MATH 3350.002: Introduction to Numerical Analysis

PLACE: Lang 223, TIME: TR 12:30 - 13:50 am
PROFESSOR: Santiago I. Betelú
OFFICE: GAB 316, e-mail: betelu@unt.edu
TEXT: Timothy Sauer "Numerical Analysis" second edition
OFFICE HOURS: TR 08:00-9:25 and 14:00-15:35

GRADES: Grades will be based on three midterm exams (20 points each), homeworks (20 points) and a final exam (40 points). The lowest of the midterm grades is dropped, so the maximum score is 100. To earn an A you need 90 points, 80 for a B, 70 for a C and 60 for a D.

HOMEWORK: Will be assigned each class, to be completed the same day of the following week. Check your solutions with the solutions at the end of the textbook, if you don't get them come to my office for help. The grader evaluates the intermediate steps so you must be clear to get the full grade. Remember to write your name, problem numbers, due date and staple each HW. Some HW problems are computer assignments, I will ask you to show them to me running in your computer or smartphone during office hours.

EXAMS: Midterm exams will be given on Sep 20, Oct 25 and Nov 22 on regularly scheduled class time. The final exam is scheduled on Thursday Dec 13 at 10:30-12:30 AM on the same classroom (these dates may change, so ask me one week before).

PROGRAMMING: We will do elementary programming in Matlab, which is available at the University computer labs and for download at: https://it.unt.edu/matlab-simulink, click "Mathworks portal" and authenticate with EUID and password. You will find very convenient the online version at https://matlab.mathworks.com. Alternatively you can use Octave, a free clone of Matlab. Previous programming experience is not necessary, I will teach the basics during the first few classes, we shall use only a small subset of MATLAB functions.

DISSABILITIES: It is responsibility of students with certified disabilities to provide the instructor with appropriate documentation from the Dean of Students Office.

CHEATING: or homework plagiarism will not be tolerated.

SCHEDULE

Week	Sections	Summary
Aug 27	0.2 - 0.5	Binary numbers, floating point representation and loss of significance. Introduction to MATLAB. Taylor theorem. Applications: numerical differentiation.
Sep 4	1.1 - 1.3	Solving equations, Bisection method, fixed point iteration, solving linear recursions, limits of accuracy
Sep 11	1.4 - 1.5, 2.1	Newton's method, error analysis, secant method, Brent's method, Gaussian elimination, tridiagonal systems
Sep 18	2.3, 2.5, 2.7	Iterative methods for systems of equations, nonlinear systems of equations, MT1
Sep 25	3.1 - 3.3	Lagrange interpolation, interpolation errors, Chebyshev interpolation
Oct 2	4.1, 4.2, 5.1, 5.2	Least squares and models. Numerical differentiation, numerical integration
Oct 9	5.3, 5.4, 5.5	Romberg integration, adaptive quadrature, Gaussian quadrature
Oct 16	6.1, 6.2, 6.3	Initial value problems, error analysis, systems of ODES
Oct 23	6.4, 6.5 6.6, 6.7	Runge Kutta, variable step size, implicit methods, stiff equations, multistep methods, stability, convergence and consistency, MT2
Oct 30	7.1, 7.2	Boundary value problems. Shooting method, finite differences, applications
Nov 6	8.1	PDES: parabolic methods, Von Neumann stability
Nov 13	8.1, 8.2	Hyperbolic equations, waves, CFL condition, stability, error analysis
Nov 20	8.2, 8.3	Elliptic equations, Laplace equation, Poisson equation. Applications. MT3
Nov 27	8.3, 8.4	Nonlinear PDEs, reaction-diffusion problems, biological problems, fluid flow.
Dec 4	9.1, 9.2	Random numbers, Pseudo random numbers generation, and Monte Carlo Simulation. Comprehensive review
Dec 13	Final Exam Thursday 10:30-12:30am	