**MTH335: Numerical Analysis**

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**Meeting Time and places:** MW 12:50 - 2:15
**Office Hours:** W: 2:15-3:30
**Required Text:** Numerical Analysis, Kincaid and Cheney, Third Edition, AMS

**About:** MTH335 covers the basics of numerical analysis. The attached syllabus is tentative. It is likely a few sections will be trimmed during the semester.

**The book:** The book is available at the book store or online. It is a bit advanced in parts, but was significantly cheaper than some alternatives. It should be available for under $80, where alternatives were well over $200.
There are some online notes for this class which can be found at https://github.com/csimth335/MTH335.

**Grading policy:** Your grade will be determined by your performance on the two in-class exams, the final exam, and a homework grade. The three exams are each worth 30% of the grade, the homework grade 10%. Homework will be collected and spot-checked, but not fully graded. There may be quizzes during the semester. Points earned here will count towards your test grades.

**Exam Policy:** I expect full attendance at all the exams. There will be no make-up exams as a general rule. Be warned, there will be *no* use of cell phones during exams.

**Exam Dates:** Our tentative dates for the mid-term exams are The mid-term exams will be 10/15 and 11/19. The second exam will be after the drop date.

**Academic Honesty:** The CUNY academic integrity policies are available from the website http://www.math.csi.cuny.edu/verzani/classes/CUNYapr.pdf. Cheating on exams will not be tolerated. Although I encourage you to work together – if desired – on any assignment for the in-class portion of your grade, this does not mean you can copy another person's work.

(Tentative) Syllabus for MTH 335

| | Topic | pgs | Homework |
|---|---|---|---|
| | **Ch. 1: Mathematical Preliminaries** | | |
| 1 | Taylor's Theorem, Convergence | 2-28 | 1.2: 1,2,4,7,10,30; cp: 1, 2 |
| | **Ch. 2: Computer Arithmetic** | | |
| 2 | Floating point | 37-54 | 2.1: 3, 10, 16,24,26; |
| | Julia in a nutshell | | 2.2: 2,3,5,7,25, cp: 3,4,8 |
| 3 | Errors, Conditioning | 55-72 | 2.3: 3,4,5 cp: 6 |
| | **Ch. 3: Solution of Nonlinear Equations** | | |
| 4 | Root finding, Bisection | 74-80 | 3.1: 2,8,9,22; cp: 1, 4 |
| 5 | Newton's method, Secant method | 81-99 | 3.2: 2,5,8,15; cp 1,2,5,9; |
| | | | 3.3: 1,2,3,7 |
| 6 | Fixed points and Functional Iteration | 100-108 | 3.4: 2,3,5,7,10,12, 39 |
| | **Ch. 4: Solving Systems of Linear Equations** | | |
| 7 | Matrix algebra | 139-149 | 4.1: 3, 6,11 |
| 8 | LU and Cholesky factorization | 149-162 | 4.2: 1 bc, 5,7,12,30,31,33,46 |
| 9 | Pivoting and Algorithms | 163-185 | 4.3: 1,3,18,50 |
| 10 | Norms and analysis of errors | 186-197 | 4.4: 1, 5, 13, 40, 48 |
| 11 | Solution of equations by iterative methods | 207-231 | 4.6: 1, 8, 18, 29; cp: 1 |
| | **Ch. 5: Topics in Numeric Linear Algebra** | | |
| 12 | Matrix Eigenvalue Problem: Power method | 254-263 | 5.1: 1, 6, 7, 13; cp: 1, 3 |
| 13 | Orthogonal Factorizations and Least-Squares Problems | 273-287 | 5.3: 5, 8, 29, 37 |
| 13a | QR Algorithm of Francis | 298-305 | 5.5: 2,3,4 |
| | **Ch. 6: Approximating Functions** | | |
| 14 | Polynomial interpolation | 308-335 | 6.1: 1a,b,c; 2, 8, 12, 15, 22, |
| | | | 34($n = 3$ only); 6.2: 2, 3 |
| 15 | Splines | 349-377 | 6.4: 3,4,7, 13, 21 |
| 16 | Best Approximation: Least-Squares Theory | 392-404 | 6.8: 1, 2, 8, 14 |
| | **Ch. 7: Numerical Differentiation and Integration** | | |
| 17 | Numerical Differentiation | 465-477 | 7.1: 2, 5, 6; c.p. 2, 5 |
| 18 | Numerical Integration, Interpolation | 478-491 | 7.2: 1, 2, 4, 5, 6, 15; c.p.: 1, 3 |
| 19 | Numerical Integration, Gaussian Quadrature | 492-501 | 7.3: 3, 10a, 22 |
| | **Ch. 8: Numerical Solutions of ODEs** | | |
| 20 | Existence and Uniqueness | 524-529 | 8.1: 1, 2, 6,7; cp. 1 |
| 21 | Taylor-Series method | 530-538 | 8.2: 1, 2, 4; cp: 1, 37 |
| 22 | Runge-Kutta Methods | 539-548 | 8.3: 1, 2, 5; cp: 1 |
| 23 | Multistep Methods | 549-557 | 8.4: 1,4,7; cp 1 |
| 24 | Local and Global Errors: Stability | 557-564 | 1, 5 |