**Time:** Monday, Wednesday, Thursday 10:00–10:50 (Block C)  
**Room:** Goldsmith 300  
**Instructor:** Daniel Ruberman  
   Room 310  
   736–3074  
   **e-mail:** ruberman@brandeis.edu

**Office hours** (subject to change): Monday and Wednesday, 11-12; Thursday 1-2, and by appointment.

Course information, including all homework assignments, may be found on LATTE. The course URL is [https://moodle2.brandeis.edu/course/view.php?id=3461](https://moodle2.brandeis.edu/course/view.php?id=3461).

This course is about the differential geometry of curves and surfaces in the plane and Euclidean 3-space. The basic concept we will try to master is the measurement of curvature, using the tools of multivariable calculus. Curvature, while a reasonably intuitive concept, is expressed mathematically by formulas that can look complicated and intimidating. Viewed properly, however, these formulas are very revealing, and reveal interesting global information (we’ll learn to call some of this ‘topological’) about geometric objects. We will be studying classical concepts relating to low-dimensional objects. When applied in higher dimensions, these lead to Riemannian geometry, which underlies Einstein’s theory of relativity. We won’t be studying Riemannian geometry directly, but I will try to hint at some of the connections to more advanced topics.

**Textbook:** *DIFFERENTIAL GEOMETRY: A First Course in Curves and Surfaces* by Theodore Shifrin. The book is free, and available online from [http://www.math.uga.edu/~shifrin/ShifrinDiffGeo.pdf](http://www.math.uga.edu/~shifrin/ShifrinDiffGeo.pdf) If there is sufficient interest, I will have copies printed and bound available to students at cost.

I plan to cover the first two chapters completely, the section about the Gauss-Bonnet theorem from the third chapter, and perhaps another topic from the third chapter depending on time and inclination of the class.

The prerequisites for the course are Math 23b, Math 22a or 15a, and Math 22b or 20a. I expect you to be able to write coherent mathematical proofs, using the basic tools from Math 23. I also expect you to be conversant with some of the basics of the real numbers as taught in Math 23. If you are uncertain about the level of the class, please speak with me.

The heart of learning mathematics at this level is in problem-solving and homework, and there will be regular assignments, some of which will be challenging. Late homework will not be accepted. Students who miss a test (or exam) will not be granted a make-up test (or exam) unless there is a documented medical or other emergency.
Grading: Grades will be based on homework, a 1-hour test (in class), and a final exam (scheduled by the registrar for this time block), weighted as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Homework</td>
<td>35%</td>
</tr>
<tr>
<td>Midterm exam</td>
<td>25%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>40%</td>
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Midterm exam scheduled for Wednesday, March 11 (to be confirmed).

Homework policy: You may discuss the homework problems with other students in the class; however, if you do, you should write on your homework submission the students with whom you discussed the assignment. (You do not need to mention any help you received from the TA’s or instructor.) You may not copy the written work of another student or allow another student to copy your written work. What you submit must be your own work, in your own words.

If you are a student who needs academic accommodations because of a documented disability, please contact me and present your letter of accommodation as soon as possible.

If you have questions about documenting a disability or requesting academic accommodations, you should contact Academic Services (x6-3470.)

Letters of accommodation should be presented at the start of the semester to ensure provision of accommodations. Accommodations cannot be granted retroactively.

You are expected to follow the University’s policy on academic integrity, which is distributed annually as section 4 of the Rights and Responsibilities Handbook (see http://www.brandeis.edu/studentaffairs/srcs/rr/index.html). Instances of alleged dishonesty will be forwarded to the Department of Student Development and Conduct for possible referral to the Student Judicial System. Potential sanctions include failure in the course and suspension from the University. If you have any questions about how these policies apply to your conduct in this course, please ask.