Math 318-01 Topics in Geometry: Differential Geometry of Curves and Surfaces
FALL 2026

Professor: M. Sandoval, Nutt MECC 219, 297-2062, email: mary.sandoval@trincoll.edu (The best way to contact me!)

Time and Location: MWF 11am–11:50, Location: LSC Room 132.

Course Website: We have a Moodle Website in the usual place, available from the portal: `https://my.trincoll.edu`

Office Hours

Monday	1pm–3pm
Tuesday	none
Wednesday	1pm–3pm
Thursday	none
Friday	2pm–3pm
or	by appointment.

If making an appointment, please allow at one business day to arrange a mutually agreeable time.

Textbook: *Differential Geometry of Curves and Surfaces,* by Kris Tapp. Springer, 2007, ISBN: 978-3-319-39798-6 (Print), 978-3-39799-3 (eBook), Chapters 1, 3–6.

This textbook is available **FREE** from the publisher when accessed through the following link:

`http://link.springer.com.ezproxy.trincoll.edu/`

You may also purchase a hard copy online as I have not ordered it for the bookstore.

To access a free PDF version:

- Click on the link above to take you to the Springer website as a validated Trinity user.
- Go to the website for each text:
  `https://link-springer-com.ezproxy.trincoll.edu/book/10.1007/978-3-319-39799-3`
- On the left side you will see a link that says, **Download Book PDF**.
- Clicking on the link will open the book on your computer. BE SURE AND SAVE IT OR YOU WILL HAVE TO GO THROUGH THIS PROCEDURE EVERY TIME!

Course Learning Objectives

By the end of this course, successful students will be able to:

1. Students will be able to closely read definitions, arguments, identify common structures, apply abstract criteria to determine if particular examples meet the abstract hypotheses or criteria, and be able to explain the logical relationship between theorems and definitions in this course.
2. Students will be able to closely read proofs, identify logical structures, and identify commonly used techniques.

3. Students will be able to reflect on an argument, assess its validity, analyze its structure, comparing it to similarly structured arguments, and revise it as needed.

4. Students will be able to construct correct, concise arguments (proofs), making well-justified rigorous statements, sometimes from first principles, and write them up clearly, using good style, exposition, and form.

More specifically, in terms of subject matter, successful students will be able to :

- Understand how the geometry of one- and two-dimensional objects (curves and surfaces) can be described by invariant concepts such as curvature, torsion (for curves) , and Gaussian curvature (for surfaces);
- Understand what an geometric invariant is in different contexts;
- Understand what geodesic curves are for surfaces;
- Understand the relationship between local geometric invariants and global topological properties;
- Gain a foothold in understanding how these concepts extend to higher dimensions, and how these ideas can be used to understand ideas in modern physics.

Office Hours: It is quite normal for students to regularly make use of my office hours. In office hours, I will help you learn how to do the homework on your own. I will not do any of the assigned homework problems *for* you. I will gladly review similar problems as examples for you to follow, or review general techniques and strategies. It is your responsibility to see me if you are having difficulty with the homework in a timely manner. Waiting until the last minute is too late, and, in fact, constitutes an act of irresponsibility on your part. Faculty at Trinity are generally willing to help, but you, the student, must assume responsibility for your education. So take note: you should start the homework soon enough so that you can take advantage of my office hours. If you wait until the last minute to begin the homework, you will not be able to make use of office hours and you will find yourself forced into turning in an incomplete or badly done assignment.

Grading: Like most upper-level mathematics courses, this work of this course is primarily involves proving mathematical facts and relationships, rather than performing computations. We have two types of work: (1) homework involving proofs and (2) oral presentations of your proofs.

Attendance	5%
In-class Activities/Low-Stakes Quizzes	15%
Proof-Writing Homework Sets	60%
Presentations	20%

Extra credit beyond the above is not available. Late assignments will not be accepted except under extraordinary circumstances that can be documented via the Dean of Students Office.

The letter grade in this course is based on a straight scale, with the exceptions (1) that I do not decorate D grades with plusses or minuses; and (2) the grade of A+ is reserved for the truly remarkable students–someone whom I would rate in the top 1 percent of all the students I have encountered in my career at Trinity (this is consistent with the policy of the Dean of the Faculty's

latest policy)–consequently, a grade that is a 90 percent but below a 95 percent is an A- and a grade above 95 percent is an A.

Attendance and Classroom Deportment: Successful students attend class. Attendance will be taken and will be taken into account in the calculation of the final grade. To receive credit for zoom attendance you must attend zoom class for the full class period **with the video on**. We will be using a work-shop model to actively work on the assignments during a portion of the class period, and to participate your video must be on. Be sure to dress (appropriately). If your internet connection is too unstable to allow you to regularly attend with video on, you can still get credit for attendance by participating via the chat feature. At times, you will need to present material, so you should try to solve the video issue to receive the same opportunities as everyone else.

Worksheets and Quizzes: We will have regular in-class activities in the form of worksheets or quizzes. Some of the quizzes may be posted before class for you to complete on moodle. If you are absent, you may not make up the missed worksheet or quiz except under extraordinary circumstances that can be documented via the Dean of Students Office.

Proof-Writing Sets: Working through the homework assignments is where you will really learn the material that is the main focus of the course. Late assignments will not be accepted except under extraordinary circumstances that can be documented via the Dean of Students Office. You should submit your assignments as a **single** pdf file. It must also meet some basic criteria for legibility, organization, and form which will be spelled out in more detail with the first assignment. Submissions will that do not meet the basic criteria will not be accepted. Late homework will receive a zero, and will not be graded. Your work does not need to be typeset with a word-processing program; hand-written work is fine as long as it is organized and legible. If your handwriting is not legible, you will be required to type your homework. Each proof will be graded according to the Grading Rubric for Proofs in the Course Documents folder. For each proof set (except those assigned in the last week of J-term), you may rewrite one problem to improve its score after receiving feedback. The rewritten proofs for each week are due on Fridays. For the assignments that are due in the last week of J-term, no rewrites are possible due to the time constraints involved in submitting final J-term grades.

Basic Requirements for Proofs: Each proof must meet the following minimum requirements. Any proof that does not meet these basic requirements will not be considered for grading, and will be returned with a zero grade.

1. The entire statement problem must be included, written out in its entirety, word for word, as it appears in the assignment. If a problem refers to something in the text, you should write out the relevant information from the text.

2. The first sentence of your proof must identify the basic strategy of the proof. How will you go about accomplishing the task? Minimally, this might include a sentence identifying the type of proof. Direct proof? Proof by direct abstract computation? Proof by induction? Disproof by counterexample? Contrapositive proof? Proof by Contradiction? You may want to review the basic proof types that you learned in a previous course. You may also wish to expand upon this by stating your plan more precisely.

3. The second paragraph of your proof must contain all the assumptions that you are making, and establish the notation that you are using.

Presentations: There are two required presentations, which will be graded according to the Grading Rubric for Presentations found in the Course Documents folder. The first one is a sort of

a dry run, worth 5 percent of your grade. The second is worth 10 percent of your grade. Tentatively, we will have presentations on the third and fifth Friday of the J-term.

Attendance and Deportment: In a seminar class such as this, attendance and participation are essential. Your attendance grade will be calculated on the basis of days attended divided by days of class. If you miss a class, even for a good reason, it will impact your participation scores.

Expectations: For this course, you should expect to spend an average of 9 hours per week studying and completing assignments. This work may take the form of finishing in-class activities, working on assignments, actively reading the text, and preparing for the presentations.

Athletes and Scheduling Difficulties: Is this still even a thing? Athletes and others who have scheduled absences are responsible for notifying me in advance of any scheduling conflicts with deadlines, or exams. In addition, if there are sudden changes in your schedule, due to playoffs or rain-outs, you are responsible for notifying me in advance as well.

Absences: As wise old college students, you know that in the event that you are absent, it is your responsibility to do the following:

- To get any handouts or assignment sheets you have missed. These are always on the website.
- To get a copy of the class notes from one of your classmates. These are always on the website.
- To learn the material that you have missed. (I am, of course, available in office hours to assist you.)
- To know and keep the same deadlines as everyone else. All of this is posted on the website.
- To collect any graded work that has been handed back during the missed class. This year, papers will be handed back electronically.

Academic Honesty: Academic honesty is highly valued at Trinity. In accordance with the Trinity College Student Integrity Contract, students are expected to abide by the highest standards of intellectual honesty in all academic exercises. Intellectual honesty assumes that students do their own work and that they credit properly those upon whose work and thought they draw. In this course, you may not draw upon internet solutions or the work of others. It is the responsibility of each student to make sure that he or she is fully aware of what constitutes intellectually honest work in every examination, quiz, paper, laboratory report, homework assignment, or other academic exercise submitted for evaluation in a course at Trinity College.

Students with Academic Accommodations: Trinity College is committed to creating an inclusive and accessible learning environment consistent with the Americans with Disabilities Act. Students with disabilities who may need some accommodation in order to fully participate in this class are urged to contact the Student Accessibility Resource Center, as soon as possible, to explore what arrangements need to be made to assure access. If you have approval for academic accommodations, please notify me by the end of week two of classes. For those students with accommodations approved after the start of the semester, a minimum of 10 days' notice is required. Please be sure to meet with me privately to discuss implementation. Student Accessibility Resources can be reached by emailing SARC@trincoll.edu.

Finally: Unless stated otherwise, all other matters of course policy are subject to the instructor's discretion and may be changed with suitable notice.
