

## ANNEXURE - II

### SYLLABI FOR ENTRANCE TESTS IN ENGINEERING COURSES 611 - B.Tech Degree Programmes (Self-Supported Mode) (As per the APEAPCET-2024)

#### MATHEMATICS

##### ALGEBRA

- a) **Functions:** Types of functions – Definitions - Real valued functions (Domain and Range).
- b) **Matrices:** Types of matrices - Scalar multiple of a matrix and multiplication of matrices- Transpose of a matrix – Determinants (excluding properties of determinants) - Adjoint and Inverse of a matrix - Rank of a matrix - solution of simultaneous linear equations (Excluding Gauss Jordan Method).
- c) **Complex Numbers:** Complex number as an ordered pair of real numbers fundamental operations - Representation of complex numbers in the form  $a+ib$  (excluding Square root of Complex numbers and related problems) - Modulus and amplitude of complex numbers –Illustrations - Geometrical and Polar Representation of complex numbers in Argand plane-Argand diagram.
- d) **De Moivre's Theorem:** De Moivre's theorem- Integral and Rational indices -  $n^{\text{th}}$  roots of unity Geometrical Interpretations –Illustrations.
- e) **Quadratic Expressions:** Quadratic expressions, equations in one variable - Sign of quadratic expressions – Change in signs – Maximum and minimum values.
- f) **Theory of Equations:** The relation between the roots and coefficients in an equation - Solving the equations when two or more roots of it are connected by certain relation - Equation with real coefficients, occurrence of complex roots in conjugate pairs and its consequences.
- g) **Permutations and Combinations:** Fundamental Principle of counting – linear and circular permutations- Permutations of 'n' dissimilar things taken 'r' at a time - Permutations when repetitions allowed - Circular permutations - Permutations with constraint repetitions Combinations-definitions, certain theorems. (Excluding derivation of **Formula  ${}^n P_r$  and  ${}^n C_r$**  ).
- h) **Partial fractions:** Partial fractions of  $f(x)/g(x)$  when  $g(x)$  contains non –repeated linear factors Partial fractions of  $f(x)/g(x)$  where both  $f(x)$  and  $g(x)$  are polynomials and when  $g(x)$  contains repeated and/or non-repeated linear factors - Partial fractions of  $f(x)/g(x)$  when  $g(x)$  contains irreducible factors (excluding conversion of  $f(x)/g(x)$  in power series of  $x$ ).

##### TRIGONOMETRY

- a) **Trigonometric Ratios upto Transformations:** Graphs and Periodicity of Trigonometric functions - Trigonometric ratios and Compound angles - Trigonometric ratios of multiple and sub- multiple angles - Transformations - Sum and Product rules.
- b) **Hyperbolic Functions:** Definition of Hyperbolic Function – Graphs - Definition of Inverse Hyperbolic Functions – Graphs - Addition formulae of Hyperbolic Functions.
- c) **Properties of Triangles:** Relation between sides and angles of a Triangle - Sine, Cosine, Tangent and Projection rules- Half angle formulae and areas of a triangle–In-circle and Ex-circle of a Triangle (excluding problems related to heights and distances).

## **VECTOR ALGEBRA**

- a) **Addition of Vectors:** Vectors as a triad of real numbers - Classification of vectors - Addition of vectors - Scalar multiplication - Angle between two non-zero vectors – Linear combination of vectors - Component of a vector in three dimensions - Vector equations of line and plane including their Cartesian equivalent forms.
- b) **Product of Vectors:** Scalar Product - Geometrical Interpretations - orthogonal projections Properties of dot product - Expression of dot product in i, j, k system - Angle between two vectors - Geometrical Vector methods – Vector equations of plane in normal form-Angle between two planes- Vector product of two vectors and properties- Vector product in i, j, k system - Vector Areas.

## **MEASURES OF DISPERSION AND PROBABILITY**

- a) **Measures of Dispersion** - Range - Mean deviation - Variance and standard deviation of ungrouped/grouped data.
- b) **Probability:** Random experiments and events - Classical definition of probability, Axiomatic approach and addition theorem of probability - Independent and dependent events - conditional probability- multiplication theorem and Baye's theorem.
- c) **Random Variables and Probability Distributions:** Random Variables - Theoretical discrete distributions – Binomial and Poisson Distributions.

## **COORDINATE GEOMETRY**

- a) **Locus:** Definition of locus –Illustrations-To find equations of locus-Problems connected to it.
- b) **The Straight Line:** Revision of fundamental results - Straight line - Normal form – Illustrations - Straight line - Symmetric form - Straight line - Reduction into various forms - Intersection of two Straight Lines - Family of straight lines - Concurrent lines - Condition for Concurrent lines - Angle between two lines - Length of perpendicular from a point to a Line - Distance between two parallel lines - Concurrent lines - properties related to a triangle.
- c) **Pair of Straight lines:** Equations of pair of lines passing through origin - angle between a pair of lines - Condition for perpendicular and coincident lines, bisectors of angles - Pair of bisectors of angles (excluding proofs of all the theorems only) - Pair of lines - second degree general equation - Conditions for parallel lines - distance between them, Point of intersection of pair of lines - Homogenizing a second degree equation with a first degree equation in x and y.
- d) **Circle :** Equation of circle -standard form-centre and radius equation of a circle with a given line segment as diameter & equation of circle through three non collinear points - parametric equations of a circle - Position of a point in the plane of a circle – power of a point-definition of tangent-length of tangent - Position of a straight line in the plane of a circle-conditions for a line to be tangent – chord joining two points on a circle – equation of the tangent at a point on the circle- point of contact-equation of normal - Chord of contact - pole and polar-conjugate points and conjugate lines - equation of chord with given middle point.
- e) **System of circles:** Angle between two intersecting circles - Radical axis of two circles-properties- Common chord and common tangent of two circles – radical centre - Intersection of a line and a Circle.
- f) **Parabola:** Conic sections –Parabola- equation of parabola in standard form-different forms of parabola- parametric equations.
- g) **Ellipse:** Equation of ellipse in standard form- Parametric equations.
- h) **Hyperbola:** Equation of hyperbola in standard form- Parametric equations - Equations of tangent and normal at a point on the hyperbola (Cartesian and parametric) - conditions for a straight line to be a tangent-Asymptotes.

- i) **Three Dimensional Coordinates:** Coordinates - Section formulae - Centroid of a triangle and tetrahedron.
- j) **Direction Cosines and Direction Ratios:** Direction Cosines – Direction Ratios (Excluding angle between two lines and problems related to it).
- k) **Plane:** Cartesian equation of Plane – Simple Illustrations (Excluding angle between two planes and problems related to it).

### CALCULUS

- a) **Limits and Continuity:** Intervals and neighborhoods – Limits - Standard Limits –Continuity.
- b) **Differentiation:** Derivative of a function - Elementary Properties - Trigonometric, Inverse Trigonometric, Hyperbolic, Inverse Hyperbolic Function – Derivatives - Methods of Differentiation - Second Order Derivatives.
- c) **Applications of Derivatives:** Geometrical Interpretation of a derivative - Equations of tangents and normals - Angles between two curves and condition for orthogonality of curves - Increasing and decreasing functions - Maxima and Minima.
- d) **Integration:** Integration as the inverse process of differentiation- Standard forms - properties of integrals - Method of substitution- integration of Algebraic, exponential, logarithmic, trigonometric and inverse trigonometric functions (excluding the integrals of the form

$\int \sqrt{ax^2 + bx + c} dx$ ,  $\int (px + q) \sqrt{ax^2 + bx + c} dx$ - Integration by parts – Integration by partial fractions method – Reduction formulae.

- e) **Definite Integrals:** Fundamental theorem of Integral Calculus– Properties - Reduction formulae.
- f) **Differential equations:** Degree and order of an ordinary differential equation - Solving differential equation by i) Variables separable method, ii) Homogeneous differential equation, iii) Linear differential equations (excluding Solution of linear differential Equations of the type  $\frac{dx}{dy} + Px = Q$ , Where P and Q are constants or functions of y only. ay

### PHYSICS

1. **PHYSICAL WORLD:** What is physics? Scope and excitement of physics. Physics, technology and society Fundamental forces in nature. Nature of physical laws
2. **UNITS AND MEASUREMENTS: Introduction,** The international system of units, Measurement of Length, Measurement of Large Distances, Estimation of Very Small Distances, Size of a Molecule, Range of Lengths, Measurement of Mass, Range of Masses, Measurement of time, Accuracy, precision of instruments and errors in measurement, Systematic errors, random errors, least count error, Absolute Error, Relative Error and Percentage Error, Combination of Errors, Significant figures, Rules for Arithmetic Operations with Significant Figures, Rounding off the Uncertain Digits, Rules for Determining the Uncertainty in the Results of Arithmetic Calculations, Dimensions of Physical Quantities, Dimensional Formulae and dimensional equations, Dimensional Analysis and its Applications, Checking the Dimensional Consistency of Equations, Deducing Relation among the Physical Quantities.
3. **MOTION IN A STRAIGHT LINE: Introduction,** Position, path length and displacement, average velocity and average speed, instantaneous velocity and speed, acceleration, kinematic equations for uniformly accelerated motion, relative velocity.
4. **MOTION IN A PLANE: Introduction,** Scalars and vectors, position and displacement vectors, equality of vectors, multiplication of vectors by real numbers, addition and subtraction of vectors - graphical method, resolution of vectors, vector addition - analytical method, motion in a plane, position vector and displacement, velocity, acceleration, motion in a plane with constant acceleration, relative velocity in two dimensions, projectile motion, equation of path of a projectile,