Math 128A: Numerical Analysis (Spring 2019)

Enrollment

Direct enrollment questions to Jennifer Sixt enrollment@math.berkeley.edu. Be sure to inform your GSIs as soon as possible if you change discussion sections.

Description

Basic concepts and methods in numerical analysis: Solution of equations in one variable; Polynomial interpolation and approximation; Numerical differentiation and integration; Initial-value problems for ordinary differential equations; Direct methods for solving linear systems. Prerequisites: Math 53 and 54, basic programming skills.

Web page

http://math.berkeley.edu/~strain/128a.S19

Professor

John Strain
Office hours: Tuesday and Thursday 3:30-5:00, 891 Evans.

Lectures

TuTh 2:10 - 3:30 pm, 105 Stanley

Midterm

Thursday Mar 14, 2:10 pm - 3:30 pm, 105 Stanley
Solutions S19.msol (Mean 73, Median 78, Standard deviation 9.8)
Previous midterm exams and solutions:
S18.mid S18.msol S16.mid S16.msol F01.mid F01.msol

Final

Monday May 13, 11:30 am - 2:30 pm, location Stanley 105.
Previous final exams and solutions:
S18.final S18.fsol S16.final

Required text

Chapters 1-6 of
(BFB) Burden, Faires and Burden, *Numerical Analysis*, 10th edition, 2015.

Recommended texts

(GGK) Gander, Gander and Kwok, Scientific Computing - An Introduction using Maple and MATLAB
Quarteroni and Saleri, Scientific Computing with MATLAB and Octave

MATLAB Books

Otto and Denier, An Introduction to Programming and Numerical Methods in MATLAB
K. Sayood, Learning programming using MATLAB

MATLAB

- Available during discussion sections in B3A Evans only: bring your own to discussion sections in other rooms
- Student editions: The Mathworks
- Open-source alternative Octave
- Math 98 is recommended for people without programming skills.

Problem Sets, Reading and Quizzes

Due Date	Problem Set	Solutions(code files embedded)	Quiz
Wed 1/30	**PS01**	**PSOL01**	**Q1**
Wed 2/06	**PS02**	**PSOL02**	

Wed 2/13	PS03	PSOL03	Q2
Wed 2/20	PS04	PSOL04	
Wed 2/27	PS05	PSOL05	Q3
Wed 3/06	PS06	PSOL06	Q4
Wed 3/20	PS07	PSOL07	Q5
Wed 4/03	PS08	PSOL08	
Wed 4/10	PS09	PSOL09	Q6
Wed 4/17	PS10	PSOL10	
Wed 4/24	PS11	PSOL11	Q7
Wed 5/01	PS12	PSOL12	Q8

Syllabus

Week	Lecture	Date	Reading: BFB Section and Topic	Reading: Supplementary Material
1	1	Tue 1/22	1.1: Review of Calculus	
	2	Thu 1/24	1.2: Round-off Errors and Computer Arithmetic	GGK 2.1-4 macheps
2	3	Tue 1/29	1.3: Algorithms and Convergence	GGK 2.5.2 GGK 5.2.3
	4	Thu 1/31	2.1: The Bisection Method	GGK 5.2.1 GMB
3	5	Tue 2/05	2.2: Fixed-point Iteration 2.3: Newton's Method and Its Extensions	GGK 5.2.2
	6	Thu 2/07	2.4: Error Analysis for Iterative Methods	GGK 5.2.6
4	7	Tue 2/12	3.1: Interpolations and the Lagrange Polynomial	GGK 4.2
	8	Thu 2/14	3.3: Divided Differences	GGK 4.2.4
5	9	Tue 2/19	3.4: Hermite Interpolation	Hermite Interpolation
	10	Thu 2/21	4.1: Numerical Differentiation	GGK 8.2 FDF
6	11	Tue 2/26	4.3: Elements of Numerical Integration	GGK 9.2
	12	Thu 2/28	4.4: Composite Numerical Integration	GGK 9.2.3 Euler-Maclaurin and ECTR
7	13	Tue 3/05	4.7: Gaussian Quadrature	GGK 9.3 Gaussian Integration
	14	Thu	4.7: Gaussian Quadrature (cont.)	GGK 9.3

		3/07		
8	**15**	Tue 3/12	4.6: Adaptive Quadrature	GGK 9.4
		Thu 3/14	Midterm Exam (Chaps. 1-4)	
9	**16**	Tue 3/19	5.1: The Elementary Theory of Initial-Value Problems 5.9: Higher-Order Equations and Systems	GGK 10.2.1 GGK 10.2.6
	17	Thu 3/21	5.2: Euler's Method 5.10: Stability	GGK 10.2.5 GGK 10.4
		3/26-3/30	Spring Break	
10	**18**	Tue 4/02	5.4: Runge-Kutta Methods	GGK 10.3
	19	Thu 4/04	Deferred Correction	IDEC
11	**20**	Tue 4/09	5.6: Multistep Methods	GGK 10.4
	21	Thu 4/11	5.7: Variable Step-Size Multistep Methods	
12	**22**	Tue 4/16	5.10: Stability	GGK 10.4.3
	23	Thu 4/18	5.11: Stiff Differential Equations	GGK 10.5
13	**24**	Tue 4/23	6.1: Linear Systems of Equations 6.2: Pivoting Strategies	GGK 3.2
	25	Thu 4/25	6.3: Linear Algebra and Matrix Inversion 6.5: Matrix Factorization	GGK 3.2
14	**26**	Tue 4/30	6.6: Special Types of Matrices	GGK 3.4
	27	Thu 5/02	7.5: Iterative Improvement	GGK 11.2
		5/06-5/10	Reading/Review/Recitation Week - No lectures or discussion sections	
		Mon 5/13	Final Exam 11:30 am - 2:30 pm	

GSIs and Discussion Sections

Sec	Time	Room	GSI	E-mail	Office	Office hours	RRR week	Final week
101	Wed 8:10 -	B3A Evans	Jeffmin Lin	jeffminlin@berkeley.edu	941 Evans	Wed 2:30-4:30	TBA	TBA

	9:00 am							
102	Wed 9:10 - 10:00 am	B3A Evans	"	"	"	"	"	"
103	Wed 10:10 - 11:00 am	206 Dwinelle*	Noble Macfarlane	noble@math.berkeley.edu	1049 Evans	Mon 12:00-2:00 pm	"	"
104	Wed 11:10 - 12:00 pm	209 Dwinelle*	"	"	"	"	"	"
105	Wed 12:10 - 1:00 pm	259 Dwinelle*	"	"	"	"	"	"
106	Wed 1:10 - 2:00 pm	B3A Evans	Jeffmin Lin	jeffminlin@berkeley.edu	941 Evans	Wed 2:30-4:30	"	"
107	Wed 2:10 - 3:00 pm	B3A Evans	Jiahao Yao	jiahao@math.berkeley.edu	844 Evans	TuTh 1:10-2:00 pm	"	"
108	Wed 3:10 - 4:00 pm	B3A Evans	"	"	"	"	"	"
109	Wed 4:10 - 5:00 pm	B3A Evans	"	"	"	"	"	"
110	Wed 5:10 - 6:00 pm	B3A Evans	Angxiu Ni	niangxiu@berkeley.edu	824 Evans	Wed 9:00-11:00 am	"	"
111	Wed 3:10 - 4:00 pm	47 Evans*	"	"	"	"	"	"
112	Wed 4:10 - 5:00 pm	39 Evans*	"	"	"	"	"	"
* Bring your own computer with MATLAB to sections in starred rooms								

Grading and policies

Problem Sets Problem sets are due at 11:59pm on Wednesdays on Gradescope. (Be sure to associate your work with the appropriate problems or no credit will be given.) No late submissions, lowest score dropped. Group discussions are encouraged, but each student must submit their own version.

Quizzes Given in your own discussion section. No makeups, lowest score dropped.

Exams All exams and quizzes are closed-book closed-notes: Written, typed and printed materials and electronics are not permitted. No makeup exams will be given.

Grades The course grade will be computed from the formula 0.25 * problem sets + 0.15 * quizzes + 0.25 * max(midterm , final) + 0.35 * final. Thus the final exam score will override a lower or missing midterm score.

Incompletes "A grade of Incomplete may be assigned when a student has completed and passed a majority of the work required for a course but, for reasons beyond the student's control, cannot complete the entire course."

Special arrangements DSP students should see their GSIs to arrange accommodations for homeworks/quizzes.