



I Year-I Semester		L	T	P	C
		3	0	0	3
<b>MATHEMATICS – I (BS1101)</b>					

**Prerequisite Course:** Knowledge and application of differentiation and integration

**Course Description and Objectives:**

This course will illuminate the students in the concepts of calculus, differential equations and multivariable calculus to handle various real world problems and their applications.

**Course Outcomes:**

Upon completion of the course, the student will be able to achieve the following outcomes.

CO	Course Outcomes	POs
1	Utilize mean value theorems to real life problems	4
2	Solve the differential equations related to various engineering fields	5
3	Familiarize with functions of several variables which is useful in optimization	4
4	Learn important tools of calculus in higher dimensions and will become familiar with 2- dimensional and 3-dimensional coordinate systems.	5
5	Apply double integration techniques in evaluating areas bounded by region	5

**Syllabus:**

**UNIT I:**

**Sequences, Series and Mean value theorems:**

Sequences and Series: Convergences and divergence – Ratio test – Comparison tests – Integral test – Cauchy’s root test – Alternate series – Leibnitz’s rule. Mean Value Theorems (without proofs): Rolle’s Theorem – Lagrange’s mean value theorem – Cauchy’s mean value theorem – Taylor’s and Maclaurin’s theorems with remainders.

**UNIT II:**

**Differential equations of first order and first degree:**

Linear differential equations – Bernoulli’s equations – Exact equations and equations reducible to exact form. Applications: Newton’s Law of cooling – Law of natural growth and decay – Orthogonal trajectories – Electrical circuits.

**UNIT III:**

**Linear differential equations of higher order:**

Non-homogeneous equations of higher order with constant coefficients – with non-homogeneous term of the type  $e^{ax}$ ,  $\sin ax$ ,  $\cos ax$ , polynomials in  $x^n$ ,  $e^{ax} V(x)$  and  $x^n V(x)$  – Method of Variation of parameters. Applications: LCR circuit, Simple Harmonic motion.

**UNIT IV:**

**Partial differentiation:**

Introduction – Homogeneous function – Euler’s theorem – Total derivative – Chain rule – Jacobian – Functional dependence – Taylor’s and Mc Laurent’s series expansion of functions of two variables. Applications: Maxima and Minima of functions of two variables without constraints and Lagrange’s method (with constraints).

**UNIT V:**

**Multiple integrals:**

Double and Triple integrals – Change of order of integration – Change of variables. Applications: Finding Areas and Volumes.

**TEXT BOOKS:**

1. B. S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

**REFERENCE BOOKS:**

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India.
2. Joel Hass, Christopher Heil and Maurice D. Weir, Thomas calculus, 14th Edition, Pearson.
3. Lawrence Turyn, Advanced Engineering Mathematics, CRC Press, 2013.
4. Srimantha Pal, S C Bhunia, Engineering Mathematics, Oxford University Press.