Department of General-Physics

College of *Science*

University of *Salahaddin-Erbil*

Subject: Linear Algebra II

Course Book *(Second Year/Second Semester)*

Lecturer's name: Awreng B. Mahmood

Academic Year 2022-2023

Course Book

1. Course name	Linear algebra II
2. Lecturer in charge	Awreng B. Mahmood
3. Department/ College	General Physics / Science
4. Contact	E-mail(1): awring2002@yahoo.com E-mail(2): awreng.mahmood@su.edu.krd Tel: (optional): 0750 4237656
5. Time (in hours) per week	Theory: 2 Tutorial: 1
6. Office hours	Tuesday,Wednesday and Thursday at 08:30am---10:30am, 12:30pm---1:30pm
7. Course code	
8. Teacher's academic profile	My name is Awreng B. Mahmood. I graduated from mathematics Department in Mosul University, Iraq. I have got Master of Science in commutative Algebra, Since 2006 in college of science /salahaddin University. Recently I got PHD of science in Number theory/2018 from University of Mosul/ College of Computer sciences and Mathematics/Mathematics Department. Iam working as a lecturer in mathematics department / college of science / Salahaddin University-Erbil up to date.
9. Keywords	Matrix, Vector Space, Linear Independent Set, Linear Transformation. Matrices of Linear Transformation and Representing Linear Transformations by Matrices.

10. Course overview:

Linear Algebra is one of the most important basic areas in Mathematics, having at least as great an impact as Calculus, and indeed it provides a significant part of the machinery required to generalize Calculus to vector-valued functions of many variables. Unlike many algebraic systems studied in Mathematics or applied within or outwith it, many of the problems studied in Linear Algebra are amenable to systematic and even algorithmic solutions, and this makes them implementable on computers { this explains why so much calculation use of computers involves this kind of algebra and why it is so widely used. Many geometric topics are studied making use of concepts from Linear Algebra, and the idea of a linear transformation is an algebraic version of geometric transformation. Finally, much of modern abstract algebra builds on Linear Algebra and often provides concrete examples of general ideas.

11. Course objective

Linear algebra is the branch of mathematics concerning vector spaces and linear mappings between such spaces. It includes the study of lines, planes, and subspaces, but is also concerned with properties common to all vector spaces.

Linear algebra is central to both pure and applied mathematics. For instance, Techniques from linear algebra are used in analytic geometry, engineering, physics, natural sciences, computer science, computer animation, advanced facial recognition algorithms and the social sciences (particularly in economics). Because linear algebra is such a well-developed theory, non-linear mathematical models are sometimes approximated by linear models.

The goal of the course is to cover the central aspects of linear algebra, including but not limited to: vectors, vector spaces, standard methods to find bases of subspaces, compute matrices for linear operators with regard to given bases, find real eigenvalues and eigenvectors of real matrices with at lease one rational eigenvalue;

12. Student's obligation: Students and their obligations throughout the academic year, is the attendance and completion of all tests, exams, assignments.

13. Forms of teaching: Magic board, sometimes data show, discussion and allow leg students to write some problems on the board and assignments and I give hard copy of my lecture notes to students before coming lecturer time.

14. Assessment scheme

Theoretical: 40% (Three Midterm exams and other activities, home works and quizzes).

Final Exam: Theoretical: 60%

15. Student learning outcome:

The course provides an introduction to the concepts and theories that form the foundation of Linear Algebra.

16. Course Reading List and References:

[1] Anton H. and Rorres C. (2010), Elementary linear Algebra, application version, tenth edition, John Wilely and Sons, INC.
[2] Denton T.and Waldron A.,(2012, Linear algebra in twenty five lectures.
[3] Hefferon J,Linear algebra,third edition.
[4] Hefferon J .,Answers to exercises Linear algebra, third edition.
[5] Kolman B. (1980), introductory linear algebra with applications, 2nd edition
[6] Lankham I.,Linear Algebra As an Introduction to Abstract Mathematics, , Bruno Nachtergaele, Anne Schilling, Lecture Notes for MAT67,University of California.
[7] Lipschutz, S. and Lipson.M(2009), Schaum's outline of linear algebra, fourth edition, McGraw-Hill.

17. The Topics:	Lecturer's name
Chapter 1: Vector Spaces and Subspaces 1.0 Introduction (Groups and Fields) 1.1 Vector Spaces • Definition of Vector Space. • Further Examples of Vector Spaces 1.2 Subspaces • Definition of Vector Subspace • Examples of Vector Subspaces • Intersections of Vector Subspaces • Unions of Vector Subspaces • Sums of Vector Subspaces **Chapter2: Bases and Finite Dimensional Vector Spaces: (Spanning Sets, Linear Independence, Bases and Dimension)** 2.1 Linear Combinations and Linear Spans 2.2 Spanning Sets 2.3 Linear Independence and Dependence. 2.4 Constructing Linearly Independent Sets 2.5 Bases and Finite Dimensional Vector Spaces. **Chapter 3: Linear Transformations and its Matrices** 3.1 Definition and Main Properties of Linear Transformations 3.2 Matrices of Linear Transformations. 3.3 Representing Linear Transformations by Matrices. 3.4 Certain Types of Linear Transformations. **Chapter 4: Eigenvectors and Eigenvalues** 4.1 Eigenvectors and Eigenvalues of Linear Maps and Matrices 4.2 Computing Eigenvectors and Eigenvalues for a Matrix 4.3 Diagonalization of Matrices 4.4 Eigenspaces 4.5 Cayley-Hamilton Theorem	
18. Practical Topics (If there is any)	
19. Examinations: Compositional: In this type of exam the questions usually starts with Explain how, furthermore it is like as lecture notes and contains some home work , so there will be continuing assignments of problem outside the lecture notes (note that this problem having small marks).	
20. Extra notes:	