CS 3513: Numerical Methods for Digital Computers
Spring 2023 Syllabus

Instructor Information

Name: Vishalini Laguduva Ramnath  
Office: MSCS 207  
Email: vlagudu@okstate.edu  
Office Hours: T TR 1:00 - 2:30 pm, or by appointment.

Class Information

Dates: 18th Jan - 17th May  
Time: MWF 1:30 - 2:20 pm  
Classroom: NRD 316

TA Information

Name: TBD  
email: TBD  
Office Hours: TBD  
Office: TBD

Course Description

Errors, floating point numbers and operations, interpolation and approximation, solution of non-linear equations and linear systems, condition and stability, acceleration methods, numerical differentiation and integration. Prerequisites: MATH 2153, MATH 3013 (concurrent enrollment is OK, substituting MATH 3263 or MATH 2233 is OK), and a knowledge of programming.

Course Objectives

This course teaches numerical methods for the approximate solution of continuous mathematical problems in linear algebra and calculus. This class also introduces students to key ideas behind numerical computation, with emphasis on the implementation of common numerical methods. The material is intended to be useful in the solution of problems in engineering, statistics, and the sciences.

Required Textbook


Reference Textbooks

It is expected that students in this class have basic prior programming experience.

Course Outline and Tentative Schedule

Week 1    Review, Course introduction, Python setup development environment, Nature of Errors,
Week 2    Floating point number systems, introduction to NumPy
Week 3    Taylor Series; Root finding: Bracketing and Open methods
Week 4    Root finding continuation, Complexity, Python profiling
Week 5    Linear systems: Linear algebra, Gauss elimination, LU factorization
Week 6    Matrix inverse, conditions, and iterative methods
Week 7    Eigen values and vectors, more on Numpy and Scipy, Midterm 1
Week 8    Continuation on Eigen Values, Python OOP, recursion
Week 9    Spring Break
Week 10   Curve fitting: Straight line Linear Regression, nonlinear regression, Fourier Analysis
Week 11   Polynomial Interpolation, Splines and piecewise interpolation, Midterm 2
Week 12   Continuation on interpolation, Introduction to Visualization and plotting
Week 13   Numerical Integration
Week 14   Numerical Differentiation
Week 15   Ordinary Differential Equations, Any pending topics
Week 16   Exam review, Pre-Finals Week
Week 17   Finals Week

Class Attendance and Participation

You are strongly encouraged to attend all the lectures. Please let the instructor know if you will be missing multiple classes for legitimate, unavoidable reasons. Students are responsible for any material covered in class. Some of the material covered in class will not be in the textbook. Announcements about tests etc. will be made in class and/or as an announcement. Students are to check their Canvas regularly (using their class accounts).

Assignments and Quizzes

• We will have seven to eight assignments/homework's based on time left at the end of semester. All assignments must be solved by hand if mentioned in the assignment and the corresponding programs should be turned in.

• If you need or desire an extension on any Assignment for any reason, contact your instructor in a timely fashion, as permitted by the need. No late work is accepted!!

• There will often be two quizzes or in-class assignments per week. It will most often be given on Wednesdays and Fridays. No make-up quizzes will be given. Quizzes will be Open book and Open notes. It will be online on Canvas.
• Academic integrity is taken very seriously. You are permitted to discuss the course material with fellow students in general terms, but the programs you write must be your own. Code copied from each other or found on the web will result in an automatic zero for the assignment, and may even result in earning an “F!” for the course and facing academic disciplinary measures.

Exams

• There will be two midterm and a final exam. Midterm exam 1 is scheduled for the week of February 20th and midterm exam 2 for the week of March 27th.

• The final exam is comprehensive and will be given during a two-hour block. The exact time will be announced later in the semester. The final exam will only be given at the announced time. There will be no exceptions. If a student has a conflict with another final exam, the student must contact their instructor at least two weeks in advance in order to have it resolved.

• There will be no make-up exams, even in the case of an emergency. A missed exam counts as a zero unless a valid excuse from a physician or the Dean's Office is presented to your instructor. With an acceptable written excuse, a missed exam score will be replaced with the percentage earned on the corresponding subsection of the final exam.

Grading

The course grade is determined by the following components:

- Midterm Exam 1 15%
- Midterm Exam 2 15%
- Assignment/Homework 30%
- Quizzes/in-class assignment 15%
- Final Exam 20%

Final grades will be assigned according to the following scale,

- Grade A 90-100%
- Grade B 80-89%
- Grade C 70-79%
- Grade D 60-69%
- Grade F 0-59%

DEPARTMENT POLICIES

Drop and Add Policy: Students will be allowed to drop as long as the University permits them to do so. A grade of W or F will be determined on the basis of the points earned until that time.

Academic Dishonesty/misconduct: A short example: Any student who cheats on an exam or assignment will receive an “F” in the course. Furthermore, I will recommend that the university carry out the strongest disciplinary action possible under the circumstances.

Cheating can include, but not limited to: (i) giving unauthorized assistance to others, (ii) receiving unauthorized assistance from others, (iii) looking at another student's solution in an exam.
or assignment, (iv) looking at or consulting material not allowed in the exam or assignment parameters, and (v) using another person or website (such as Chegg.com) for solutions to assignments, programming projects or exams.

The Computer Science departmental policy for academic dishonesty and misconduct applies to this class. A student attempting to gain unfair advantage by keeping an examination paper longer than the time permitted is guilty of academic misconduct.

**Computer Usage:** The Computer Science departmental policy for computer usage applies to this class. Exceptions will be made for students whose companies permit use of company machines for academic work. Students taking advantage of the exception must have two-way email access.

**Americans with disabilities act:** The University policy for students with disabilities applies to this class. Anyone who has a need for examinations by special arrangements should see the instructor as the earliest possible opportunity during scheduled office hours.

**Examinations/Tests:** No discussion of any kind (except with the instructor) is allowed. No access to any type of written material is allowed. Students who do not comply with the described collaboration policy will receive a grade of F in the course and be reported as academic dishonesty.

**Important Dates**

- Midterm 1: Week of 20\textsuperscript{th} February 2023
- Midterm 2: Week of 27\textsuperscript{th} March 2023
- Last day to drop a course with no grade: 24\textsuperscript{th} Jan 2023
- Academic Withdrawal Deadline: 14\textsuperscript{th} April 2023
- Final Exam: 12\textsuperscript{th} May, Timings - 02:00 - 03:50 pm.