Math 61CM – Fall 2017

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Office hours of Professor and TA will be announced early in week 1.

Text (Required): An Introduction to Multivariable Mathematics, Leon Simon. An electronic version (pdf eBook) is provided by the publisher at: http://www.morganclaypool.com/doi/abs/10.2200/S00147ED1V01Y200808MAS003 (no charge to Stanford students-SUNet ID required; you will also be able to use this link when you are off-campus, but for that you first need to configure your browser as described in http://www-sul.stanford.edu/apcproxy/index.html)

There will also be extra handouts with details on material not in the text.

Math 61CM is the first quarter of the honors calculus sequence. This course introduces students to theoretical methods in multivariable calculus and linear algebra. The linear algebra lectures in weeks 1-6 will be cotaught with Math 61DM (The discrete mathematics version of the honors sequence). These joint lectures will be in 380-380C. These shared lectures will be taught by Professor Mazzeo in weeks 2, 3 and 5, and by Professors Fox/Manners in weeks 1, 4, 6.

Prerequisites: Students are expected to have an understanding with and facility with one-variable calculus at least at the level of BC Calculus. Some facility with multivariable calculus and linear algebra is also useful since they ways these subjects will be discussed here are quite different than in an ``ordinary'' calculus class. This sequence is designed for students with an interest in understanding the ``theory behind the calculations''. In this course you will learn to read and do mathematical proofs. This is an excellent introduction to higher level courses in Mathematics, Statistics, Physics or other natural sciences. This course is not a prerequisite for being a math major, or an honors math major, and many people who are interested in other disciplines as their primary majors take this class.

There will be fairly difficult weekly problem sets, two midterm examinations and a final examination. Grades will be based on the following:

Homework: 30%
Midterms: 20% each
Final: 30%

All examinations will be in-class (in the evening), and closed book.

Homeworks are due on Friday of each week (exception: Homework 1 will be due on Monday, October 2). You are strongly encouraged to work together on the homeworks. Please do not simply copy from someone else, but make a strong effort to understand what is going on and write it up in your own way. Homeworks will be graded for clarity of exposition (write in complete sentences!) as well as correctness. Solutions will be posted, and you are strongly encouraged to review these solutions to learn other ways to look at the problem, etc.

The midterms will cover the previous material (since the earlier midterm in the case of midterm 2), and the final exam will be cumulative.
Make-ups for the exams are available only for students who have a clash with some other class, or some other academic reason, and by **prior arrangement** only. Midterms are in the evenings: 7-8:30PM in Rooms 380-C and 380-Y.

TA sessions on Friday of each week are a crucial part of the class.

Course Schedule: (1.1 etc. from Simon book; HO = handout, available on webpage)

9/25 Appendix A.1, A.2: The real numbers, Fields.	9/26 Linear Alg. 1.1, 1.2, HO Vectors, Fields, Dot products	9/27 Linear Alg. 1.3 Fields, vector spaces, linear dependence	9/28 Appendix A.2, A.3. Sequences, Limits.	9/29 TA Session
10/2 2.1. More on limits. Bolzano-Weierstrass. Continuity.	10/3 Appendix A.3, 2.2 Open and closed sets, Metric spaces	10/4 Linear Alg. 1.4 Gaussian Elimination	10/5 Linear Alg. 1.5 Bases	10/6 TA Session
10/9 HO Compactness, more on open and closed sets.	10/10 More on Compactness. Series	10/11 Linear Alg. 1.6, 3.6. Linear maps, Matrices	10/12 Linear Alg. 1.7 Rank/Nullity	10/13 TA Session

10/16 Series	10/17 Series Midterm 1	10/18 Linear Alg. 1.8, Orthocomplements, projectors	10/19 Linear Alg. 1.9, 1.10 Inhomogeneous systems	10/20 TA Session
10/23 2.3 Differentiability in R^n	10/24 2.4 Partial Derivatives	10/25 Linear Alg. 3.1 Permutations, Multilinear maps	10/26 Linear Alg. 3.2 Determinants	10/37 TA Session
10/30 Linear Alg. 3.3 Inverses	10/31 Linear Alg. 3.5 Gram-Schmidt, Orthonormal bases	11/1 2.4, 2.5, HO Chain rule, product rule	11/2 2.4, 2.5 Chain rule	11/3 TA Session
11/6 2.6, 2.7 Spectral theorem (linear alg.)	11/7 2.6, 2.7 Hessian matrix Higher derivatives.	11/8 Taylor series in one and several variables	11/9 More on Taylor series.	11/10 TA Session
11/13 2.8 Geometry of curves	11/14 2.9 Submanifolds Midterm 2	11/15 2.9 Submanifolds	11/16 4.1, HO Contraction Mapping	11/17 TA Session
11/20 Thanksgiving	11/21 Thanksgiving	11/22 Thanksgiving	11/23 Thanksgiving	11/24 Thanksgiving
11/27 HO ODE's. Basic existence theorem	11/28 4.2 Inverse Function theorem	11/29 4.2 Inverse Function theorem	11/30 4.3 Implicit Function theorem	12/1 TA Session
12/4 Implicit Function Theorem	12/5 Summary and review	12/6 Summary and review	12/7 Summary and review	12/8 TA Session

Final Exam: Monday, December 11, 7-10PM

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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 being made. Students should contact the OAE as soon as possible since timely notice is needed to coordinate accommodations. The OAE is located at 563 Salvatierra Walk (phone: 723-1066, URL: **http://oae.stanford.edu**).

Affordability of Course Materials
Stanford University and its instructors are committed to ensuring that all courses are financially accessible to all students. If you are an undergraduate who needs assistance with the cost of course textbooks, supplies, materials and/or fees, you are welcome to approach me directly. If would prefer not to approach me directly, please note that you can ask the Diversity & First-Gen Office for assistance by completing their questionnaire on course textbooks & supplies: http://tinyurl.com/jpqbarn or by contacting Joseph Brown, the Associate Director of the Diversity and First-Gen Office (jlbrown@stanford.edu; Old Union Room 207). Dr. Brown is available to connect you with resources and support while ensuring your privacy.

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