

**Indian Institute of Engineering Science and Technology, Shibpur**

**Department of Mathematics**

**Five Year Integrated Dual Degree (B.Tech. -M.Tech.) Programme**

**First Semester (For all Engineering Branches)**

Subject : Mathematics-I (MA-101)

Weekly contact periods: 3- 1 - 0 (L - T - S)

Full Marks: 100

Credit-4

Sl. No.	Module Name and Topics	No. of Lecture Classes
1.	<b>Functions of Single Real Variable:</b> n-th order derivative, Leibnitz's theorem for successive differentiation, Rolle's theorem, M.V.T's of differential calculus. Taylor's theorem with Lagrange's and Cauchy's forms of remainders, Taylor's and Maclaurin's series, expansion of functions, curvature, asymptotes.	9
2.	<b>Functions of Several Real Variables:</b> Partial derivatives, chain rule, differential and small error, Euler's theorem for homogeneous functions, Taylor's theorem (statement only), expansion of functions of two real variables, maxima and minima, Lagrange's method of undetermined multipliers.	7
3.	<b>Infinite Series:</b> Concept of convergence, Geometric series and p-series, Comparison test, D'Alembert's ratio test, Cauchy's root test, Raabe's test, Gauss' test, Power series, radius of convergence.	4
4.	<b>Multiple Integrals:</b> Double integral, change of order of integration, Jacobian, change of variables, applications.	4
5.	<b>Improper Integrals :</b> Definition, Convergence, Cauchy's principal value, Comparison test, $\mu$ -test, Beta and Gamma functions and their properties. relation between Gamma function and Beta function.	5
6.	<b>Ordinary Differential Equations :</b> Higher order ordinary differential equations with constant coefficients, Euler's equation, method of variation of parameters, series solution in the neighborhood of an ordinary point. Legendre differential equation, Legendre polynomials, Orthogonality property, recurrence relations, Bessel differential equation, Bessel functions, recurrence relations.	10
	<b>First half: Sl. No. 1,2,3    Second half: Sl. No. 4,5,6</b>	<b>39</b>

**Suggested Reading:** (1) Advanced Engineering Mathematics - E. Krysizg (2) Engineering Mathematics- S. S. Sastry (3) Introductory Course in Differential Equations- Daniel A. Murray (4) Differential Calculus – B.C. Das & B.N.Mukherjee (5) Integral Calculus – B.C. Das & B.N.Mukherjee (6) Advanced Calculus- D.V. Widder. (6) *Engineering Mathematics*