First Year 1st Semester Curriculum Structure for B.Tech. Course

Mathematics-I (BSC103)	
Department: **Program:** **Course Code:** **Title of Course:** **Year of Study:** **Semester:**	Basic Science and Humanities B. Tech. **BSC103** **Mathematics-I** First Year First
Contact Hours: **Credits:** **Type of course:** **Total Lecture Hours:**	L-T-P: 3-1-0 4 Theory
Pre-requisites Courses:	• **High School Mathematics**
Course Outcome (CO):	**CO1:**Demonstrate the domain of applications of mean value theorems and apply to engineering problems. **CO2:**Apply the concept and techniques of differential and integral calculus to determine curvature and evaluate different types of improper integrals. **CO3:**Develop the knowledge for addressing the real life problems which comprises of several variables or attributes and identify extremum points of different surfaces of higher dimensions. **CO4:**Identify different types of matrices and relate the concept of rank for solving linear system of equations, appraise the idea of vector space and apply the concept of eigenvalues, eigenvectors, diagonalization of matrices and orthogonalization in inner product spaces for understanding physical and engineering problems.

Detailed Syllabus

- **Module 1: Calculus (Differentiation) (6 L)**

Rolle's Theorem, Mean Value Theorems, Taylor's and Maclaurin'sTheorems with Remainders; Indeterminate forms and L'Hospital's Rule; Maxima and Minima;Evolutes and Involutes.

- **Module 2: Calculus (Integration) (6 L)**

  Evaluation of Definite and Improper Integrals; Beta and Gamma Functions and their properties; Applications of Definite Integrals to evaluate surface areas and volumes of revolutions.

- **Module 3: Multivariable Calculus (Differentiation) (8 L)**

  Limit, Continuity and Partial Derivatives, Directional Derivatives, Total Derivative; Tangent Plane and Normal Line; Maxima, Minima and Saddle points; Method of Lagrange multipliers; Gradient, Curl and Divergence.

- **Module 4:Linear Algebra (25 L)**

  Matrices, Vectors: Addition and Scalar Multiplication, Matrix Multiplication; Linear Systems of Equations, Linear Independence, Rank of a Matrix, Determinants, Cramer's Rule, Inverse of a Matrix, Gauss Elimination and Gauss-Jordan Methods.

  Vector Space, Linear Dependence of Vectors, Basis, Dimension; Linear Transformations (maps), Range and Kernel of a Linear Map, Rank and Nullity, Inverse of a Linear Transformation, Rank Nullity Theorem, Composition of Linear Maps, Matrix associated with a Linear Map.

  Eigenvalues, Eigenvectors, Symmetric, Skew-symmetric, and Orthogonal Matrices, Eigenbases.Diagonalization; Inner Product Spaces, Gram-Schmidt Orthogonalization.

- **Book list:**

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. Veerarajan T., Engineering Mathematics for First Year, Tata McGraw-Hill, New Delhi, 2008.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
5. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
6. N.P. Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
7. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
8. V. Krishnamurthy, V.P. Mainra and J.L. Arora, An Introduction to Linear Algebra, Affiliated East–West Press, Reprint 2005.
9. B.BasuMallik&KrishanuDeyasi, Engineering Mathematics-1A, Cengage Learning, First Edition, 2020.
10. B.BasuMallik&KrishanuDeyasi, Engineering Mathematics-1B, Cengage Learning, First Edition, 2020.