# Details Syllabus of Mathematics (Pass)

**Total Marks = 600**

**Total credits = 24**

| COURSE | MARKS |
|---|---|
| SEMESTER-I | |
| 1  *Course code GMAP01*<br>(A) Classical Algebra<br><br>(B) Trigonometry | 100<br><br>Credit = 4 |
| SEMESTER-II | |
| 2. *Course code GMAP02*<br>(A) Abstract algebra<br><br>(C) Discrete Mathematics | 100<br><br>Credit = 4 |
| SEMESTER-III | |
| 3. *Course code GMAP03*<br>(A)Differential calculus | 100<br><br>Credit = 4 |
| SEMESTER-IV | |
| 4. *Course code GMAP04*<br>(A) Integral Calculus<br><br>(B) Differential Equations | 100<br><br>Credit = 4 |
| SEMESTER-V | |
| 5. *Course code GMAP05*<br>(A) Analytical geometry<br><br>(C) Vector analysis | 100<br><br>Credit = 4 |
| SEMESTER-VI | |
| 6. *Course code GMAP06*<br>(A) Mechanics<br><br>(B) Elementary Statistics | 100<br><br>Credit = 4 |

**GENERAL PROGRAMME**
**SEMESTER – I**

**Course Code: GMAP-01**
**(A) Classical Algebra**

**UNIT-1**:**Theory of equation-I** :Polynomial equations, Relation between roots and coefficients and related problems,Symmetric functions of roots

**UNIT 2**: **Theory of equation-II** : Cardon's method of solution of cubic equation, Descartes' rule of sign, Cardan's Solution of the Standard cubic.

**UNIT 3** : **Inequalities**:Definition,properties, Inequalities involving arithmetic, geometric and harmonic means,Weirstrass inequalities and examples.

**UNIT 4** : **Determinant** : Definition and examples, properties (without proof),problems on determinants (using properties).

**UNIT-5**: **Matrices** : Definition of Matrix and Examples, Types of matrices,Transpose of a matrix,symmetric and skew-symmetric matrix,algebra of matrices:Addition of matrices,scalar multiplication,subtraction of matrices,multiplication of matrices: Adjoint and inverse of a matrix and its existence,

**UNIT 6** : **Rank :** : Definition of rank of a matrix,Properties
**UNIT7 :Elementary Operations** : Elementary operations ,Inverse Using Elementary operations.

**UNIT 8** :**System of Linear Equations** :Solution of a system of linear equations by matrix method, Solution of a system of linear equations by Cramer's rule

**UNIT 9** : **Eigen Values and Eigen Vectors** : Characteristic equation of a matrix,Characteristic matrix, Definition,properties of eigenvalues and eigenvectors,
**UNIT 10 :Cayley Hamilton Theorem :**
Cayley Hamilton (Statement only) and its application.

**(B) Trigonometry**

**UNIT-11**:**De Moivre's theorem and its application** : Statement and proof, Important deductions from De Moivre's theorem. Extraction of roots of complex numbers,solution of equation.

**UNIT-12: Expansion of Trigonometric function** :Expansion for cosine and sine.

**UNIT 13** :**Hyperbolic function** :Definition & Examples ,Relation between Hyperbolic Functions - Inverse Hyperbolic Functions.
**UNIT 14**: **Logarithm of a complex number** :Definition,Examples
**UNIT 15** : **Trigonometric series**: Gregory Series and other related series,Summation of trigonometric series(when the angles are in A.P, C+iS method,Method of differences )

## SEMESTER-II

## Course Code: GMAP-02
### (A) Abstract Algebra

**UNIT-1** : **Relation & Functions** :Relations and Types of relations,equivalence relation,function and types of function.
**UNIT 2** : **Binary Operation** : Definition,Types of binary operation
**UNIT-3**: **Group** :Definitions and Examples of groups, Properties of groups
**UNIT 4** : **Subgroups:** Definition,Examples,Properties, cyclic groups,
**UNIT 5** : **Group of permutation** : Definition of permutation,different kinds of permutation,permutation group.
**UNIT 6**: **Cosets** : Definition,properties of cosets,Lagrange's Theorem
**UNIT 7** : **Normal subgroups &Quotient groups** : Definition and Examples,properties.
**UNIT 8** : **Homomorphism of groups**: Definition and Examples,Properties of Homomorphism
**UNIT-9:Ring** :Definitions and Examples of Rings,Properties of Ring
**UNIT 10** : **Integral domain :**Definition and Examples,Properties.
**UNIT11: Field**: Definition and Examples,Properties.
**UNIT 12** : **Vector Space** : Definition and Examples,Subspace,Properties,Linear dependence and Independence,Basis and Dimension.

### (B) Discrete Mathematics

**UNIT-13**: **Combinatorics** : The rules of sum and product,permutations,combinations.

**UNIT-14**: **Mathematical Logic**:Propositions and Logical connectives,Truth table,construction of truth tables,tautologies and contradictions,Equivalence and Implication.
**UNIT 15 :Boolean Algebra :** Definition,Basic Boolean algebra Laws,Boolean expression.

## SEMESTER-III

### Course code :GMAP-03

**Differential Calculus :**

**UNIT-1**: **Function** : Definition,Domain and range,Classification of a function.
**UNIT 2** :**Limit of a function**:Concept of limit of a function,properties.
**UNIT 3** :**Continuity of a function** : Definition and examples,properties
**UNIT 4** :**Differentiability of a function** : Definition and Examples,properties
**UNIT 5** :**Indeterminate form** : Definition, L'Hospital's Rule.
**UNIT-6**:**Derivative of a function:**Derivative of various standard function,Derivative of sum and difference of functions,Derivative of product of functions,Quotient rule,
**UNIT 7** :**Derivative of some special function** :Derivative of trigonometric functions, Derivative of exponential and logarithmic function. Logarithmic Differentiation, Derivative of hyperbolic function.
**UNIT-8**: **Successive differention** :Leibnitz's theorem for the nth derivative of the product of two functions.

**UNIT-9**:**Application of derivatives**:Increasing and Decreasing of a function,Derivatives as rate measurer, Maximum and minimum of a function,
**UNIT 10 : Tangent and Normals** :Curvature,tangent and normals.

**UNIT-11**:**Mean Value theorem** : Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem,

**UNIT-12**:**Function of several variables**: Partial Derivatives, homogeneous function, Euler's theorem on homogeneous function.

**UNIT-13**: **EXTREME VALUE OF FUNCTION :** Maximum and minimum of a function of two variables,Definition,Examples,Application.
**UNIT 14**: **Jacobians** : Definition, its properties.

**UNIT 15** : **Lagrange method of undetermined multipliers :**
Statement,Application.

## SEMESTER- IV

## Course Code : GMAP-04

### (A) Integral calculus:

**UNIT-1**: **Integration and Methods of Integration:** Introduction, Integration of simple functions,Properties of Integrals, Methods of integration: Integration by substation,Integration by parts,Integration by Partial fraction.

**UNIT2** :**Definite integrals**:Definition,Fundamental properties of definite integrals, Evaluation of definite integrals by using properties only.

**UNIT-3**:. **Reduction formulae** : Derivation of some reduction formulae

**UNIT-4**:**Quadrature of plane areas** :Definition,Areas in Cartesian coordinates,Areas bounded by two curves.

**UNIT-5**:**Rectification of plane curves** : Definition,Formula for Cartesian equation

**UNIT-6 :Volume of revolution and surface of revolution**: Volume of revolution about x-axis,Area of the curved surface of a solid of revolution about x-axis.

### (B) Differential equation:(Ordinary and Partial)

**UNIT-7**:**DifferentialEquation:Fundamental concepts:**Definition and Examples,Order and degree of ordinary differential equation,Linear and non-linear differential equation,Formation of a differential equation.

**UNIT-8**: **Differential equation of first order and first degree:**Solution of differential equation ,Differential equation of first order and first degree; solution by variable separable methods;homogeneous equations

**UNIT-9:Linear differential equation of first order** : linear differential equations ,Bernoull's equation, exact differential equations.

**UNIT-10 : Application of differential equation of first order and first degree**: Problems related to economics.

**UNIT-11**: **First order and higher degree differential equation:** First order higher degree equations solvable for x, y and p,Clairaut's form.

**UNIT-12**: **Linear differential equation of higher order:** Linear differential equation of higher order with constant coefficients,

**UNIT 13**: **Simultaneous linear differential equation**: Simultaneous equation of the first order

**UNIT 14**: **Partial differential equation**: Formation of Partial differential equation,

 **UNIT 15** :**Linar partial differential equation** :  Solution of first order and first degree partial differential equation,Lagrange's solution of linear equation.

## SEMESTER-V

## Course Code: GMAP-05

**(A) Analytical geometry of 2 dimension :**

**UNIT-1: Intoduction of straight lines** : Slope of a line,Various standard forms of equation of straight lines.
**UNIT -2 :Tranformation of coordinate axes** : Translation and rotation,Related theories and problems.

**UNIT-3 : Pair of straight lines**,Pair of straight lines though origin, Angle and Bisectors of the angle between the lines given by homogenous equation of 2nd degree, Condition for the general equation of second degree to represent a pair of straight lines, Pair of intersecting straight lines, Pair of parallel straight lines.

**UNIT-4**:  **Circle**: Second degree equation of  a circle,Equation of a circle when end points of its diameter is given , tangent and normal,

**UNIT-5**:**Conic sections**: Parabola and its standard equation, Ellipse and its standard equation, hyperbola and its standard equation, Conjugate Hyperbola, Conjugate Diameter for Ellipse and Hyperbola.
 **(B)   Analytical geometry of 3 dimension :**

**UNIT-6**::**Introduction of co-ordinate in three dimention**:Coordinate axes, Direction cosine of a line,direction ratio of a line

**UNIT -7:Plane & Stright line** : Plane, straight lines, in three dimensions, equation of plane & straight line

**UNIT-8**: **Sphere**: Definition and General equation of Sphere.

**UNIT -9: Cone** : Definition and General equation of Cone.

**UNIT -10** : **Cylinder** : Definition and General equation of Cylinder.

 **(B) Vector analysis :**

**UNIT-11: Introduction to Vectors** :Classification of vectors,Algebra of vectors:Addition of vectors,subtraction of vectors, Multiplication vectors by scalars.

**UNIT-12:Product of vectors**:Scalar or dot product and cross or vector product of two vectors,Properties and problems.

**UNIT -13:Scalar triple product and vector triple product** : Geometrical meaning of scalar triple product,product of four vectors.

**UNIT-14:Vector calculus** :Scalar point function, Vector point function, Ordinary derivatives of vectors, Differentiation formulae,

**UNIT 15** : **Differential operators and directional derivative** :Vector differential operator del, Partial derivatives of vectors, , gradient, divergence , curl and identities( Cartesian coordinates Only),Laplacian operator.

# SEMESTER-VI

## Course Code: GMAP-06

### (A) Mechanics

**UNIT-1: Forces**: Types of forces, Magnitude and direction of the resultant of the forces acting on a particle.

**UNIT-2**: **Coplanar forces :**Triangle law of forces,polygon of forces,Lami's theorem, equilibrium of a particle under several coplanar forces, parallel forces, moments, couples-simple problems,Friction.

**UNIT -3 : Moments and couples** :Definition and examples,simple problem.

**UNIT-4 : Friction** : Definition,types of friction,laws of friction,simple problems.

**UNIT-5**: **Kinematics of a particle :**kinematics of a particle, velocity, acceleration, relative velocity, angular velocity, Newton's laws of motion, equation of motion, rectilinear motion under constant acceleration,

**UNIT-6 Simple harmonic motion** :simple harmonic motion and related problems

### (B) Elementary Statistics

**UNIT 7** : **Measures of Cental tendency**  :Introduction,Arithmetic mean (A.M.),Properties of arithmetic mean,Median,Mode,Geometric mean (G.M.),Harmonic mean (H.M.).

**UNIT-8**: **Measures of Dispersion**: Range, Quartile deviation,Mean deviation,Standard deviation,  co-efficient of variation.

**UNIT 9** : **Moments,Skewness & Kurtosis** : Moments,Moments –raw and central,Relation between raw and central moments,Skew ness,Measures of skew ness,kurtosis,Measures of kurtosis

**UNIT-10**: **Probability**: Basic terminology: Random experiment, sample space ,events ,Classical definition of probability, Axiomatic approach to probability. Some theorems on probability.

**UNIT-11**: **Conditional probability** :Multiplication theorem of probability, Independent events, Multiplication theorem of probability for independent events, Extension of multiplication theorem of probability, Law of Total probability,Bayes theorem.

**UNIT 12** : **Random variables and probability distribution :**
Definition(discrete and continuous type)

**UNIT 13** : **Theoretical Distribution-I** : Standard Distributions: Discrete type Bernoulli, Binomial, Poisson distributions(definition,  properties and applications).

**UNIT 14**: **Theoretical Distribution-II** : Continuous type,Normal (definition, properties and application)

**UNIT 15 : Time Series** :Definition of Time Series,Importance of Time Series Analysis,Components of a Time Series,Methods of Measuring Secular Trend,Estimation of the Trend by the Method of Moving Average

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