Course Title	**LINEAR ALGEBRA**
Course Code	**MPHY-203**
Credit Hours	**CH3**
Pre- requisites	**MPHY-101, MPHY-102**
Learning outcomes	The aims of this course are to introduce the basic ideas of linear algebra.
Contents	**System of Linear Equation and Matrices:** Introduction to system of Linear Equations, Gaussian Elimination. **Matrices and Matrix Operations:** addition, transposition, linearity, matrix multiplication, properties of matrix multiplication, matrix inversion, methods of finding inverses, elementary matrices and equivalence. **Determinants:** Calculation by Cofactor Expansion, Row Reduction and Cramer's Rule, Other Properties of Determinants, orthogonal projection, determinants, additional properties of determinants. **Euclidean Vector Spaces:** vectors in 2-Space, 3-Space and n-Space, subspaces, four fundamental subspaces, Operations on Vectors in Spaces, vector norms, inner-product spaces, orthogonal vectors, invariant subspaces, norms, inner products, and orthogonality. **General Vector Spaces:** Real Vector Spaces, Subspaces, linear independence, Coordinates and basis, dimension, change of basis, row/column/null-space, rank, nullity cand the fundamental matrix spaces, matrix transformations, properties of matrix transformations. **Eigenvalue Problem and Inner Product Spaces**: Eigenvalues and eigenvectors, properties of Eigen systems, diagonalization by similarity transformations, functions of diagonalizable matrices, Gram-Schmidt Process **Inner Product Spaces:** Inner Products, Angle and Orthogonality in Inner Product Spaces, Gram–Schmidt Process; QR-Decomposition, Best Approximation; Least Squares, Least Squares Fitting to Data, Function Approximation; Fourier Series.
Teaching-learning Strategies	Classroom teaching / Lecturing
Assignments- Types and Number	Problem sheet: 3-4
Assessment and Examinations	Mid-Term Assessment: 35% Formative Assessment: (25%): It includes classroom participation, attendance, assignments and presentations, homework, attitude and behavior, hands-on-activities, short tests, quizzes etc. Final Term Assessment: 40%
Text Books	1. Elementary linear algebra: applications version (11th Edition) by H. Anton and C. Rorres, Wiley (2010). 2. Mathematical Methods for Physicists (7th Edition) by G. B. Arfken, H. J. Weber and F. E. Harris, Academic Press (2012). 3. Mathematics for physicists by P. Dennery and A. Krzywicki, Dover Publications (2012). 1. Mathematical methods for physics and engineering by K. F. Riley, M. P. Hobson, and S. J. Bence (3rd Edition), Cambrige (1999).