>C</td>
<td>[70%,80%)</td>
</tr>
<tr>
<td>D</td>
<td>[60%,70%)</td>
</tr>
<tr>
<td>F</td>
<td>[0%,60%)</td>
</tr>
</tbody>
</table>

Assignments will be graded holistically on a 0-10 scale based on completion and performance; the overall Assignment course component will be the mean of these scores converted to a percentage. The various scores are described below. To summarize, a "passing" score is a 7 or higher and a "failing" score is a 6 or lower. Each score will take execution, communication, and correctness into account. I am using this system so that I can better communicate to you whether you understand the material well enough or not.
Your primary goal is to earn a 7 or better on each assignment. In addition, for any group assignments, participation by each group member will be considered.

<table>
<thead>
<tr>
<th>Score</th>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 or 9</td>
<td>Outstanding (&quot;A&quot;)</td>
<td>These score means that your mathematics and communication are flawless or nearly flawless.</td>
</tr>
<tr>
<td>8</td>
<td>Good (&quot;B&quot;)</td>
<td>This score means that, overall, you understand the material well, but made minor mistakes in the mathematics or communication.</td>
</tr>
<tr>
<td>7</td>
<td>Average (&quot;C&quot;)</td>
<td>This score means that, overall, you understand the material well enough to pass, but you made several substantial mistakes in mathematics or you communicated poorly.</td>
</tr>
<tr>
<td>6</td>
<td>Deficient (&quot;D&quot;)</td>
<td>This score means that you show some understanding but the flaws in mathematics or communication are not sufficient to be considered passing.</td>
</tr>
<tr>
<td>5 or less</td>
<td>Failing (&quot;F&quot;)</td>
<td>This score means that either you did not complete the assignment, you did not sufficiently partcipate in the discussion, or your mathematics or communication shows serious and fundamental errors. You need to review prerequisite material and the basics of what was being assessed. You must complete every assigned problem in order to score higher than a 5.</td>
</tr>
</tbody>
</table>

Note that certain mistakes by themselves will automatically drop you to a 6 or lower because they are common but fundamental errors that wreck havoc on the truth of your work or fundamentally change the difficulty level of the task at hand. Also, be sure to think about what your writing communicates to a reader. I grade what you have said, not what you meant to say.

### Make-Up, Communication, Academic Dishonesty, and Other Class Policies

- It is your responsibility to be aware of due dates and to have access to a computer and other equipment that can handle the necessary work and to schedule enough time to complete the assignments.
- Any bonus assignments will be announced ahead of time and will be open to the entire class. For fairness and equity reasons, I do not offer bonus assignments to individual students at the end of the semester.
- Assignment deadlines may be extended at the discretion of the instructor in case of exceptional technical difficulties, but you should make every effort to avoid doing things
at the last minute. As you have an entire week in which schedule your midterm and final exam, only exceptional excuses like a long-term illness will be accepted to allow a make-up.

• Discussions require time to develop. Please start on discussion assignments immediately after they are opened so your classmates can have time to consider and respond.

• Please don’t hesitate to contact me if you have questions. You may call my office, leave a voice mail with my Google Voice number, text my Google Voice number, use chat in D2L, attend virtual office hours in ZOOM, or e-mail me. I will have five hours per week of office hours, but half of my duties are technical support for the college. Thus, I can usually easily be found in or around my office, the math building, the science building, or the STEM building during the week outside of scheduled office hours. So, schedule a time to meet me in person or online during the week if my posted scheduled hours don’t fit your schedule.

• However, you should hesitate to contact me if the information you are asking about can be easily found in the syllabus, a news item, or content in D2L. Check those resources before asking me. Issues needing your immediate attention will be posted as news items. I will regularly post news items to remind everyone of upcoming due dates and needed announcements.

• You bear some responsibility to help make the class a welcoming learning environment. See the SFA Way, below, as a reminder of how we all can work together to make this class a safe and respectful learning environment. I also pledge to follow the SFA Way.

• You are expected to contribute substantively to each group project; your grade on assignments can be affected by nonparticipation.

• Cheating is a most serious offence, resulting in a grade of 0 on the assignment and being reported to the university. Here are some of the ways I define cheating (academic dishonesty) for the various components of this class. These are examples and not exhaustive lists of what I consider cheating. If you have any question as to what I consider cheating, contact me before you turn in the assignment. See also the official SFA policy later in the syllabus.

  ○ Overall: Copying or paraphrasing from any source, including classmates, without citation or without permission

  ○ Midterm and final exam: Do not use any materials besides those provided at the test or otherwise expressly permitted by the instructor, your calculator and a writing instrument. You may not ask discuss the test with anyone in or outside the class until after the test is over. For those of you testing via ZOOM, be sure to discuss your camera situation with me before the test.

  ○ Group assignments: Copying or paraphrasing from any other groups or anyone outside the course. Using projects submitted by students who have previously taken the course is also considered academic dishonesty. Only use the resources allowed in the instructions.

  ○ Individual assignments: Copying or paraphrasing from other students is prohibited. Individual assignments are intended to measure your understanding of the material of the course, not anyone else’s. As individual work, it is normal to
expect that your work should have some significant differences that indicate your individuality. Just changing a few words or symbols from someone else's work counts as cheating. You work should reflect your true understanding of the material, not just responses parroted or cobbled together from others in class or outside class, including the internet in general. With advance permission, you may work together on some assignments. But if you do so, indicate who you worked with in the assignment. You should make a deliberate effort to make you work look different from the person you worked with. "We worked together" is not a valid excuse for individual assignments to look the same unless you have explicit permission from me.

- Make sure you have read this entire syllabus carefully because you are responsible for what lies within it. Ignorance of the rules is not an excuse.

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**Tips For A Successful Math Class**

- **Sleep and relax!** Well...outside of class, that is. It is hard to do math well with a tired or anxious mind!
- **Learn mathematical terminology!** It’s hard to think and talk about concepts when you don’t know what the words mean that we’re using. For any math word, be able to give a formal definition, an informal definition, an example that illustrates the concept, and “non-examples” (examples of situations that are close to being right, but not quite).
- **Do. The. Homework. All of it. Several times if necessary.** Create new problems if you run out of problems to practice.
- **Strategize!** Take the time to think about how the different types of problems are solved and create a road map in your mind how to get to the solution.
- **The quality of the time is as important as the quantity of the time you spend studying.** You have to understand the concepts and basic examples before you can master the harder problems. Regularly look back at the big picture when you get stuck on an immediate detail.
- **Get help!** If you’re alert, know the words, and understand the examples but are still stuck, then get help from me or a tutor.
- **Learning math is a lot like learning anything else – sports, music, etc.** Some have natural talent, some don’t. At the beginning, you have to drill those basic moves until you can do them almost without thinking in order to overcome your anxiety. Only then can you concentrate on improving your skills and learning more sophisticated moves. I am your coach; I can’t make the moves for you. I can show you the mechanics of the move and explain why the move does what it does, but only you can do it for yourself. You must both practice and reflect on your performance in order to win!
- **Find your motivation and hold onto it!** It’s hard to do well in something you don’t want to do, and it’s easy to get lost in the drudgery and lose focus. But, math can be very beautiful and enjoyable with a little motivation!
The SFA Way

"...striving for personal excellence in everything that we do."

At Stephen F. Austin State University, our faculty, staff, alumni and students believe in doing things "The SFA Way." We expect the best from ourselves and from each other, and we hold each other accountable when we fail to maintain these standards.

Root Principles

Grounded in the five "Root Principles" below, members of the SFASU community seeks to strive for personal excellence in everything that we do.

The Principle of Respect:

Lumberjacks command respect and treat others with respect • They are considerate of others and tolerant of differences • They demonstrate respect for those around them by avoiding the use of offensive or profane language • They do not threaten or harm anyone and deal peacefully and civilly with conflict.

The Principle of Caring:

Lumberjacks think of the needs of others and seek to improve the quality of life of those around them • They are compassionate, empathic and kind • They respond with humility to those they have helped and express gratitude freely to those who help them • Lumberjacks prepare themselves to become leaders in their communities and workplaces • They dedicate themselves to excellence in their chosen field of study and to using what they learn in the service of others.

The Principle of Responsibility:

Lumberjacks do what is right • They persevere in times of adversity • Through self-control and self-discipline, they strive to do their best • Lumberjacks challenge each other to exceed expectations • They are active learners both inside and outside of the classroom • They are reliable; they do what they say they will do • Lumberjacks hold themselves accountable for their decisions •

The Principle of Unity:

Lumberjacks are loyal to their friends, family, university, state and country • Lumberjacks stand together against any adversary • They recognize that though we are very different from one another, we are united by the Lumberjack Spirit. Lumberjacks seek to understand the people and world around them • When one lumberjack fails, all fail • When one lumberjack succeeds, all succeed.

The Principle of Integrity:
Lumberjacks have the courage to do what is right, even when it is hard or unpopular. They respond to each situation with steadfast values that are not subject to change based on the actions of others. They seek opportunities to practice effective and ethical leadership. Lumberjacks are honest; they do not deceive, cheat or steal. Lumberjacks stand up for those who cannot stand up for themselves. As lifelong learners, lumberjacks are committed to continuously improving themselves.

**Academic Integrity A-9.1**

Abiding by university policy on academic integrity is a responsibility of all university faculty and students. Faculty members must promote the components of academic integrity in their instruction, and course syllabi are required to provide information about penalties for cheating and plagiarism as well as the appeal process.

*Definition of Academic Dishonesty*

Academic dishonesty includes both cheating and plagiarism. Cheating includes, but is not limited to (1) using or attempting to use unauthorized materials to aid in achieving a better grade on a component of a class; (2) falsification or invention of any information, including citations, on an assignment; and/or, (3) helping or attempting to help another in an act of cheating or plagiarism. Plagiarism is presenting the words or ideas of another person as if they were your own. Examples of plagiarism include, but are not limited to: (1) submitting an assignment as if it were one's own work when, in fact, it is at least partly the work of another; (2) submitting a work that has been purchased or otherwise obtained from the Internet or another source; and, (3) incorporating the words or ideas of an author into one's paper or presentation without giving the author due credit. Please read the complete policy at [http://www.sfasu.edu/policies/academic_integrity.asp](http://www.sfasu.edu/policies/academic_integrity.asp).

**Withheld Grades (Semester Grades Policy A-54)**

Ordinarily, at the discretion of the instructor of record and with the approval of the academic chair/director, a grade of WH will be assigned only if the student cannot complete the course work because of unavoidable circumstances. Students must complete the work within one calendar year from the end of the semester in which they receive a WH, or the grade automatically becomes an F. If students register for the same course in future terms the WH will automatically become an F and will be counted as a repeated course for the purpose of computing the grade point average.

The circumstances precipitating the request must have occurred after the last day in which a student could withdraw from a course. Students requesting a WH must be passing the course with a minimum projected grade of C.
Students with Disabilities

To obtain disability related accommodations, alternate formats and/or auxiliary aids, students with disabilities must contact the Office of Disability Services (ODS), Human Services Building, and Room 325, 468-3004 / 468-1004 (TDD) as early as possible in the semester. Once verified, ODS will notify the course instructor and outline the accommodation and/or auxiliary aids to be provided. Failure to request services in a timely manner may delay your accommodations. For additional information, go to http://www.sfasu.edu/disabilityservices/.

Acceptable Student Behavior

Classroom behavior should not interfere with the instructor’s ability to conduct the class or the ability of other students to learn from the instructional program (see the Student Conduct Code, policy D-34.1). Unacceptable or disruptive behavior will not be tolerated. Students who disrupt the learning environment may be asked to leave class and may be subject to judicial, academic or other penalties. This prohibition applies to all instructional forums, including electronic, classroom, labs, discussion groups, field trips, etc. The instructor shall have full discretion over what behavior is appropriate/inappropriate in the classroom. Students who do not attend class regularly or who perform poorly on class projects/exams may be referred to the Early Alert Program. This program provides students with recommendations for resources or other assistance that is available to help SFA students succeed.