Course Code	**GP 116**
Course Title	**Linear Algebra**
No. of Credits	**3**
Pre-requisites	**-**
Compulsory/Optional	**Compulsory**

Aim(s): 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 eigenvectorsof matrices and linear transformations and apply the concepts in physical situations.
- Prove eigenvalue properties of real symmetricmatrices and apply them in quadratic forms.

Time Allocation (Hours): Lectures 36 Tutorials Practical Assignments18

Course content/Course description:

- **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, matrixrepresentation, operationsof linear transformations, change of basis.
- **System of linear equations:**Gauss and Jordan elimination; LU factorization, least square approximations, ill-conditioned and over-determined systems.
- **Characteristic value problem:** Computing eigenvalues and eigenvectors, Eigen-basis, diagonalization, matrix exponentials.
- **Real Symmetric matrices**: Properties, definiteness, quadratic forms, applications.

Recommended Texts:

- 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,4thedition, (2005),Cengage.
- Thomas.S.Shores, Applied Linear Algebra and Matrix Analysis, (2007), Springer.

Assessment	**Percentage Mark**
In-course	
Tutorials/Assignments	20
Mid Semester Examination	30
End-semester	50