INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPARTMENT/CENTRE: Mathematics

1. **Subject Code:** MAI-101   **Course Title**: Mathematics I
2. **Contact Hours:**   **L:** 3   **T:** 1   **P:** 0
3. **Examination Duration (Hrs.):**   **Theory:** 03   **Practical:** 00
4. **Relative Weightage:** **CWS:** 20-35   **PRS: 0**   **MTE:** 20-30   **ETE:** 40-50   **PRE:** 0
5. **Credits:** 04   **6. Semester:** Autumn   **7. Subject Area:** BSC
6. **Prerequisite:** NIL
7. **Objective:** To provide the essential knowledge of basic tools of Differential Calculus, Integral Calculus, Vector Calculus and Matrix Algebra.

10. **Details of the Course**

S. No.	Contents	Contact Hours
1.	**Matrix Algebra:** Elementary operations and their use in getting the rank, inverse of a matrix and solution of linear simultaneous equations. Orthogonal, symmetric, skew-symmetric, Hermitian, skew-Hermitian, normal and unitary matrices and their elementary properties. Eigenvalues and Eigenvectors of a matrix, Cayley-Hamilton theorem, Diagonalization of a matrix.	8
2.	**Differential Calculus:** Limit, continuity and differentiability of functions of two variables, Euler's theorem for homogeneous equations, Tangent plane and normal. Change of variables, chain rule, Jacobians, Taylor's Theorem for two variables, Error approximations. Extrema of functions of two or more variables, Lagrange's method of undetermined multipliers	12
3.	**Integral Calculus:** Review of curve tracing and quadric surfaces, Double and Triple integrals, Change of order of integration. Change of variables. Gamma and Beta functions. Dirichlet's integral. Applications of Multiple integrals such as surface area, volumes, centre of gravity and moment of inertia..	12
4.	**Vector Calculus:** Differentiation of vectors, gradient, divergence, curl and their physical meaning. Identities involving gradient, divergence and curl. Line and surface integrals. Green's, Gauss and Stoke's theorem and their applications.	10
	Total	**42**

11. **Suggested Books:**

S.No.	Name of Authors/Book/Publisher	Year of Publication / Reprint
1.	Kreyszig, E., "Advanced Engineering Mathematics", 10th Ed., Wiley India Pvt. Ltd	2015
2.	Jain, R. K. and Iyenger, S. R. K., "Advanced Engineering Mathematics", 5th Ed., Narosa Publishing House.	2017
3.	Thomas, G. B., Hass, J., Heil, C. and Weir M. D., "Thomas' Calculus", 14th Ed., Pearson Education	2018