0701M450

Numerical Analysis I

Instructor: TBA
Time: October 17- November 18, 2022
Office Hours: 2 hours (according to the teaching schedule)
Contact Hours: 60 (50 minutes each)
Credits: 4
E-mail:TBA

Course Description

This course will focus on numerical differentiation and integration, approximation, statistical analysis, finite difference methods and numerical solution to ordinary and partial differential equations, methods of numerical linear algebra, and modeling of stochastic processes. (Monte Carlo and other methods involving computer-generated pseudo-random numbers).

Prerequisites

Calculus I and Calculus II or consent of instructor.

Required Textbook(s)

Numerical Analysis 10e, CENGAGE Learning by Richard L. Burden, J. Douglas Faires, and Annette M. Burden

Course Schedule

Please note that the schedule is meant to give an overview of the major concepts in this course. Changes may occur in this calendar as needed to aid in the student's development.

Week One
- Course Introduction
- Round-off error and computer arithmetic
- Data types
- Algorithms
- Programming languages
- OS and computer environment

Week Two
- Solutions of equations in one variable
- The Bisection Method
- Fixed-Point Iteration
- Newton's method
- Numerical analysis of one-dimensional data sets
- Numerical differentiation and integration
- Statistical analysis
- Linear regression

Week Three
- Numerical solutions of systems of linear equations
- Tri-diagonal matrices. Application: Interpolation of numerical data by cubic splines
- Gaussian exclusion
- Steepest descent
- Conjugate-gradients method
- Eigenvalues and Eigenvectors; Jacobi rotations
- Midterm Exam

Week Four
- One-dimensional problems
- Time evolution in nonlinear ODEs
- PDEs and multi-dimensional problems

Week Five
- (Pseudo)-random numbers
- Stochastic algorithms
- Stochastic aggregation of particles
- Recursion and iteration – what are the difference?

- Revisit some of the algorithms studied previously
- Some cool examples of recursions
- <u>Final Exam</u>

Course Requirements

Reading
Reading the book, lecture notes and distributed articles, as well as watching the videos provided to you is an essential and required aspect of the course.

Homework
No late homework will be accepted. You are encouraged to make sure of the following resources: your classmates, course assistants and the textbook. When you work in a team, you should write down all people's name in your term.

Exams
There will be one midterm and one final exam. If you must miss a midterm exam because of an approved conflict, please contact me as soon as possible, and no later than one week before the exam. Only simple, scientific calculators are allowed to use in the exam. No cell phone and laptop should be used in exams.

Grading Policy

Homework: 30%
Quizzes: 10%
Midterm exam: 30%
Final exam: 30%

Grading Scale

The instructor will use the grading system as applied by JNU:

Definition	Letter Grade	Score
Excellent	A	90~100
Good	B	80~89
Satisfactory	C	70~79
Poor	D	60~69
Failed	E	Below 60

Academic Integrity

As members of the Jinan University academic community, students are expected to be honest in all of their academic coursework and activities. Academic dishonesty,

includes (but is not limited to) cheating on assignments or examinations; plagiarizing, i.e., misrepresenting as one's own work any work done by another; submitting the same paper, or a substantially similar paper, to meet the requirements of more than one course without the approval and consent of the instructors concerned; or sabotaging other students` work within these general definitions. Instructors, however, determine what constitutes academic misconduct in the courses they teach. Students found guilty of academic misconduct in any portion of the academic work face penalties that range from the lowering of their course grade to awarding a grade of E for the entire course.