Course Description

Differential geometry is a branch of mathematics lying at a meeting point somewhere between calculus and geometry. In this course we will study the classical Riemannian geometry of curves and surfaces living in three-dimensional space. Topics will include the properties of curves and surfaces, notions of curvature (mean curvature, Gauss curvature, Gauss' Theorema Egregium), and the connection between curvature and topology (the Gauss-Bonnet theorem, Bonnet's Theorem). In addition to visiting some of the beautiful results of this field, our goal is to develop insight and intuition required for future study of modern differential geometry (without spending time to develop the machenery required by it).

Essential Information

Professor	David Maxwell
Office	Chapman 308C
Phone	474-1196
Email	`ffdam@uaf.edu`
Web	`http://www.math.uaf.edu/~maxwell`
Text	**Differential Geometry of Curves and Surfaces**, *Manfredo P. Do Carmo*, Prentice Hall

Prerequisites:

MATH F314 (Linear Algebra) and F401 (Advanced Calculus) or permission of instructor.

Class Time

There will be three hours of lectures each week. The times are initially scheduled below, but we will pick a permanent time at the time of the first class meeting.

Lecture Times
MWF 2:15–3:15 Chapman 107

Office Hours

I will schedule 3 hours a week of formal office hours. These times will be chosen after consulting with my classes. I will post the times on my website and outside my office door. I have an open door policy; if I'm in my office and my door is open, please feel free to drop by with questions. You are also welcome to schedule a meeting outside of my formal office hours by sending me an email.

Homework

There will be a homework assignment due roughly every week. We will decide together on the first day of class on a good day of the week for your homework to be due. Each week's assignment and due date will be announced in class and will be posted on my web page. After your homeworks have been graded, I will post solutions on my web page. I will accept late homework, but there will be a 10% deduction for each day the homework is handed in after its due date.

Homeworks will include both computations and some proofs, with an emphasisis on the computations. Try to write up your assignments as if you were presenting the solution to yourself (before you had solved the problem). Be sure to make use of full sentences to guide your reader through the solution.

Midterms

There will be one in-class midterm exam. It will be held on Friday March 11.

Final Exam

Differential geometry is a computation intensive subject. To compensate for this, the final exam will be a take-home exam. The date it is handed out will be announced later in the semester. It will be due in my office on the last day of exam week, Thursday May 12, at 4:30pm.

Evaluation

Course grades will be determined as follows:

Homework	40%
Midterm	30%
Final	30%

Letter grades will be assigned according to the following scale. This scale is a guarantee; I also reserve the right to lower the thresholds.

A	90–100%
B	80–89%
C	70–79%
D	60–69%
F	0–59%

Tentative Schedule

This schedule is probably ambitious. I will make the requisite adjustments as the course progresses. Each week's readings will be announced on my web page.

Week	Topics and Events
1/21	Orientation and Introduction to Curves (Section 1-2)
1/24 – 1/28	Curves parameterized by arclength, vector product (Sections 1-3–1-5)
1/31 – 2/4	Local cannonical form, global theory of curves (Sections 1-6–1-7)
2/7 – 2/11	Review of the derivative, regular surfaces (Section 2-2)
2/14 – 2/18	Change of parameters and the tangent plane (Sections 2-3, 2-4)
2/21 – 2/25	First fundamental form, lengths and areas (Section 2-5)
2/28 – 3/4	Gauss map (Sections 3-2, 3-3)
3/7 – 3/11	Gauss map continued Friday: Midterm Exam
3/14 – 3/18	Spring Break
3/21 – 3/25	Vector fields, ruled surfaces (Sections 3-4, 3-5) Monday: Last day for withdrawal
3/28 – 4/1	Minimal surfaces, Isometries (Sections 3-5, 4-2)
4/4 – 4/8	Theorema Egregium, Parallel Transport (Sections 4-3, 4-4)
4/11 – 4/15	Parallel Transport continued, Surfaces and the Euler Characteristic (Section 4-5)
4/18 – 4/22	Gauss-Bonnet theorem and applications (Section 4-5)
4/25 – 4/29	Introduction to global theorems, Hopf-Reinow theorem (Section 5-3)
5/2 – 5/6	Bonnet's theorem (Section 5-4)
5/12	Final Exam due

Rules and Policies

Collaboration You are encouraged to work together in solving homework problems. But each student must write up his or her own solutions independently. If you receive significant help solving a problem, it is customary to make a note in your homework to give the person who helped you credit.

Exam Aids The midterm exams will be written without any aids. No notes, books or calculators will be allowed. You will be able to use the course text for the take-home final exam. More specific rules for the final will be announced in class.

Makeup Exams You can make up an exam if certain extenuating circumstances prevent you from taking it and if you inform me in advance. Contact me as soon as possible if you are going to miss an exam.

Attendance Attendance is not included directly as part of your grade.

Cell Phones Turn off your cell phone before you come to class.

Disabilities Services I will work with the Office of Disabilities Services (203 Whitaker, 474-7043) to provide reasonable accommodation to students with disabilities.

Incomplete Grade Incomplete (I) will only be given in Computer Science, Mathematics or Statistics courses in cases where the student has completed the majority (normally all but the last three weeks) of a course with a grade of C or better, but for personal reasons beyond his/her control has been unable to complete the course during the regular term. Negligence or indifference are not acceptable reasons for the granting of an incomplete grade. (Note: this is essentially the old University policy.)

Late Withdrawals A withdrawal after the university deadline from a Department of Mathematical Sciences course will normally be granted only in cases where the student is performing satisfactorily (i.e., C or better) in a course, but has exceptional reasons, beyond his/her control, for being unable to complete the course. These exceptional reasons should be detailed in writing to the instructor, department head and dean.

Academic Dishonesty Academic dishonesty, including cheating and plagiarism, will not be tolerated. It is a violation of the Student Code of Conduct and will be punished according to UAF procedures.