Syllabus

Notice: the most up-to-date course information can always be found on the course webpage.

Course description: This will be a mathematically rigorous course on the local and global geometry of curves and surfaces in Euclidean space. Topics will include geodesics, parallel transport, curvature, isometries, the Gauss map, and the Gauss-Bonnet theorem.

Prerequisites: C or higher in MAT 319 or MAT 320 or MAT 364; MAT 203 or MAT 307 or MAT 322
Credits: 3
Meetings: Tuesdays and Thursdays 11:30-12:50pm, Physics P113

Instructor: Maxim Jeffs
Email: maxim.jeffs@stonybrook.edu
MLC hour: 1-2 pm Tuesdays, see here for the most up-to-date information.
Office hours: 10-11 am Wednesdays and 4-5 pm Thursdays in SCGP 303, see here for the most up-to-date information.

Grader: Joao Pering
Email: Joao.pering@stonybrook.edu
MLC hours: Friday 9:00am-10:00am and Friday 10:00am-11:00am (zoom), see here for the most up-to-date information.
Office hour: Friday 8:00-9:00am (zoom), see here for the most up-to-date information.

Textbook: (optional) Manfredo P. Do Carmo, *Differential Geometry of Curves and Surfaces* (2nd ed.), Dover Publications.

Homework: will be assigned biweekly through the course webpage and submitted during class. Please try to write legibly and explain your reasoning carefully and completely. Points may be deducted for work that is not presented clearly. You are encouraged to discuss the homework problems with others, but your write-up must be your own work.
Homework sent as an email will not be accepted. Late homework will not be accepted except under documented extenuating circumstances.

Examinations: There will be one midterms (taken during class time) and a final exam. Make-up exams will not be given without a serious and documented reason.

Final exam: Tuesday 14th of May, 11:15-1:45 pm.

Midterm: (preliminary) Thursday March 7th, during class.

Grading system:

- Final exam: 40%

- Midterm: 30%

- Homework: 30%

Student Accessibility Support Center (SASC) statement: If you have a physical, psychological, medical, or learning disability that may impact your course work, please contact SASC (631) 632-6748 or at sasc@stonybrook.edu. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential.

Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and SASC. For procedures and information go to the website and search Fire Safety and Evacuation and Disabilities.

Academic integrity statement: Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another persons work as your own is always wrong. Faculty are required to report any suspected instance of academic dishonesty to the Academic Judiciary. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website.

Critical incident management: Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Judicial Affairs any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, and/or inhibits students ability to learn. Further information about most academic matters can be found in the Undergraduate Bulletin, the Undergraduate Class Schedule, and the Faculty-Employee Handbook.

Student Absences Statement: Students are expected to attend every class, report for examinations and submit major graded coursework as scheduled. If a student is unable to attend lecture(s), report for any exams or complete major graded coursework as scheduled due to extenuating circumstances, the student must contact the instructor as soon as possible. Students may be requested to provide documentation to support their absence and/or may be referred to the Student Support Team for assistance. Students will be provided reasonable accommodations for missed exams, assignments or projects due to significant illness, tragedy or other personal emergencies. In the instance of missed lectures or recitations, the student is responsible for review posted slides, recorded lectures, and notes. Please note, all students must follow Stony Brook, local, state and Centers for Disease Control and Prevention (CDC) guidelines to reduce the risk of transmission of COVID.

Schedule (tentative)

- **Week 1:** (Tu 1/22, Th 1/25) Introduction, parametrized curves

- **Week 2:** (Tu 1/30, Th 2/1) Arc length and arc-length parametrization

- **Week 3:** (Tu 2/6, Th 2/8) Curvature, torsion, and the Frenet-Serret frame.

- **Week 4:** (Tu 2/13, Th 2/15) Regular surfaces, change of coordinates

- **Week 5:** (Tu 2/20, Th 2/22) Smooth functions on a surface, the tangent plane

- **Week 6:** (Tu 2/27, Th 2/29) The first fundamental form, area

- **Week 7:** (Tu 3/5, Th 3/7) Area and orientation

- **Spring break:** no classes.

- **Week 8:** (Tu 3/19, Th 3/21) The Gauss map, properties

- **Week 9:** (Tu 3/26, Th 3/28) Second fundamental form, curvature

- **Week 10:** (Tu 4/2, Th 4/4) Isometries and conformal maps

- **Week 11:** (Tu 4/9, Th 4/11) Gauss's theorem and the compatibility equations

- **Week 12:** (Tu 4/16, Th 4/18) Geodesics and vector fields

- **Week 13:** (Tu 4/23, Th 4/25) The Gauss-Bonnet Theorem

- **Week 14:** (Tu 4/30, Th 5/2) Review