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 machinery required by it).

Essential Information

Professor	David Maxwell
Office	Chapman 308C
Email	ffdam@uaf.edu
Phone	474-1196
Web	http://www.math.uaf.edu/~maxwell
Required Text	**Differential Geometry and its Applications**, *John Oprea*, Mathematical Association of America

Prerequisites:

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

Class Time

There will be three hours of class lecture each week.

Lecture Times		
MWF	1:00–2:00	Chapman 107

Office Hours

I will schedule 3 hours a week of formal office hours after consulation with my classes My office hours will always be posted on my web site and on 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, usually on Fridays. Each week's assignment and due date will be announced in class and will be posted on my web page. I will also post solutions after each homework has been handed in.

Regarding late homework, I will accept from each student a single late homework with no questions asked. You must notify me no later than the time the homework is due that you intend to take advantage of this opportunity, and you must hand in the homework no later than one week after it was due. Subsequent late homeworks will be accepted only under extenuating circumstances to be determined at my discretion.

We will used Maple (a computer algebra program) for some of the assignments. There is a copy of Maple on the computers in the Math Lab. You can also buy a student version online

for $99. If you already have access to and are familiar with another comparable program (e.g. Mathematica) you are welcome to try to use it to complete the Maple exercises.

Midterm

There will be one in-class midterm exam. It is tentatively scheduled to be held on Friday, March 6.

Final Exam

Differential geometry is a computation intensive subject. To compensate for this, the final exam will be a take-home exam. More details will be announced later in the semester. It will be due in my office on the last day of exam week, Friday May 8, at 4:30pm.

Evaluation

Course grades will be determined as follows:

Homework	50%
Midterm	20%
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+	97–100%	C+	77–79%	F	≤ 59
A	93–96%	C	73–76%		
A-	90–92%	C-	70–72%		
B+	87–89%	D+	67–69%		
B	83–86%	D	63–66%		
B-	80–82%	D-	60–62%		

Tentative Schedule

The following is a tentative list of the topics to be covered in this class. As we proceed in the course, the course web page will list specific sections to be read for each week.

Week	Topics and Events
1/23	Review of curves (1.1)
1/26 – 1/30	Curves parameterized by arclength, Frenet Formulas (1.2–1.3)
2/2 – 2/6	Non-unit speed curves. Implications of curvature (1.4–1.5)
2/9 – 2/13	A global theorem. More of Maple and Curves (1.6 1.7)
2/16 – 2/20	Basics of surfaces (2.1–2.3)
2/23 – 2/27	Normal curvature. Maple and Surfaces. (2.4-2.5)
3/2 – 3/6	Introduction to curvature. (3.1–3.2) Friday: Midterm Exam
3/9 – 3/13	Spring Break (no classes).
3/16 – 3/20	Surfaces of revolution. More on Gauss curvature (3.3–3.4)
3/23 – 3/27	Effects of curvature. Delaunay sufraces. (3.5–3.6) Friday: Last day to withdraw with a 'W'.
3/30 – 4/3	Maple and surfaces. Introduction to geodesics. (3.8,5.1,5.2)
4/6 – 4/10	Abstract surfaces. (5.3–5.4)
4/13 – 4/17	Isometries. Geodesics and Maple (5.5–5.6)
4/20 – 4/24	Introduction to Holonomy. (6.1–6.3)
4/27 – 5/1	Gauss-Bonnet theorem. (6.5–6.6)
5/4	Catch-up and review

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.

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.