

Vimukta Jati Seva Samitee's  
**Gramin (ACS) Mahavidyalaya VasantNagar Kotgyal**  
**Tq.Mukhed Dist.Nanded**

**Department of Mathematics**

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**Outcomes**

**Algebra and Trigonometry**

1. Add, Subtract and Multiply of Matrices.
2. Recognize the different types of Matrices.
3. Find the Inverse of invertible Matrices.
4. Determine the Rank of a Matrices.
5. Transform matrix to Row Echelon form.
6. Solve the System of Linear Equations.
7. Find the characteristics Roots and characteristic Vectors of a Square Matrix.
8. Check that every square matrix satisfies is own Characteristic Polynomial.

**Geometry – IV**

1. Understanding concepts on Three Dimensional Geometry.
2. Find equations of Right lines, Planes, Spheres, Cones and Cylinders.
3. Find the Direction cosines of any line under the different given conditions.
4. Understand the intersection of any two or three, three dimensional geometrical figures.
5. Transform the equation of a plane to the normal form.
6. Transform equation of line from the unsymmetrical to the symmetrical form.
7. Find the length of perpendicular from a point to a plane.
8. Find the angle of intersection of two spheres.
9. Understanding concepts of plane of contact.

**Real Analysis-I**

1. Understand the basic concept of sets and their properties.
2. Understanding the concept of a neighborhood of a point, interior points of a set, open set.
3. Understanding concept of limit points of a set, closed set, closure of a set, dense set.
4. Understanding the basic concept of sequences, subsequences, bounds of sequences, limit point of sequences, general principle of convergence, different types of sequences.
5. Understanding the concept of infinite series, different types of series, the general principle of convergence.
6. Use the results to solve some problems.
7. Understanding the difference between different types of sequences, series, and comparison tests.

**Elementary Number Theory**

1. Apply different methods of proofs including induction, contradiction, counter examples to verify mathematical assertions.
2. Explain basic concepts like divisibility, greatest common divisor, congruence, linear congruence.
3. Solve systems of Diophantine equations using the Euclidean algorithm and Chinese remainder theorem.
4. Demonstrate knowledge and understanding of prime numbers.
5. Use Fermat's theorem and Wilson's theorem.

## **Partial Differential Equations**

1. Classification of PDE
2. Solve linear as well as non-linear PDE of first and second order.
3. Apply PDE techniques to predict the behavior of certain phenomena.
4. Solve real problems by identifying them approximately from the perspective of PDE.
5. Mathematical formation of real problem precisely.
6. Solve problem using boundary conditions.

## **Ordinary Differential Equations**

1. Understanding concept of solution of differential equations, order and degree.
2. Transform the equations into variable separable form.
3. Transform first-order non-homogeneous equation in x and y to homogeneous equation in x and y and solve it.
4. Find the equations that can be resolved into components equation and solve it.
5. Solve Clairaut's equations.
6. Find the solutions when the auxiliary equations are equal, different, repeated, and imaginary-roots.
7. Find the solution of the exact differential equation, rules of finding the integrating factor.
8. Transform non-linear equation to linear equation and solve it.
9. Find the solution of linear equation with variable coefficients.

## **Numerical Analysis**

1. Estimate the value of function under certain assumptions.
2. Find the missing terms in the given data using numerical techniques.
3. Apply numerical derivation and numerical integration methods.
4. Investigate numerical solutions of differential equations.
5. Find the integration of a functions using numerical methods.
6. Find the solutions of ordinary differential equations.

## **Integral Transforms**

1. Understand the concept of Integral Transforms.
2. Identify integral transforms by their integration limits and kernels.
3. Obtain integral transforms of functions.
4. Know the formulae for integral transforms of standard functions.
5. Understand various properties of integral transforms.
6. Apply the integral transforms for evaluating integrals.
7. Apply the integral transforms along with their inversion formulae for solving differential equations with initial conditions.
8. Apply the integral transforms along with their inversion formulae for solving systems of simultaneous differential equations with initial conditions.

## **Differential Calculus**

1. Understanding concept of limit, continuity of single and two variable functions.
2. Find the higher order derivatives of product of functions.
3. Find equation of Tangent, Normal and length of Tangent Normal, sub-tangent, sub-normal.
4. Understanding of mean value theorem concepts.
5. Expand functions in terms of infinite series.
6. Understand the concepts of partial differentiation.
7. Use the results to solve problems.
8. Differentiate difference between derivative of single and two variables.

## **Integral Calculus –III**

1. Apply method of integration to find the integral of function.
2. Solve examples of definite integrals using properties definite integrals.

3. Find the area and volume of given shape.
4. Understanding concept of Gamma and Beta functions.
5. Solve problems and multiple Integrals.

#### **Practical Paper-V**

1. Verify associativity of matrix addition, left and right distributive law of matrices.
2. Find determinant, Eigen values, Eigen Vectors, inverse, powers and characteristics polynomial of a square matrix.
3. To draw the graph of different functions with the help MATLAB Software and related Freeware.

#### **Group Theory –VII**

1. Understand the concepts on an equivalence relation.
2. Find the examples of equivalence relation.
3. Check whether the given set is a group for the given operation or not.
4. Understand the general properties of groups.
5. Solve problems on groups.
6. Understand the concepts of the cyclic group.
7. Use Lagrange's theorem to solve the problems in number theory.
8. Form a quotient group.
9. Find the Kernel of a group homomorphism.

#### **Real Analysis –II**

1. Understand the meaning of internal subinterval partitions and their refinement.
2. Understanding the basic concept of upper integral and lower integral and Riemann integral.
3. Understanding difference between upper sum, lower sum and Riemann sum.
4. Acquire the idea about Riemann integrability and Riemann integration.
5. Understand various theorems associated with Riemann integration.
6. Understand the meaning of improper integral.
7. Develop a knowledge about Riemann integration and applies to problems.
8. Determine convergence of improper integrals with discontinuities in their domain or infinite limits of integration.
9. Develop skill in checking the convergence of improper integral using various tests of convergence.
10. Understanding distinguishes between convergence and absolute convergence of improper integral.
11. Use comparison test with a corresponding improper integral with other improper integral to decide whether use the results to solve problems.
12. Use the results to solve problems.

#### **Ring Theory –X**

1. Understand given algebraic structure is a ring or not.
2. Construct the example of ring with known examples of ring.
3. Differentiate between zero divisors and non-zero divisors in a given ring.
4. Check whether the given ideal of a ring is a principal ideal or not.
5. Understand the concepts on principal ideal ring.
6. Understand concepts on Euclidean rings.

#### **Metric Spaces-XII**

1. Demonstrate an understanding of metric spaces and subspaces by proving unseen result.
2. Produce examples and counter examples illustrating the mathematical concepts.
3. Understand the concepts of open and closed sets.
4. Understand the concepts and develop skill to check the positions of a point in the space.
5. Understand the concepts of convergences and completeness.
6. Understand the concepts of fixed point and Banach principle.

7. Understand the concepts of continuity and uniform continuity.
8. Understand the concepts of compact and non-compact sets with various properties.
9. Understand the concepts of Lebesgue Number for covers and correctness of sets.
10. After completion of this course student can aware with basic concepts of functional analysis.

### **Linear Algebra –XIII**

1. Understand and prove algebraic statements about vector spaces, subspaces, basis, inner product spaces.
2. Determine a basis and the dimension of finite dimensional space.
3. Understand and prove statements about linear transformation.
4. Find the Kernel, range, rank and nullity of linear transformation.
5. Determine Eigen values and Eigen vectors.
6. Interpret a matrix as a representation of linear transformation.

### **Complex Analysis-XV**

1. Operate basic mathematical operations with complex numbers in Cartesian and Polar forms.
2. Demonstrate the ability of limit, continuity, analyticity of a function.
3. Find the derivative and integral of a complex variable function.
4. Work with exponential and logarithmic functions.
5. Use Cauchy integral theorem and Liouville's theorem.
6. Use Taylor and Laurent's series.