Ministry of Higher Education and Scientific Research

SH. A.

المعهد العالى للحاسبات وتكنولوجيا المعلومات
مدينة الشروق ـ القاهرة
شعبة علوم الحاسب

Course specification

Course Code: BS 102

Course Title: Linear Algebra

Academic Year: 2023 /2024

Course specification
(BS 102 Linear Algebra)

Course Outline	
Faculty:	*HICIT- (Higher Institute for Computers & Information Technology-El Shorouk Academy)*
Programme(s) on which the course is given:	Undergraduate program in Computer Science
Major or minor element of programme:	Core
Department offering the program	Department of Computer Science
Department offering the course:	Department of Computer Science
Level	1st Year – 1st Semester
Date of specification approval	DD/MM/2023

Basic Information			
Code: BS 102	*Title:*	Linear Algebra	
Prerequisites:	***BS101 Calculus***		
Weekly Hours:			
Lecture: 2	**Exercise:** ٢	**Practical :** -	**Total:** 3 credit hours

Professional Information

Course Aims:

This course introduces matrices, solution of linear system, Eigen values and vectors, determinants and their applications, vector space, linear independence, linear transformation, inner product, and orthogonality and projection.

a1	Understand the essential mathematics relevant to computer science.
a4	Demonstrate basic knowledge and understanding of a core of analysis, algebra, applied mathematics and statistics.
b1	Define traditional and non-traditional problems, set goals towards solving them, and observe results.
b7	Establish criteria, and verify solutions.
b8	Identify a range of solutions and critically evaluate and justify proposed design solutions.
c16	Apply tools and techniques for the design and development of applications.
d1	Communicate effectively by oral, written and visual means.
d2	Work effectively as an individual and as a member of a team.
d3	Collaborate effectively within multidisciplinary team.

Program ILOs Covered by Course			
Knowledge and understanding	**Intellectual Skills**	**Professional and practical skills**	**General and Transferable skills**
A1, A4	B1, B7, B8	C16	D1, D2, D3

Intended learning outcomes of course (ILOs)

a. Knowledge and Under-Standing:
  a1. Know and understand the essential concepts related to Matrices , Determinants, and Vectors relevant to computer science.
  a2. Know and understand the different applications that need the different concepts of the course.

b. Intellectual Skills:
  b1. Solve a wide range of problems related to the construction and Implementation of computer systems related to the course.
  b2. solve any problem on any different concepts of the course that needs deep thinking skills.

c. Professional and practical skills   c1. Matrices & Determinants and Vectors are necessary for different courses.

d. General and transferable skills
  d1. Work effectively as an individual and as a member of a team .
  d2. Develop Creativity and imagination skills, Self-assessment ability and Critical thinking and analytic ability

Contents		
Topic	**Contact Hours**	
	lecture	**Ex/Lab**
System of linear equations	2	2
Matrix operations	2	2
Inverse of matrix	2	2
Determinants and their properties	2	2
Cramer's rules	2	2
Solving system of linear equation by using inverse of matrix	2	2
Euclidean vector spaces	2	2
Eigen values and Eigen vectors	2	2
Orthogonal bases and orthogonal projections	2	2
Positive definite matrices	2	2
Linear transformation	2	2
Linear dependence and independence	2	2
Singular value decomposition	2	2

Teaching and learning methods

Teaching and learning methods	Used
Lectures	√
Tutorial Exercises	√
Practical Lab	
Discussions.	√
Self – Learning (Reading material, Websites search,)	
Self-studies	
Group work	
Presentation	
Problem solving/problem solving learning based	
Case study	
Synchronous E-Learning	
Video lectures	
Asynchronous E-Learning	

Student assessment methods & Schedule

Methods	Used	Week#
Midterm Exam	√	8
Final Exam	√	16
Course Work & Quizzes	√	2-14

Assessment Weight

Assessment	Weight %
Mid Term Exam	20
Final Exam	60%
Course Work & Quizzes	20%
Total	100

Course Work &Quizzes

Short Exams, Assignments, Research, Reports, Presentations
Class/Project discussion

List of references

Essential books (textbooks)	☐ Strang, Gilbert. Introduction to Linear Algebra. 4th ed. Wellesley, MA: Wellesley-Cambridge Press, February 2009. ISBN: 9780980232714. ☐ Strang, Gilbert. Introduction to Linear Algebra. 5th ed. Wellesley, MA: Wellesley-Cambridge Press, February 2016. ISBN: 9780980232776

Course notes	E-Learning Portal
Recommended books	
Periodicals, website	
Videos link	

Required Facilities		
Tools & SW (Technology facilities):		
Teaching facilities:	Whiteboard	√
	Computer Lab	√
	Data show	√
	E-Learning	√
	Videos	√
	Website	√

Course Content/ILO Matrix							
Course Contents	**Knowledge & understanding**		**Intellectual skills**		**Professional and practical skills**	**General**	
	a1	**a2**	**b1**	**b2**	**c1**	**d1**	**d2**
System of linear equations		X		X			
Matrix operations	X		X				X
Inverse of matrix		X		X			
Determinants and their properties	X					x	
Cramer's rules							
Solving system of linear equation by using inverse of matrix				X	X		X
Euclidean vector spaces	X		X				
Eigen values and Eigen vectors		X					
Orthogonal bases and orthogonal projections			x	X	x		
Positive definite matrices		X		X			
Linear transformation			X				X
Linear dependence and independence		X		X		X	
Singular value decomposition				X			

Learning Method /ILOs Matrix							
Learning Methods	**Knowledge & understanding**		**Intellectual skills**		**Professional and practical skills**	**General**	
	a1	**a2**	**b1**	**b2**	**c1**	**d1**	**d2**
Lectures		X		X			
Tutorial Exercises	X		X				X
Reading material		X		X			
Websites search	X					x	
Research and reporting							
Problem solving				X	X		X
Group work	X		X				
Case study		X					
Practical Lab			x	X	x		
Discussions.		X		X			

Assessment Methods /ILOs Matrix							
Assessment Methods	**Knowledge & understanding**		**Intellectual skills**		**Professional and practical skills**	**General**	
	a1	**a2**	**b1**	**b2**	**c1**	**d1**	**d2**
Mid Term Exam		X		X			
Final Exam	X		X				X
Course Work &Quizzes	X					x	

Course ILOs Vs Program ILOs									
Course ILOs \ Prog ILOs	**Knowledge & understanding**		**Intellectual skills**			**Professional and practical skills**	**General**		
	A1	**A4**	**B1**	**B7**	**B8**	**C16**	**D1**	**D2**	**D3**
Knowledge and Understanding — a1	X	X							
a2	X	X							
Intellectual skills — b1			X	X					
b2				X	X				
Professional and practical skills — c1						X			
General skills — d1							X	X	X
d2									X

Course Coordinator : (   )
Head of Department: (   )
Date: --/--/2023