Independent University, Bangladesh
Department of Physical Sciences

Course Outline

Course Title: Linear Algebra-vectors and matrices
Course Code: MAT 203/222
Summer 2023, S/T: 08:00-9:530
(Section-3), BC 6007

Instructor's details:
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Course Description

The course Linear Algebra has two major components, matrix Algebra and vector spaces. Essentially Linear Algebra teaches how to deal with physical systems with very large number of governing independent variables. The relationship between the dependent and the independent variables is assumed to be linear- hence the name 'Linear Algebra'. It may appear at first sight that the assumption of linear dependency narrows the application of Linear Algebra, which is not true. To understand the nonlinear dependency in a physical system, it is first necessary to understand the linear dependency. The necessary mathematical tools, which are used to deal with a nonlinear system, is built upon the mathematical tools of a linear system. At present, the Linear Algebra forms the basis of most analysis in Physics, Engineering and many branches of Management Science.

Course Policy:

1. It is the student's responsibility to gather information about the assignments and covered topics during the lectures missed. Regular class attendance is mandatory.
2. The dates of midterm and final exam will be declared in the class. There is **NO** provision for make-up class tests except for a serious reason.
3. Quizzes will be taken regularly in the end of any class.
4. Complete course notes and slides are available.
5. Class participation is vital for a good understanding of the course material. Students are invited to ask questions.
6. On every Saturday a tutorial class will be held.
7. Students must maintain the IUB code of conduct and ethical guidelines offered by the School of Engineering, Technology and Sciences.

Course Learning Outcomes (CLOs) with mapping to PLOs

CLOs	CLO Statement	Corresponding PLO(s)
CLO1	Understand the background of basic theories	PLO1: Knowledge
CLO2	Apprehend abstract logic of vector space	PLO2: Problem analysis
CLO3	Use of transformation in computer graphics	PLO2: Problem analysis

Assessment and Marks Distribution:

Students will be assessed on the basis of their overall performance in all the exams and class tests. The Marks distribution is as follows:

Type of Assessment	Weight
Attendance	05%
Final Exam I	35%
Final Exam II	35%
Class Test/Quiz	25%

Grade Conversion Scheme:

The following chart will be followed for grading.

A	A-	B+	B	B-	C+	C	C-	D+	D	F
90-100	85-89	80-84	75-79	70-74	65-69	60-64	55-59	50-54	45-49	0-44

Required Texts:

- **Linear Algebra with Applications** – Steven J Leon (8th edition)
- **Elementary Linear Algebra Applications version**, Howard Anton & Chris Rorres 10th edition, John Wiley Publishing Company

SEMESTER SCHEDULE

Reference – Elementary Linear Algebra with Applications – Steven J Leon

Sessions **Topics and Readings**

Lecture 1	Matrices and Systems of Equations: Basic terminology, System of Linear Equations, Section 1.1
Lecture 2	Matrices and Systems of Equations: Row Echelon Form, Guassian and Gauss Jordan algorithm, Section 1.2
Lecture 3	Matrices and Matrix Operations: Matrix Arithmetic, Section 1.3, Matrix Algebra Section 1.4
Lecture 4	Matrices and Systems of Equations: Elementary Matrices and the Invertible Matrix Theorem, Section 1.5
Lecture 5	Determinants: The Determinant of a Matrix, Section 2.1, Properties of Determinants, Section 2.2, Cramer's Rule, Section 2.3
Lecture 6	Vector Spaces: Definition and Examples, Section 3.1, Subspaces, Section 3.2
Lecture 7	Vector Spaces: Subspaces, Section 3.2
Lecture 8	Vector Spaces: Linear Independence, Section 3.3
Lecture 9	Vector Spaces: Basis and Dimension, Section 3.4
Lecture 10	Review
FINAL I	Final Exam (*Syllabus – Topics covered in Sessions 1 – 10*)
Lecture 12	Vector Spaces: Change of Basis, Section 3.5
Lecture13	Vector Spaces: Row space and Column Space, Section 3.6
Lecture 14	Vector Spaces (Continued)
Lecture 15	Linear Transformations: Definition and Examples, Section 4.1, Matrix Representations of Linear Transformations, Section 4.2
Lecture 16	Linear Transformations (continued)
Lecture 17	Orthogonality: The Scalar Product in $\mathbb{R}^n$, Section 5.1, Orthogonal Subspaces, Section 5.2
Lecture 18	Orthogonality: Orthonormal Sets, Section 5.5
Lecture 19	Orthogonality (continued)
Lecture 20	Eigenvalues: Eigenvalues and Eigenvectors, Section 6.1
Lecture 21	Eigenvalues and eigenvectors (continued)

Lecture 22	Eigenvalues: Diagonalisation, Section 6.3
Lecture 23	Review
Final II Exam	TBA (*Syllabus – Topics covered in Sessions 12 – 23*)