

**IK Gujral Punjab Technical University**  
**Bachelor of Technology (B. Tech. 1<sup>st</sup> Year)**

**Branch/Course: COMPUTER SCIENCE AND ENGINEERING**

<b>BTAM104-18</b>	<b>Mathematics Paper-I</b> <b>(Calculus &amp; Linear Algebra)</b>	<b>4L:1T:0P</b>	<b>4 credits</b>
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**Course Objective:**

The objective of this course is to familiarize the prospective engineers with techniques in basic calculus and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

**Detailed Contents:**

**Section-A**

**Unit-I: Calculus (13 hours)**

Rolle's theorem, Mean value theorems, Statements of Taylor's and Maclaurin theorems with remainders; Indeterminate forms and L' Hôpital's rule; Maxima and minima.

Evaluation of definite and improper integrals; Applications of definite integrals to evaluate surface areas and volumes of revolutions; Beta and Gamma functions and their properties.

**Unit-II: Matrix Algebra (12 hours)**

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 elimination.

**Section-B**

**Unit-III: Linear Algebra (13 hours)**

Vector Space, linear dependence of vectors, basis, dimension; Linear transformations (maps), range and kernel of a linear map, rank and nullity, statement of rank-nullity theorem, Matrix associated with a linear map.

**Unit-IV: Linear Algebra (Contd.) (12 hours)**

Eigenvalues, eigenvectors, symmetric, skew-symmetric, and orthogonal Matrices, eigen bases; Similar matrices, diagonalization.

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**Suggested Text/Reference Books**

G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9<sup>th</sup> Edition, Pearson, Reprint, 2002.

Erwin Kreyszig, Advanced Engineering Mathematics, 9<sup>th</sup> Edition, John Wiley & Sons, 2006.

D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.

Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.

B.V. Ramana, Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11<sup>th</sup> Reprint, 2010.

N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.

B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.

V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, Affiliated East–West press, Reprint 2005.

**Course Outcomes:** The students will be able

- To apply differential and integral calculus to notions of curvature and to improper integrals. Apart from various applications, they will have a basic understanding of Beta and Gamma functions. The essential tools of matrices and linear algebra including linear transformations, eigenvalues, diagonalization and orthogonalization.