

MATH 5305: Advanced Geometry

Sul Ross State University
Fall 2024

Instructor/Professor: Mohammad Shah Alam, Ph.D.

E-mail: msa24gn@sulross.edu

shahalam.mju@gmail.com

Cell Phone: (832) 877-3205

Course Description Advanced Geometry delves into the sophisticated study of shapes, spaces, and dimensions beyond basic principles. Students will explore complex figures, transformations, and non-Euclidean geometries while developing rigorous proof techniques and applying geometric concepts to real-world problems.

Mathematics Program Outcomes Upon completing the Advanced Geometry course, students will demonstrate a deep understanding of complex two-dimensional and three-dimensional geometric concepts and transformations. They will be proficient in applying advanced mathematical techniques to solve intricate problems in practical contexts such as engineering and computer graphics. Students will also develop strong skills in constructing and presenting rigorous geometric proofs. Additionally, they will effectively communicate geometric ideas and collaborate on projects requiring advanced analysis and application.

Marketable Skills (1) Advanced Problem Solving skills. (2) Proof Construction and Logical Reasoning. (3) Geometric Modeling and Application. (4) Communication and pedagogical skills.

Office Hours Monday and Wednesday, 9:30 am– 1:00 pm

Required Text 1. S. L. Loney, Coordinate Geometry. 2. Bell, J. T., A Treatise on Three Dimensional Geometry

Course Policies

Attendance Policy

Attendance is not mandatory for this web-based class. Students are expected to engage with all course materials and assignments online. It is your responsibility to stay up-to-date with class content, including notes, assignments, and announcements, even if you miss a session. In case of an emergency that requires a make-up exam, you must provide written justification and/or documentation for approval.

Communication

I will post course documents, reminders, announcements, and assignments on the Blackboard system. You will also submit homework on Blackboard. I may also occasionally send announcements via e-mail. You should make sure you know how to access and use these tools. You are welcome to e-mail, telephone, or text

me. However, you chose to contact me, please make sure to state your name at the beginning of any message. You are welcome to my office hours if you wish to speak about the content or your progress in the course. If you don't communicate with me, then I can't help you.

Grading Policy

Your grades will be weighted as follows:

Assignments	30%
Mid Term Exam	30%
Final Exam	40%

A student who averages at least 90% will receive an A; at least 80% will receive at least a B; at least 70% will receive at least a C; at least 60% will receive at least a D.

Assignments

For each section, you will be asked to complete an assignment. Assignments will be made available on Blackboard. Homework can be submitted in a variety of formats, but each assignment must be submitted as a single file that I can view and grade on Blackboard. One possibility would be to type up your homework using the Equation Editor on Microsoft Word and save it as a PDF. Another would be to capture high-quality images of your homework using a phone or other device and combine them into a single file, e.g. by pasting each image into a word processor file. Feedback will be provided in the form of comments to your Blackboard file. All work must be shown for full credit. Try to be as tidy as possible so that I can understand your work. Please try to upload pdf files, so that I can view your submission on Blackboard. Submissions consisting of multiple image files will not be graded as it's too easy for me to lose my place and miss something. If I have trouble seeing your file, I will let you know and give you a chance to resubmit.

Exams

There will be one **midterm exam**. Its tentative date is Monday, October 7. This is subject to change. You will be notified of a change at least one week in advance. Make-up exams will be given only in the event of an emergency, in which case written justification and/or documentation must be provided and approved. The comprehensive **final exam** will take place at the time scheduled by the university, during the final exam period at the end of the semester. Official time and date to be announced once the university publishes the final exam schedule.

Course Outline

Below is a tentative subject outline and schedule for this course.

(A) Geometry of Two Dimensions

1. Transformation of co-ordinates: Change of origin, Rotation of axes, Invariants Formula.
2. Pair of straight lines: Condition of pair of straight lines, Angle, Bisectors,
3. Circles and System of circles: Tangent, Normal, Chord of contact, Pole and Polar, Conjugate point, Orthogonality, Radical axis and Co-axial circles.
4. Parabola: Tangent, Normal and Parallel chords.
5. Ellipse: Director Circle, Focal distances and Conjugate diameter.
6. Hyperbola: Conjugate diameter, Asymptotes.
7. Conic Section: The general equation of 2nd degree and reduction to standard forms, Identification of conics.

(B) Geometry of Three Dimensions

1. Coordinate systems: Direction cosines and Direction ratios.
2. Planes.
3. Straight lines: Symmetrical Form, Coplanar Line, Shortest distance.
4. Sphere: Great Circle, The Pole & Polar of a Plane, Orthogonal Spheres.
5. Cylinder: Enveloping Cylinder, The Right Circular Cylinder.
6. Cone: Generator, The Right Circular Cone, Reciprocal Cone.
7. The general equations of second degree and reduction to standard forms.
8. Identification of coincides

QEP Mapped Course

Course Design: Communication Infused

To be successful in college and beyond, many sources (e.g., Morrealle & Pearson, 2008) indicate that communication competencies are essential. Sul Ross recognizes that the current generation of undergraduate university students should receive training to navigate a global world as competent communicators in various contexts and channels of communication.

Through our Quality Enhancement Plan (QEP) called Compass, Sul Ross aims to equip you to navigate excellence in the 21st century by developing your communication skills across multiple courses. This mathematics course is designed to enhance your communication skills. Therefore, this course has the following QEP Student Learning Outcome:

QEP Student Learning Outcome

The student will create works that exhibit skill in prepared and purposeful communication (written, oral, or visual).

University Statements

Distance Education Statement: *Students enrolled in distance education courses have equal access to the university's academic support services, such as library resources, online databases, and instructional technology support. For more information about accessing these resources, visit the SRSU website. Students should correspond using Sul Ross email accounts and submit online assignments through Blackboard, which requires secure login. Students enrolled in distance education courses at Sul Ross are expected to adhere to all policies pertaining to academic honesty and appropriate student conduct, as described in the student handbook. Students in web-based courses must maintain appropriate equipment and software, according to the needs and requirements of the course, as outlined on the SRSU website. Directions for filing a student complaint are located in the student handbook.*

SRSU Disabilities Services: *Sul Ross State University (SRSU) is committed to equal access in compliance with Americans with Disabilities Act of 1973. It is SRSU policy to provide reasonable accommodations to students with documented disabilities. It is the student's responsibility to initiate a request each semester for each class. RGC students seeking accessibility services should contact Paulette Harris, Executive Assistant to the Vice President and Dean, at 830-279-3023 or email pharris@sulross.edu. Ms. Harris's office is at 2623 Garner Field Road, Uvalde, TX 78801 (this is the mailing address, too).*

University Libraries: *The Sul Ross Library offers FREE resources and services to the entire SRSU community. Access and borrow books, articles, and more by visiting the library's website, library.sulross.edu. SRSU RGC students may request InterLibrary Loans (ILLs) and book check outs from the Sul Ross Library to be picked up at the SWTJC library that is most convenient. Access requires your LoboID and password. Librarians are a tremendous resource for your coursework and can be reached in person, by email (srsulibrary@sulross.edu), or phone (432-837-8123). The Southwest Texas Junior College (SWTJC) Library is also available on each campus for your physical use of the space or checking out books. Del Rio, Eagle Pass, and Uvalde students may use online resources available through SWTJC website, library.swtjc.edu. These libraries serve as pickup locations for your ILL or Document Delivery or book requests; to do so, choose the appropriate pick-up location when requesting materials from the Alpine campus.*