Fall 2017 Math 395: Numerical Linear Algebra

(Future: Math 375: Numerical Analysis)

Lecture: TuTh 12:45 - 2:30 Location: LS 209

Instructor: Xuemei Chen xchen@math.usfca.edu - **Best way to reach me**
Office Hours: T 10:30 - 11:30, W 1-3, or by appointment @Harney Science Hall 121B
Course website: https://github.com/Numerical-Analysis/course

Prerequisites: Math 110, CS 110, Math 230 (or Math 202) with grade C- or better.
Recommended text:

– Anne, Greenbaum, and Timothy P. Chartier. *Numerical methods: design, analysis, and computer implementation of algorithms*. Princeton University Press, 2012.

– *Numerical Linear Algebra*, Trefethen and Bau, Siam 1997.

Grading

Written Homework:	18%	Lowest 1 or 2 dropped
Python Projects:	12%	Lowest dropped
Quizzes:	12%	Lowest dropped
Midterm Exam:	23%	10/24 Thursday
Final Exam	35%	12/12 Tuesday 12:30 - 2:30

Letter grade cutoffs: A 90-100 B 80-89 C 70-79 D 60-69 F: less than 60
Grades will never be lower than the computed average. However, the instructor may raise a grade for exceptional class participation, significant improvement, or particularly brilliant performance within a particular course component. In particular, a strong Final Exam could significantly raise your grade.

• Written Homework: Homework is always due at the **beginning** of the class. You are welcome to turn in early, but **no late submission is accepted**, unless turned in within 105 minutes, for which a 20% penalty will be applied. To allow for unavoidable circumstances, the lowest 1 or 2 homework will be dropped. **Please write your name and STAPLE your work before handing it in, or a penalty will be applied.**

• Python Projects: Python Projects are submitted on Github and the lowest one will be dropped.

• Quizzes: Quizzes are held every one or two weeks. Dates will be announced in advance. **No make-up quizzes will be accepted for any reason.** This includes legitimate reasons. To allow for unavoidable circumstances, the lowest quiz will be dropped.

• Midterm and final Exam: Exams are closed-book. No make-up exams are given. The final exam is comprehensive.

• Extra credit: There will be opportunities for extra credits, for example, correcting mistakes in notes and keys, contributing to our Github site, answering certain questions in class, correcting board work in class, etc. Each extra credit is worth 0.25% and will be added towards your final grade. Each person can earn up to 3% extra credits.

**Remark: Dropped homework/quiz is for unavoidable circumstances, NOT for your low performance or missed work after parties. If you have to miss too many homework/quizzes or your midterm with a valid reason (with supporting documents), the weight can be carried over to your final exam. Notice that weddings, graduations, cheap flights, lack of sleep, and a busy schedule are not valid excuses.*

Course Learning Outcomes

This course presents important topics from numerical analysis and numerical linear algebra. These topics are application driven and you will use Python to implement the algorithms. By the end of the course, you will learn polynomial interpolation, iterative methods for solving nonlinear equations, topics in optimization, direct and iterative algorithms for linear systems, its stability issue and other interesting topics like data fitting and spline.

Course Material and Tentative Schedule

Week	Topics
1	Introduction and prerequisites
2	Nonlinear equations, floating point arithmetic
3	Linear algebra review
4	Solving $Ax = b$: LU factorization, Cholesky factorization
5	Stability and condition number
6	Stability on least square
7	Polynomial interpolation
8	Optimization
9	Solving $Ax = b$: Iterative methods
10	Midterm
11	Solving $Ax = b$: Iterative methods
12	Compute eigenvalue and eigenvectors
13	Compute Integrals
14	Data fitting, spline, Fast Fourier Transform
15	Review

Classroom etiquette

- Arrive on time.
- Have your electronics silenced.
- I ask you to be respectful of me and your classmates and to refrain from surfing the web or using social media (facebook, twitter, etc) or messaging programs during class. It is absolutely forbidden to use instant messaging programs, email, etc. during class lectures or quizzes. All students are expected to behave in accordance with the Student Conduct Code and other University policies (see http://www.usfca.edu/fogcutter/).

Withdraws and Incomplete

Last day to withdraw with tuition reversal - 9/8/17.

Last day to withdraw from the course - 11/3/17.

If you plan to withdraw from the course, it is your responsibility to complete the necessary paperwork by this date. An incomplete grade will be given only if you have a serious emergency, such as a medical condition, that prevents you from completing the course. You must produce proper documentation and must be passing the course with most of it complete. An incomplete grade will not be granted to avoid failing the course.

Students with Disabilities

The University of San Francisco is committed to providing equal access to students with disabilities. If you are a student with a disability, or if you think you may have a disability, please contact Student Disability Services (SDS) at 415 422-2613, to speak with a disability

specialist (please note all communication with SDS is private and confidential). If you are eligible for accommodations, please request that your accommodation letter be sent to me as soon as possible (students are encouraged to contact SDS at the beginning of the semester), as accommodations are not retroactive. Once I have been notified by SDS of your accommodations we can discuss your accommodations and ensure your access to this class or clinical setting. For more information please visit https://www.usfca.edu/student-disability-services.

Academic Honesty

As a Jesuit institution committed to cura personalis - the care and education of the whole person - USF has an obligation to embody and foster the values of honesty and integrity. USF upholds the standards of honesty and integrity from all members of the academic community. All students are expected to know and adhere to the University's Honor Code. You can find the full text of the code online at www.usfca.edu/academic-integrity.

You are encouraged to discuss the homework problems and course material with other students and with me during office hours. However, the homework that you hand in should reflect your own understanding of the material. You are NOT allowed to simply copy solutions from other students or other sources. Complete academic honesty is expected during quizzes and exams. Cheating on an exam will result in an automatic failing grade (F) for the course.

Learning and Writing Center

The Learning and Writing Center provides assistance to all USF students in pursuit of academic success. Peer tutors provide regular review and practice of course materials in the subjects of Math, Science, Business, Economics, Nursing and Languages. https://tutortrac.usfca.edu. Students may also take advantage of writing support provided by Rhetoric and Language Department instructors and academic study skills support provided by Learning Center professional staff. For more information about these services contact the Learning and Writing Center at (415) 4226713, email: lwc@usfca.edu or stop by our office in Cowell 215. Information can also be found on our website at www.usfca.edu/lwc.

Counseling and Psychological Services

CAPS counseling services are confidential and free of charge. Call 415-422-6352 for an initial consultation appointment. Having a crisis at 3 AM? We are still here for you. Telephone consultation through CAPS After Hours is available between the hours of 5:00 PM to 8:30 AM; call the above number and press 2.

Confidentiality, Mandatory Reporting, and Sexual Assault

As an instructor, one of my responsibilities is to help create a safe learning environment on our campus. I also have a mandatory reporting responsibility related to my role as a faculty member. I am required to share information regarding sexual misconduct or information about a crime that may have occurred on USF's campus with the University.