MATH 451
DIFFERENTIAL GEOMETRY
CSULB
SPRING 2009

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OFFICE: THU 10:30-11:00

Overview. How do you tell whether or not a curve is straight? Whether a surface bends? The idea of *curvature* naturally arises when we try to treat these issues. Although it's a strongly intuitive concept, curvature is deep and subtle. By studying curves and surfaces we'll explore curvature through physical and conceptual experiments. Our goal is to develop a theory rooted in perceptual understanding.

Exercises. There will be regular assignments of reading and exercises. A complete list of exercises for each assignment will appear at least two weeks before the due date.

I urge you to **work with others** and to consider the problems at some length before asking about them in class. I also urge you to ask about the problems. The work represented in what you submit should be *your own.* Everything that you submit should be written in concise, clear sentences.

For each assignment you may resubmit **one item** for up to 90% credit. Late work will be marked for up to 80% credit. The **firm deadline** for resubmissions and late submissions is the **final day of classes** (not final exams).

Problem presentation. You will present to the class a solution of a selected exercise. This should be structured to take 10-15 minutes. Your grade will reflect your understanding of and insight into the math and your effectiveness in their communication. For each assignment, I will circulate a sign-up sheet for the selected problems.

Course project. Find a topic to be examined independently. One possibility is to work out an especially challenging unassigned problem in the text. A list of other ideas will appear shortly. A number of useful items will be held on reserve for you to consult. Computational work is especially suitable. You might come up with your own topic. Bear in mind that your project should have a *narrow focus.*

I encourage you to work with someone. Be advised that the standards for group work will be proportionally higher. You will also provide a project write-up that's **due by 12N, Friday of final exam week**. Length is not important—clarity of thought and illumination of ideas are what matter most. You will present your findings to the class (10-15 minutes) during the final exam time. If you work in a group, each member must make some contribution during the presentation.

By the 11th week you submit a brief proposal that describes what you working on and planning to do. If you're having trouble, please see me.

Lab work. On two occasions (weeks five and ten) we'll meet in a computer lab to explore the computational side of things. For each session there will be a lab handout to work through.

Our computational tool will be *Maple.* Typically, you will write some smallish programs for creating useful graphical data. Your work for each lab—a **single, commented** *Maple*

worksheet—will be due at least two weeks hence. You should submit the lab worksheet via email.

WWW. Materials related to the course (course description, assignments, list of reference materials) will appear at

`www.csulb.edu/~scrass/Teaching`

Please make recommendations for things that you'd like to see on the site.

Text. P. M. H. Wilson, *Curved Spaces*

Coarse outline.

Weeks 1-6	Curves in the plane and space
Weeks 7-13	Surfaces: Gaussian curvature
Weeks 13-15	Abstract surfaces
Final exam period: 5-7 Mon 18 May	Course project presentations

Evaluation.

Exercises	25%
Labs	25%
Problem presentation	20%
Course project and presentation	30%

Here's an indication of how I will assign grades. These are **minimum** standards. The actual boundaries between grades might be lower than these, but won't be higher.

85-100%	A
75-85%	B
65-75%	C
50-65%	D

To each individual part of your work I will assign a mark 0-10. See below for an *indication* of what these marks mean.

10	Clear, elegant, shows depth of understanding and special insight or creativity
9.....	Clear, shows understanding and some elegance and insight
8.....	Mostly clear, shows understanding, little elegance and insight
7.....	Somewhat clear, lacking depth of understanding, little elegance and insight
6.....	Some significant misconceptions or shortcomings
5.....	Highly significant misconceptions
0-4....	Shows little effort.

Key to comments on marked papers.

a	This needs a supporting **argument**.
a?	What's the **argument**—the line of reasoning—here?
d	**Describe** what's going on here.
e	**Explain** what you're doing here.
h?	**How** did you get this?
i	**Illustrate** what your talking about—give an example, a picture, etc.
m	The **meaning** here isn't clear.
p	A **picture** would help here.
s	This is not a **sentence**.
w	**Wording** is awkward, confusing, etc. Meaning is unclear.
y?	**Why** is this so? What's the connection to what you've already said?
!	Very nice. Something especially clear, insightful
?	What this means or what you're doing is **unclear**. Where does this come from?
X	Something's wrong here—in concept or calculation.
$\surd$	This is right—you have the idea.

Fine Print

Withdrawal A copy of the School of Natural Sciences withdrawal policy is available from the Department Office. Note that it's different from the University withdrawal policy and the deadlines are earlier. Deadlines to which you should pay particular attention to appear below. Withdrawals from this course will be allowed only in accordance with University and College policies. Please be aware of the more specific and restrictive withdrawal policy for the College of Natural Sciences and Mathematics.

Weeks 1-2. Withdrawals will not appear on the student's permanent record.

Weeks 3-8. Withdrawals are permissible only for serious and compelling reasons. Academic progress unsatisfactory to the student is considered a serious and compelling reason during this period. Instructor and Department Chair signatures on the drop form are required.

Weeks 9-12. Withdrawals are permissible for serious and compelling reasons, but during this period, unsatisfactory academic progress is not considered a serious and compelling basis to drop a course. Circumstances must be shown that preclude the student from attending class or from any effective opportunities to study. In addition to the normal withdrawal form, a special form must be completed, and instructor and department chair signatures are required.

Weeks 13-15. Withdrawals are permissible only for serious accident or illness and involve a total withdrawal from the University. Detailed written documentation must accompany withdrawal forms. Instructor, chair, and college dean signatures are required.

Disability It is the student's responsibility to notify the instructor in advance of their need for accommodation of a disability that has been verified by the University.

Cheating/Plagiarism Cheating and plagiarism are in violation of the California Administrative Code, Title 5, Section 41301. CSULB has adopted a specific policy with respect to the violations of this nature (see the Bulletin or Schedule of Classes). Any student in violation of this code and policy in any assignment or examination related to this course shall be subject to the options specified in the policy statement. This may result in the student receiving a failing grade in the course or, in certain circumstances, being expelled from the University.