وەزارەتی خوێندنی باڵا و توێژینەوەی زانستی

Department of Physics

College of Science

Salahaddin University-Erbil

Subject: Numerical Analysis with MatLab

Course Book : Third year/communication

Lecturer's name: Assis. Lecturer Hersh M. Saber

Academic Year: 2024-2023

Course Book

1. Course name	Numerical Analysis I with MatLab
2. Lecturer in charge	Hersh Mohammed Saber
3. Department/ College	College of Science – Physics
4. Contact	e-mail: hersh.saber@su.edu.krd Tel: +9647504288013
5. Time (in hours) per week	Theory: 2 practice: 2
6. Office hours	10:30-12:30
7. Course code	
8. Teacher's academic profile	"My name is **Hersh Mohammed Saber**, I born in Erbil, Iraq in 1987. I graduated from mathematical Department / College of Science in Salahaddin University-Erbil in 2010-2011, in Erbil, Iraq. I got Master of Science in mathematical statistics in 2019. I am working as a lecturer in Mathematic department / college of Science / Salahaddin University-Erbil.
9. Keywords	Error, Approximation root, Bisection method , Secant, Newton-Raphson, linear equation, nonlinear equation.

10. Course overview:

This introductory course in numerical analysis covers a wide range of methods and applications in physics. The field of Numerical analysis Physics has the support of Mathematics and of Theoretical Physics, providing the necessary algorithms for the computing codes used by the Computational Physics. Surely, the results of numerical computations have many applications, both in the field of Theoretical Physics and in different domains of Applied (Technical) Physics. Taking into account that the validity domain of the different Physics theoretical models corresponds to some numerical values of the similitude criteria, one finds that the Numerical analysis Physics is also very important for the classification of these domains and, for the Physics teaching, consequently.

On the other hand this course covers the solution of nonlinear equations in one variable as well as large system of simultaneous linear and nonlinear equations.

11. Course objective:

The overall goal of the field of numerical analysis is the design and analysis of techniques to give approximate but accurate solutions to hard problems. Also to introduce students to the topic of Numerical Analysis and some of the major issues involved, including accuracy and convergence, through the study of some simple numerical algorithms.. Finally to learn how to apply numerical methods to a variety of physical problems.

12. Student's obligation

a. Students must come on time and remain in the classroom for the duration of scheduled classes.

b. Students own an obligation to write tests and final examinations at the times scheduled by the teacher or the College.

13. Forms of teaching

I give hard copy of My lecture notes to students before coming lecturer time. first I remember students about previous lecture, and then I start new lecture. At the end of the lecture give a homework for the next lecture. During this proses I am use presentation and whiteboard.

14. Assessment scheme

1. *Practical:* 35% Lecture assignments, quizzes, exercise and attendant.

2. *Theoretical:* 15% (Midterm exams and other activities).

3. *Final Exam: : Theoretical:* 50% .

15. Student learning outcome:

a. Students will be learn to concept of Numerical analysis and type of errors.

b. Students will be learn to find out approximate root of linear and non-linear of equations and systems by different methods.

16. Course Reading List and References:

[1] Saeed, R. k., Jwamer, K. H., Hamasalh F. K. (2015) "Introduction to Numerical Analysis, First Edition", Sulaimani, Kurdistan Region – Iraq.

[2] **Burden, R. L. and Faires, J. D. (2011)** "Numerical Analysis, Ninth Edition", Prindle, Weber and Schmidt.

[3] **Kincaid, D. and Cheney, W. (2002)** "Numerical Analysis: mathematics of Scientific computing, third edition", Brooks/Cole Publishing Company.

[4] **Phillips, G. M. and Taylor, P. J. (1973)** "Theory and applications of Numerical Analysis", New York: Academic Press.

[5] **Ralston, A. and Rabinowitz, P. (1978)** "A First course in Numerical Analysis", New York: McGraw-Hill.

17. The Topics:	Lecturer's name
Chapter One: Introduction Numerical Analysis: The concepts of Floating-point numbers and round off errors. Errors: Sources of error in numerical computation. Absolute and relative errors.	3 week (6 hours)
Chapter Two: Solution of Nonlinear equations Review of the following methods {Graphical Method, Bisection Method, False-position, Secant methods, Newton-Raphson, Fixed points iteration. Horner Algorithm, Order of convergence.	5 weeks (15 hours)
Chapter Three: Solving systems of linear Equations Solution of equations by iterative methods: (i) Jacobi method (ii) Gauss-Siedel method.	3 weeks (9 hours)

Chapter Four: Solving systems of nonlinear Equations Introduction. Newton method. Modified Newton method**.**	3 weeks (6 hours)
18. Examinations: Questions in the examination will be arranged the matching mode by way of the examples and exercises that I give delivered in the lecture notes. Sometimes will be have extra mark in examination for worthy students. Many of the questions will be taken from this book: Thomas, **Burden, R. L. and Faires, J. D. (2011)** "Numerical Analysis, Ninth Edition", Prindle, Weber and Schmidt.	
19. Extra notes: Answers of examination will be find in the board's declaration physics department after every examination and online in the student group.	
20. Peer review	