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| **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.<br>**Matrices and Matrix Operations:** addition, transposition, linearity, matrix multiplication, properties of matrix multiplication, matrix inversion, methods of finding inverses, elementary matrices and equivalence.<br>**Determinants:** Calculation by Cofactor Expansion, Row Reduction and Cramer's Rule, Other Properties of Determinants, orthogonal projection, determinants, additional properties of determinants.<br>**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.<br>**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.<br>**Eigenvalue Problem and Inner Product Spaces**: Eigenvalues and eigenvectors, properties of Eigen systems, diagonalization by similarity transformations, functions of diagonalizable matrices, Gram-Schmidt Process<br>**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%<br>Formative Assessment: (25%): It includes classroom participation, attendance, assignments and presentations, homework, attitude and behavior, hands-on-activities, short tests, quizzes etc.<br>Final Term Assessment: 40% |
| **Text Books** | 1. Elementary linear algebra: applications version (11th Edition) by H. Anton and C. Rorres, Wiley (2010).<br>2. Mathematical Methods for Physicists (7th Edition) by G. B. Arfken, H. J. Weber and F. E. Harris, Academic Press (2012).<br>3. Mathematics for physicists by P. Dennery and A. Krzywicki, Dover Publications (2012).<br>1. Mathematical methods for physics and engineering by K. F. Riley, M. P. Hobson, and S. J. Bence (3rd Edition), Cambrige (1999). |