

# St. Xavier's College (Autonomous), Ahmedabad

Syllabus of Semester – I of the following departments under Faculty of Computer Science based on Undergraduate Curriculum Framework to be implemented from the Academic Year 2024-25.

## DEPARTMENT OF COMPUTER SCIENCE

### BCS CS (Hons.) Category – IV

#### Matrix Algebra & Co-ordinate Geometry CS 1101

##### Course Outcomes

At the end of the syllabus students will be able to

- CO: 1 Perform various matrix operations and identify various types of matrices.
- CO: 2 Apply the concept of elementary operations on matrices to find the inverse of matrix and solve system of linear equations.
- CO: 3 Apply elementary operations to convert matrix into different forms and find the rank of the matrix.
- CO: 4 Apply the concept of matrices to find the eigen values and eigen vectors of a square matrix and apply the Cayley Hamilton theorem to find the inverse of a matrix.
- CO: 5 apply the knowledge of converting the co-ordinates in  $R^2$  and  $R^3$  into different system and identifying various equations in both  $R^2$  and  $R^3$ .
- CO: 6 graph different standard curves given in various forms.

##### CONTENT (Theory)

- Unit: 1** Introduction to Matrices – Types of matrices including symmetric, skew symmetric, orthogonal, Hermitian, skew-Hermitian, unitary matrices, normal matrices.  
Operations on matrices, theorems on matrices.  
Elementary operations on matrices, Row echelon form, Reduced row echelon form, normal form of a matrix,  
Linear dependence and independence of row and column of matrix, row rank, column rank and rank of a matrix  
Inverse of matrix using Gauss Jordan method (Converting to RRE form) and using adjoint of a matrix.
- Unit: 2** Application of matrices - in solving system of simultaneous linear equations (Gauss elimination method, Cramer's rule), theorems on consistency of system of linear equations.  
Characteristic equation of a square matrix, eigen values and eigen vectors of a square matrix, theorems on eigen values and eigen vectors, Cayley Hamilton theorem and its use in finding inverse of a matrix.

### List of Practicals

1. Examples on matrix algebra.
2. Row Echelon, Reduced row echelon, normal form and rank of a matrix.
3. Inverse of matrix using Gauss Jordan Method.
4. Examples on eigen values and eigen vectors.
5. Examples on Cayley Hamilton theorem and its applications.
6. Solution of simultaneous linear equation using Gauss elimination method.
7. Solution of simultaneous linear equations using Cramer's rule.
8. Linearly independent and dependent vectors.
9. Polar co-ordinate system in  $R^2$  and lines in polar form.
10. Circle and conics in polar co-ordinates.
11. Various co-ordinate system in  $R^3$ .
12. Graphs of standard curves in Cartesian form.
13. Graphs of standard curves in Polar form.
14. Graphs of standard curves in parametric form.

### Reference Books:

1. H. Anton, Elementary linear algebra with applications (8th Edition), John Wiley 1995.
2. Linear Algebra Theory and Applications - Ward Cheney, David Kincaid. Jones and Bartlet India Pvt. Ltd.
3. Introduction to Linear Algebra - Serge Lang. Springer (India).

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## DEPARTMENT OF COMPUTER SCIENCE

### BCS CS (Hons.) Category – IV

#### Bridge Course – I Basics of Trigonometry, limits, continuity, differentiability

##### Course Outcomes

At the end of the syllabus students will be able to

- CO: 1 Use trigonometry and its formulae in higher semesters.
- CO: 2 Understand the concept of limits and its importance in differentiability.
- CO: 3 Apply the concept of limits and continuity in higher semesters.

**Note:** The syllabus is framed specifically for the B group science students who have not learnt Mathematics in 11<sup>th</sup> and 12<sup>th</sup> Standard. All the results are without proof.

#### CONTENT

**Unit: 1** Unit circle, trigonometric functions, values of trigonometric function at distinct points, relation among trigonometric functions, compound angle formula, double angle formula, half angle formula, triple angle formula, inverse trigonometric functions.

**Unit: 2** Basics of Limits, Continuity and Differentiability:

Right hand limit, Left hand limit and limit of a function.

$\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a}$ ,  $\lim_{x \rightarrow 0} \frac{\sin x}{x}$ ,  $\lim_{x \rightarrow a} \frac{a^h - 1}{h}$  and  $\lim_{n \rightarrow \infty} (1 + \frac{1}{n})^n$ , continuity, differentiability.

##### Reference Books:

1. A Textbook for class XI & XII, National Council of Educational Research and Training.
2. A Class Book of Mathematics for class XII by Chakrabarty S. K., Biswajit Bhagwati ,S. Chand Publishers.