Department of …… Computer Science….

College of ……… Science……….

University of ……Salahaddin…….

Subject: … Linear Algebra & Statistics

Course Book – (Year 2)(course 1)

Lecturer's name: (Dalya Abdullah Anwar)

Academic Year: 2022-2023

Course Book

1. Course name	Linear algebra & statistics
2. Lecturer in charge	Dalya Abdullah Anwar
3. Department/ College	Computer science/science
4. Contact	e-mail:Dalya.Anwar@su.edu.krd
5. Time (in hours) per week	Theory: 2 Practical: 2
6. Office hours	Tuesday 12-1 pm
7. Course code	
8. Teacher's academic profile	- Acquired a BSc from College Computer Science and Mathematics- Department of Mathematic in Mosul University in 2004 - Graduated with a MSc in Applied Mathematics From the University of Mosul in 2006. - I have been working in the Department of Computer Science as an assistant lecturer since 2007.
9. Keywords	Matrix, linear algebra, gauss Jordan, vector space, statistic, mean, probability

10. Course overview:

The main goal of the module is to give students a clear understanding and deep knowledge how the typical of "real life" mathematical, physical, or engineering problems are to be solved in the modern setting. As opposed to tendency in lower-level mathematical courses to teach recipes for "exact" solving particular problems fitting into very special form, this module provides the idea of approximate solving wide variety of applied standard problems on a computer by numerical methods.

A branch of mathematics is Linear Algebra that has numerous applications to engineering, Computer Science, and the physical Sciences. Linear algebra makes it possible to work with large arrays of data. It has many applications in many diverse fields, such as Computer Graphics and Cryptography.

Statistics is the art of using data to make numerical conjectures about problems. Descriptive statistics is the art of summarizing data. Topics include: histograms, the average, the standard deviation.

11. Course objective:

The course will cover some topics in linear algebra, vector with its properties, solving linear system in addition with finding Eigen values and Eigen vectors. The numerical methods take a vast part of the course; there will be methods for solving nonlinear functions and calculating derivatives and integrals as long as some iterative methods for solving linear system. The course will also develop an understanding of the elements of error analysis for numerical

methods and certain proofs.

Finally, the students will be introduced to basics of statistics in a way that makesthem being aware of the techniques of statistics as they apply to the solutions of practical problems in various fields. The course is presenting a particular attention to statistical vocabulary, interpreting statistical formulas and graphs; and representing statistics symbolically and visually as well.

At the end of the course, students should be able to:

- **know and demonstrate understanding of the concepts from the five branches of mathematics (number, algebra, geometry and trigonometry, statistics and probability, and discrete mathematics)**
- **derive appropriate numerical methods to solve algebraic equations**

12. Student's obligation
- **Students must attend weekly theoretical and practical lectures.**
- **A report will be expected for the Practical part and solve Homework in theoretic and Practical.**
- **Students must also attend two exams during the course: one theoretical and the other practical.**

13. Forms of teaching
- Weekly handouts will be uploaded online for both theoretical and practical lectures.
- A projector will be used in the class, as well as a whiteboard, to convey the necessary Information to students.

14. Assessment scheme

10 %	Theory examination
25 %	Practical examination
15%	Reports, Assignments, Quizzes, Home works
50 %	
50 %	Final

15. Student learning outcome:

 At the end of the Course Students will be able to

1. solving system of linear equations.
2. basic definitions used in Statistics and Linear Algebra .
3. code a numerical method in a modern computer language.

16. Course Reading List and References:
1. **Introduction to statistics, 3rd edition, Ronalde Walpole.**
2. **D.H.Young and S.D.Al.Saadi , Statistical Theory and Methods.**
3. **Introductory Linear Algebra (8th Edi on) by Howard Anton and Chris Rorres.**

17. The Topics:	Lecturer's name/DalyaA.Anwer/(2hrs) for all Topics
Week 1:Course overview The module's structure will be explained in this lecture. The importance of the module, its objectives and outcomes will be covered. Week 2-4: (Solution of linear systems) Introduction to matrix, Linear Systems: Cramer's Rule, Gaussian Elimination and Gaussian Jordan Elimination. Week 5-6 :(Iterative methods) Jacobi, Gauss-Seide Week 7-8 :(Vectors) Vectors and geometry in two and three space dimensions, Algebraic properties, Dot products and orthogonality Week 9-10: (Eigen Values and Eigenvectors) Definition & Examples. Week 11:(Statistics and Probability) Introduction, Descriptive Statistics graphical presentation of data. Measures of central tendency and variation for ungrouped data. Week 12:(Probability) Basic Rules and definitions in probability theory. Week 13: Random Variables Definition of random variable and presenting its types (discrete and continues) with examples Week 14: Moments (Mean, Variance, and Standard Deviation)for discrete and continues random variables. Week15: (Modeling and probability calculations using the following discrete random variables) Binomial, Geometric, Poisson.	

<u>Week16</u>:(Modeling and probability calculations using the following continuous random variables) Uniform, Normal (Z-score), Exponential.	
18. Practical Topics	
<u>**Week 1**</u>: **Introduction to matrix in matlab, examples ,m-file in matlab, examples.** <u>**Week 2-4**</u>: **programming,for,if,while with examples,** <u>**Week 5-6**</u>: **Cramer's Rule, Gaussian Elimination program.** <u>**Week 7:**</u> Jacobi, Gauss-Seide program. <u>**Week 8:**</u> **Vectors and eigen value.** <u>**Week9-10**</u>:**Statistic in matlab(Mean, Variance, and Standard Deviation of a discrete random variable(of ungrouped data).type of graph.** <u>**Week 11-12**</u> **GUI in matlab ,Applications.** <u>**Week 13**</u>:**Statistic function in matlab .** <u>**Week 14-16**</u>: **Write program to Euler's method, Runge-Kutta method, multi-step methods**	**Lecturer's name** **Dalya. A. Anwar** **(2 hrs)**

19. Examinations:
   Solve the following system by Cramer's rule method:

   $3x + 2y - z = 1$

   $x - y + 5z = -2$

   $2x + y = 3$

20. Extra notes:

21. Peer review