Syllabus of Semester - IV of the following departments under Faculty of Science based on Under Graduate Curriculum Framework - 2023 to be implemented from the Academic Year 2024-25.

FACULTY OF SCIENCE

DEPARTMENT OF MATHEMATICS

BSc. (Hons.) Mathematics

Minor Course: Linear Algebra & Numerical Methods

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course Title & Code	Credit Distribution of the course			Eligibility Criteria	Pre-requisite(s) of the course (if any)
	Lecture	Practical	Activity/ Case study analysis		
Linear Algebra & Numerical Methods	**2**	**4**	**0**	10 + 2 from a recognized board in any stream	

Course Outcomes

At the end of the syllabus students will be able to

CO: 1 Student will be able to identify vector space and subspace.

CO: 2 Student will be able to obtain basis and determine dimension of vector spaces and subspaces.

CO: 3 Students will be able to employ linear algebra to solve some scientific problems.

CO: 4 Student will be able to solve different mathematical problems using the transition between vector spaces by some mathematical tools such as linear transformations.

CO: 5 Student will be able to identify the behaviour of curve in given interval and at infinity.

CO: 6 Student will be able to formulate and solve differential equations.

CO: 7 Students will be able to employ multivariate differential calculus to extreme value problems

CONTENT (Theory)

Unit: 1 Vector space – definition, examples and properties, subspace – sum and direct sum of subspaces, linear combination, span of a set, linear dependence and independence, basis and dimension of a vector space, dimension theorem (without proof)

Unit: 2 Linear transformation, range, kernel, rank and nullity of a linear transformation, rank-nullity theorem (without proof), isomorphism of vector spaces, inverse of a linear transformation, matrix associated with the linear transformation and linear transformation associated with the matrix.

List of Practical

1. Stationary points and optimization in one variable.
2. Concavity and points of inflection.
3. Optimization in multivariable including Lagrange's method of undetermined multiplier.
4. Solution of linear equations using Gauss Jacobi and Gauss Seidel method.
5. Numerical differentiation using Newton forward interpolation and Newton backward interpolation.
6. Numerical Integration using Simpson rule and Simpson $3/8^{th}$ rule.
7. Numerical Integration using Trapezoidal rule and Weddle's rule.
8. Euler's method and modified Euler's method to solve an IVP.
9. Taylor series method and Picard's method to solve an IVP.
10. Runge Kutta method of order 2 and order 4 to solve an IVP.
11. Verification of dimension theorem.
12. Verification of rank and nullity theorem.

Reference Books:

1. An Introduction to Linear Algebra - V. Krishnamurthy & others. (Affiliated East-West press, New Delhi).
2. Linear Algebra: a Geometric Approach - S. Kumaresan, PHI.
3. An Introduction to Linear Algebra - I. K. Rana, Ane Books Pvt. Ltd., New Delhi.
4. Matrix and Linear Algebra - K. B. Datta, Prentice Hall, New Delhi.
5. Numerical Analysis and Computational Procedures -S. A. Mollah.