Arab Academy for Science and Technology and Maritime Transport
Computer Science Curriculum
Course Syllabus

Course Code: BA304	**Course Title:** Linear Algebra	**Classification:** R	**Coordinator's Name:** Dr. Adel Elrfaay	**Credit:** 3
Pre-requisites: BA102	**Co-requisites:** None	**Schedule:** Lecture 2 hrs. Tutorial/Lab 2 hrs.		

Course Description:
This course illustrates the nature of mathematics as a blend of technique, theory, and applications. The important problem of solving systems of linear equations leads to the algebra of matrices, determinants, vector spaces, bases and dimension, linear transformations, and Eigen values. Vector spaces are studied in an abstract setting, examining the concepts of linear independence, span, bases, subspaces, and dimension. There follows a discussion of the association between linear transformations and matrices

Textbook:
Lay, David C, *Linear Algebra and Its Applications with CD/ROM*, Addison Wesley.

References:
David Poole, *Linear Algebra: A Modern Introduction*, Brooks Cole.

Course Objective/Course Learning Outcome:	**Contribution to Program Student Outcomes:**
1. Learn the basic theory of linear algebra through Eigenvalues. 2. Realize the wide applicability of linear algebra by examining applications.	(SO1) Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions. (SO3) Communicate effectively in a variety of professional contexts.
3. Learn some useful algorithms for linear systems.	(SO2) Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline. (SO6) Apply computer science theory and software development fundamentals to produce

	computing-based solutions.
Course Outline: 1. Matrix Algebra - Matrix Addition and Scalar Multiplication - Matrix Multiplication - Applications of Matrix Arithmetic - Special Matrices and Transposes - Determinants - Matrix Inverses 2. LINEAR SYSTEMS OF EQUATIONS AND MATRICES - Linear equations: the beginning of algebra - Reduced Row Echelon Form and Row Operations - Rank and systems of linear equations - Solving Linear Systems via Gaussian Reduction -Row Operations and Equivalent Systems - The Homogeneous Case, The Non-Homogeneous Case - Criteria for Consistency and Uniqueness 3. VECTOR SPACES - Definitions and Basic Concepts - Subspaces - Linear Combinations - Subspaces Associated with Matrices and Operators - Bases and Dimension - Inner product, length and orthogonality - The Gram-Schmidt Process	4. LINEAR TRANSFORMATIONS - Mappings - General Properties of Linear Transformations - Range and null space - Examples 5. EIGENVALUES AND EIGENVECTORS - Eigenvalues and Eigenvectors - The Characteristic Equation - Diagonalization