Semester:	2			
Course Code:	EM1020			
Course Name:	Linear Algebra			
Credit Value:	3 (Notional hours: 150)			
Prerequisites:	None			
Core/Optional	Core			
Hourly Breakdown	Lecture hrs.	Tutorial hrs.	Assignment hrs.	Independent Learning & Assessment hrs.
	35	10	-	105

Course Aim: To encourage students to develop a working knowledge of the central ideas of linear algebra: vector spaces, linear transformations, orthogonality, eigenvalues, eigenvectors and canonical forms and the applications of these ideas in science and engineering.

Intended Learning Outcomes:

On successful completion of the course, the students should be able to;

- **Apply** the knowledge of matrices, Gaussian reduction and determinants to solve systems of linear equations.
- **Apply** the properties of vector spaces and to generalize the concepts of Euclidean geometry to arbitrary vector spaces.
- **Identify** linear transformations, represent them in terms of matrices, and interpret their geometric aspects.
- **Calculate** eigenvalues and Eigenvectors of matrices and linear transformations and apply the concepts in physical situations.
- **Prove** eigenvalue properties of real symmetric matrices and apply them in quadratic forms.

Course Content:

- **Matrix Algebra:** Operations, elementary matrices, inverse, partitioned matrices.
- **Determinants:** Introduction and properties**.**
- **Vector spaces:** Definition, subspaces, linear independence and spanning, basis, change of basis, normed spaces, inner product spaces, Gram-Schmidt orthonormalization.
- **Linear Transformations:** Introduction, matrix representation, operations of linear transformations, change of basis.
- **System of linear equations:** Gauss and Jordan elimination; LU factorization, least square approximations, ill-conditioned and overdetermined systems.
- **Characteristic value problem:** Computing eigenvalues and eigenvectors, Eigen-basis, diagonalization, matrix exponentials.

- **Real Symmetric matrices**: Properties, definiteness, quadratic forms, applications.

Teaching /Learning Methods:

Classroom lectures, tutorial discussions and in-class assignments

Assessment Strategy:

Continuous Assessment 50%	Final Assessment 50%		
Details:	Theory (%)	Practical (%)	Other (%)
Tutorials/Assignments/Quizzes 20%			
Mid Semester Examination 30%	50%	-	-

Recommended Reading:

- Gilbert Strang, Introduction to Linear Algebra, 5th edition, (2010), Cambridge Press.
- David C. Lay, S. R. Lay & J. Mcdonald, Linear Algebra and its Applications, 5th edition, (2012), Pearson.
- David Poole, Linear Algebra: A Modern introduction, 4th edition, (2005), Cengage.
- Thomas. S. Shores, Applied Linear Algebra and Matrix Analysis, (2007), Springer.