# LINEAR ALGEBRA AND CALCULUS

## I B.TECH - I SEMESTER

| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | L | T | P | C | CIE | SEE | Total |
| A6BS01 | BSC | 3 | 1 | - | 4 | 40 | 60 | 100 |
| Contact Classes: 44 | Tutorial Classes: 08 | Practical Classes: Nil | | | | Total Classes: 52 | | |

### COURSE OBJECTIVES

**The course will enable the students to:**

1. Concept of Rank of a matrix, Consistency and solving system of linear equations.
2. Concept of Eigen values, Eigen vectors and diagonalization of the matrix.
3. The concept of differential equations and solve them using appropriate methods.
4. Evaluate multiple integrals and improper integrals.
5. The partial derivatives of several variable functions.

### COURSE OUTCOMES

**Upon successful completion of this course, student will be able to:**

1. Solve the system of linear equations using rank of the matrices.
2. Find the Eigen values and Eigen vectors of a matrix.
3. Identify the different types of differential equations and solve those using appropriate methods.
4. Evaluate the improper integrals using beta and gamma functions.
5. Find the Maxima and Minima of several variable functions.

| UNIT - I | MATRICES AND THEIR APPLICATIONS | CLASSES: 08 |
|---|---|---|

Real matrices: Symmetric-skew-symmetric and orthogonal matrices –Complex matrices: Hermitian, Skew – Hermitian and Unitary matrices –Elementary row and column transformations –Elementary matrix-Finding rank of a matrix by reducing to Echelon form and Normal form-Finding the inverse of a matrix using elementary row/column transformations (Gauss-Jordan method)-Consistency of system of linear equations (homogeneous and non-homogeneous) using the rank of a matrix –Solving m n and n n linear system of equations by Gauss Elimination, Gauss siedel Method

| UNIT - II | EIGEN VALUES, EIGEN VECTORS | CLASSES: 08 |
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Eigen values and Eigen vectors and its properties (without proof), Cayley-Hamilton theorem (Statement and verification)-Finding inverse and powers of a matrix by Cayley-Hamilton theorem, Diagonalization of matrices. Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to Canonical forms by Orthogonal Transformation.

| UNIT - III | ORDINARY DIFFERENTIAL EQUATIONS AND THEIR APPLICATIONS | CLASSES: 10 |
|---|---|---|

Introduction- Exact and reducible to Exact differential equations-Newton's Law of cooling-Law of Growth and Decay. Linear differential equations of second and higher order with constant coefficients - Non-Homogeneous term of the type $Q(x) = e^{ax}$, Sin ax, Cosax, $e^{ax}v(x)$, $x^n v(x)$ - Method of variation of parameters L-C-R Circuits.

| UNIT - IV | MULTIPLE INTEGRALS, BETA AND GAMMA FUNCTIONS | CLASSES: 10 |
|---|---|---|

Double and triple integrals (Cartesian and polar), Change of order of integration in double integrals, Change of variables (Cartesian to polar) in double integrals. Finding the area and volume of a region using double and triple integral.
Beta-Gamma Functions and their Properties-Relation between them- Evaluation of improper integrals using Gamma and Beta functions.

| UNIT - V | CALCULUS OF SEVERAL VARIABLES | CLASSES: 08 |
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Limit, Continuity - Partial derivative- Partial derivatives of higher order -Total derivative - Chain rule, Jacobians-functional dependence & independence. Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method (with constraints).

## TEXT BOOKS


1. Ervin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. B.S.Grewal, Higher Engineering Mathematics, Khanna publishers, 36th Edition, 2010.


## REFERENCE BOOKS


1. G.B.Thomas, Calculus and Analytical Geometry, 9th Edition, Pearson Reprint 2006.
2. N.P Bali and Manish Goyal, A Text of Engineering Mathematics, Laxmi publications, 2008.
3. E.L.Ince, Ordinary differential Equations, Dover publications, 1958.


## WEB REFERENCES

1. https://www.efunda.com/math/math_home/math.cfm
2. https://www.ocw.mit.edu/resources/#Mathematics
3. https://www.sosmath.com/
4. https://www.mathworld.wolfram.com/

## E -TEXT BOOKS

1. https://www.e-booksdirectory.com/details.php?ebook=10166

## MOOCS COURSE

1. https://swayam.gov.in/
2. https://onlinecourses.nptel.ac.in/