MATH 62CM: Modern Mathematics: Continuous Methods
SYLLABUS

Official Course Description: A continuation of themes from Math 61CM, centered around: manifolds, multivariable integration, and the general Stokes' theorem. This includes a treatment of multilinear algebra, further study of submanifolds of Euclidean space and an introduction to general manifolds (with many examples), differential forms and their geometric interpretations, integration of differential forms, Stokes' theorem, and some applications to topology. Prerequisite: Math 61CM.

Teaching Staff:

Instructor: Dr. Laura Fredrickson
E-mail: lfredrickson@stanford.edu
Webpage: web.stanford.edu/∼ljfred4/
Office: 380-382L
Office Hours: Tuesday 4-6pm

Course Assistant: Cedric De Groote
E-mail: cedricd@stanford.edu
Office: 380-381H
Office Hours: TBD

Lecture:	M,Tu,W,Th	9:30-10:20am	200-305 (*History Corner*)
TA Session:	F	9:30-10:20am	200-305 (*History Corner*)

Exams: There will be two midterm exams, taken in the evening. The final is comprehensive.

Midterm #1: Tuesday, January 30 from 7-10pm in 380X+380W
Midterm #2: Tuesday, February 27 from 7-10pm in 380X+380W
Final: Tuesday, March 20 from 8:30-11:30am (Location TBD)

Prerequisites: Math 61CM

Textbook: Yakov Eliashberg's course notes *Multilinear algebra, differential forms and Stokes' theorem*, available on Canvas.

Course website: Course announcements, homework, solutions will be posted on Canvas. Additionally, the syllabus will be posted on my website web.stanford.edu/∼ljfred4/.

Grading Policy: On all work, your grade will be computed as a percentage: the number of points you earned divided by the number of points possible. The weekly homework and exams are weighted as follows:

- Homework: 30% (lowest score dropped)
- Midterm #1: 20%
- Midterm #2: 20%
- Final: 30%

Your letter grade will be given based on your numerical average earned in the class, on a scale not stricter than the following: you are guaranteed a D for 60.0 or above, C- for 70.0 or above, C for

73.0 or above, C+ for 77.0 or above, B- for 80.0 or above, B for 83.0 or above, B+ for 87.0 or above, A- for 90.0 or above, and an A for 93.0 or above.

Homework: The only way to learn mathematics is to do mathematics! The homework problems are an integral part of the course; they are the best and most reliable way to check your progress. Problems will range from fairly standard computations to routine applications of the definitions and formulae, to more difficult problems which will require more thought. I encourage you to form study groups and work together. A good strategy is to try each problem yourself first, then get together with others to discuss your solutions and questions, and finally *write up the solutions yourself.*

Please work out problems neatly—don't hand in your scratch work. One course goal is to sharpen your mathematical writing skills, and homework is a place to practice. Homework will be graded for clarity of exposition as well as correctness. Additionally, your homework must be stapled (no paperclips, please!) without the rough edges from tearing out of a spiral notebook.

Weekly homework assignments are due in class on Friday. Alternatively, you can turn them in to Cedric's mailbox by 9:20am on Friday. Assignments will be posted the previous Monday.

The lowest score will be dropped to accommodate exceptional situations such as a serious illness. Because the lowest score is dropped, you can miss one assignment without penalty. No late homework will be accepted, and no make-up homework will be given.

Alternate Sitting for the Midterm Exam: In exceptional circumstances, and by *prearrangement only*, you may take the midterm exam at a fixed alternate time. The alternate sitting will always occur *before* the standard sitting for the exam. To arrange an alternate sitting you must e-mail me at least two weeks before the midterm.

Final Exam Policy: (See `http://registrar.stanford.edu/students/final-exams`.)

- Students must not register for classes with conflicting end-quarter exams.
- Alternative arrangements for the final may only be made for the following unforeseen circumstances: illness, personal emergency, or the student's required participation in special events (for example, athletic championships) approved as exceptions by the Committee on Undergraduate Standards and Policy (C-USP).

Schedule: This course is structured with the expectation that you will attend every lecture. Of course, sometimes an absence is necessary. In such a situation, you should contact a classmate to get notes and other information for the class you missed.

We will have 37 lectures in total. Here is a tentative schedule, which may be adjusted as the quarter goes on.

- Week 1: Review of abstract vector spaces, dual spaces, multilinear functions and the geometry of bilinear functions.
- Week 2: Beginning of tensor algebra. Symmetric and skew-symmetric tensors. Exterior products.
- Week 3: Skew-symmetric tensors. Other constructions on tensors
- Week 4: Orientations, volumes and determinants. Duality theory.
- Week 5: Some topology.

- Week 6: Vector fields. Introduction to differential forms.
- Week 7: Differential forms. The exterior derivative.
- Week 8: Integration of differential forms.
- Week 9: Stokes' Theorem.
- Week 10: Stokes' Theorem. Review.

Students with Documented Disabilities: Students who may need an academic accommodation based on the impact of a disability must initiate the request with the Office of Accessible Education (OAE). Professional staff will evaluate the request with required documentation, recommend reasonable accommodations, and prepare an Accommodation Letter for faculty dated in the current quarter in which the request is made. Students should contact the OAE *by the end of the first week of the quarter*, since timely notice is needed to coordinate accommodations. The OAE is located at 563 Salvatierra Walk (phone: 723-1066, URL: `studentaffairs.stanford.edu`).

Textbook and other Resources: The primary text for this class is Yakov Eliahberg's course notes *Multilinear algebra, differential forms and Stokes' theorem*, and you should read it. This does not mean that it is "easy" to read. Math books are quite demanding on the reader, owing to the intrinsic difficulty of the material, so do not be surprised if you have to go slowly.

You are encouraged to attend the office hours provided by the instructor and course assistant.

Another resource which may be of use is Counseling and Psychological Services. See `http://vaden.stanford.edu/caps-and-wellness`.

Computers: If you wish to use a computer in class, you must speak with me first.

Academic Integrity: The Honor Code articulates Stanford University's expectations of students and faculty in establishing and maintaining the highest standards in academic work. Examples of conduct that have been regarded as being in violation of the Honor Code (and are most relevant for this course) include copying from another's examination paper or allowing another to copy from one's own paper; plagiarism; revising and resubmitting an exam for regrading, without the instructor's knowledge and consent; representing as one's own work the work of another; and giving or receiving aid on an academic assignment under circumstances in which a reasonable person should have known that such aid was not permitted. See `http://communitystandards.stanford.edu/` for more information on the Honor Code.

Important Dates

First Day of Classes	January 8
Martin Luther King Jr. Day (no class)	January 15
Add/Drop Deadline	January 26
Presidents' Day (no class)	February 19
Midterm Exam	February 6 (Tuesday)
Course Withdrawal & Change of Grading Basis Deadlines	March 2
Last Day of Classes, Last Day to Arrange an Incomplete	March 16
Final Exam	March 20 (Tuesday)