

Recommended Syllabus For CET (Engineering) 2012

MATHEMATICS (I)

1. **Trigonometry** Angle and its measurements, Standard angles, Angles in quadrant and quadrantal angles, Relation between degree measure and radian measure, Length of arc of a circle, Area of sector **Trigonometric ratios** : Trigonometric ratios of any angle, Signs of Trigonometric ratios in different quadrants, Fundamental identities , Trigonometric ratios of compound angles, Trigonometric ratios of allied angles, Trigonometric ratios of multiple angles, Trigonometric ratios of half angles, Factorization and Defactorization formulae , Sum and difference of two angles , **Properties of Triangle** : Trigonometric ratios of angles of a triangle, Cosine rule, Sine rule, Projection rule, **Inverse Circular functions** : Properties of inverse circular functions,
2. **Determinant** Determinant of order 3, (Expansion and Properties), Cramer's rule, Condition of consistency, Area of a triangle,
3. **Sets, Relations and Functions** Review of set theory, Power set, Cartesian product, Relations, Functions, Types of functions, Graphs of functions, Composite function, Inverse function, Constant function
4. **Logarithm** Introduction and definition, Laws of logarithm with proof, Change of base, Numerical Problems.
5. **Complex Numbers** Complex Number in the form $a+ib$, Modulus, Complex Conjugate, Argument of Complex Number, Algebra of Complex numbers, Square roots of Complex numbers, Argand diagram
6. **Quadratic Equations** Roots of equation, Nature of roots, Sum and product of roots, Formation of quadratic equation, Symmetric functions of roots, Complex cube roots of unity
7. **Sequences and Series** Arithmetic Progression, Geometric progression , Harmonic progression, Arithmetic mean, Geometric mean, Harmonic mean , Special series n , n^2 , n^3 and their uses
8. **Permutations and Combinations** Factorial Notation, Properties of $n!$, Fundamental Principle of Counting, Permutations, Permutations of repeated objects, Combinations, Relation between permutations and combinations,

9. Mathematical Induction and Binomial Theorem	Principle of Mathematical Induction and its applications, Binomial Theorem for, (statement only), Obtaining general term in the expansion
10. Limits & Continuity	Standard Limits, Definitions, Algebra of limits (without proof), Limit at infinity, Continuity of a function at a point, Continuity of a function in the interval, Algebra of continuous functions, Types of discontinuity, Continuity of some standard functions.
11. Differentiation	Definition of Derivative, Derivatives of-(a) Constant functions,(b) Power functions,(c) Trigonometric functions, Derivatives of $\log x, a^x, e^x$ (without proof), Rules of Differentiators :(a) Derivative of sum (b) Derivative of Difference (c) Derivative of product (d) Derivative of Quotient, Derivative from first principle, Relation between continuity and differentiability, Derivative of composite function, Derivative of inverse functions, Derivative of implicit functions, Derivative of parametric functions, Second order derivative
12. Applications of Derivatives	Increasing and decreasing functions, Tangent and normal at a point to a curve, Rate measurer, related rates, Approximations and small errors, Maxima and minima
13. Integration	<p>Definition of an Integral, Integral as a limit of sum, Integrals of some standard functions. Rules of integration on</p> <p>a) $\{f(x) + g(x)\} dx = f(x)dx + g(x)dx$</p> <p>b) $\{f(x) - g(x)\} dx = f(x) dx - g(x) dx$</p> <p>c) $kf(x)dx = k \int f(x)dx$</p> <p>If $\int f(x) dx = \int (x) + c$ then $\int f(ax + b) dx = \frac{(ax+b)}{a} + c$</p> <p>Definite Integrals, Methods of integration., a) Substitution Method., b) Integration by parts., c) Integration by partial fractions., Definite integrals, (a) Fundamental Theorem of integral calculus (without proof)., (b) Properties of definite integrals</p>
14. Application of integral	Area under the curve, Volume of solid by revaluation,

15. **Differential equations** Definitions of Differential equation, order, degree, General solution and Particular solution., Formation of Differential equation., Solutions of First order and first degree differential equations. a) Variables separable method (b) Homogeneous and non-homogeneous differential equations, Applications of Differential equations, Growth and decay
16. **Numerical Methods** Finite differences, Interpolation a) Newton's forward and backward difference Interpolation formulae (without proof) Numerical integration - a) Trapezoidal Rule b) Simpson's(1/3)rd and (3/8)th Rule
17. **Boolean Algebra** Boolean Algebra as an algebraic structure, Principle of duality, Boolean function and switching circuits., Application of Boolean Algebra to switching circuits.
18. **Mathematical Logic** Statements, Truth values of statement, Compound statement, Logical connectives and truth table, Statement pattern and logical equivalence, Tautology, Contradiction, Contingency, Applications of logic to switching circuits
19. **Matrices** Definition and types of matrices, Algebra of matrices, Elementary transformation and Inverse of Matrix by elementary transformation, Minors and cofactor of elements, Adjoint of matrix, Inverse by adjoint method, Solution of Linear Equations by reduction method and inversion method
20. **Plane Co-ordinate Geometry** **Locus** : definition of locus, Equation of locus, Point of locus, Shift of origin,
Line : Definition of line, slope of line, equation of lines in standard forms, general equation, angle between two lines, point of intersection of lines, conditions of concurrent lines, distance of a point from a line, family of lines
Pair of straight lines : Pair of lines passing through origin, Pair of lines not passing through origin. Condition that general second degree equation in x and y represents a pair of lines, conditions of parallel lines and perpendicular lines, angle between the lines represented by $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$
Circle- Different forms of Equations of a circle, Standard equation, General equation, Centre-radius form, Parametric equation of a circle, Tangent and normal, Equations of tangent and normal, condition of tangency to the standard circle, Director circle, Length of tangent segment, tangent in terms of slope,

Conics- Equations of conics, Definition of conic, Focus, Directrix, Eccentricity, Classification of conics, Standard equations of parabola, Ellipse, Hyperbola, Tangents and Normals, Equation of tangent and normal at a point, condition of tangency, tangent in terms of slope.

21. Vectors

Scalar and vector, Different types of vectors, Collinear vectors, Co-planar vectors, Algebra of vectors, Addition of vectors, Scalar multiplication of Vectors, Position vectors, Scalar products and its properties, Vector products and its properties, Angle between two vectors, Collinearity and Coplanarity of vectors, Section formula., Midpoint formula, Centroid formula, Scalar triple product., Volume of parallelopiped, Applications of vectors to Geometry. Applications of vectors to mechanics.

22. Three-Dimensional Geometry

Direction Cosines and Ratios : Relation between direction cosines and direction ratios, Angle between two lines, Condition of perpendicular and parallel lines,

Lines : Equation of line passing through given point and parallel to given vector, Equation of line passing through given two points, (Vector and Cartesian form), **Plane** : Equation of plane in different forms, Equation of plane passing through three points, angle between two planes, (Vector and Cartesian form).

23. Linear Programming-

Solution of linear inequalities in one & two variable, Introduction of concepts, Formation of linear programming problem, Graphical solution of linear programming problem, Simplex Method (Number of variable not more than 2).

24. Statistics

Measures of dispersion : Range, Mean Deviation, Variance and standard deviation, Quartile deviation,

Bivariate frequency Distribution : Tabulation, Correlation, Scatter diagram, Covariance, Karl Pearson's coefficient of correlation.

Probability : Events and Algebra of events, Definition of probability, Addition theorem, Multiplication theorem, Conditional probability, Independent events, Baye's theorem, Random variable, Discrete and continuous random variable, Probability distribution of discrete and continuous random variable.



Physics

Mechanics and Properties of Matter

- 1) **Measurements** Need for measurements, Unit for measurements, System of unit, S.I. units, Fundamental and derived units, Dimensional Analysis, Order of magnitude and significant figures, Accuracy and errors in measurements.
- 2) **Scalars And Vectors** Addition and subtraction of vectors, Product of vectors (scalar product and vector product) 3) **Projectile Motion** Uniformly accelerated motion along a straight line, Velocity-time graph and position-time graph, Equation of the path of a projectile, Time of flight, Horizontal range, Maximum height of a projectile.
- 4) **Force** Types of force, General idea of gravitational, electromagnetic and nuclear forces from daily life experiences, Law of conservation of momentum, Elastic and inelastic collisions, inertial and non-inertial frames, Moment of force, Couple and properties of couple, Centre of mass, Centre of gravity, Conditions of equilibrium of a rigid body
- 5) **Friction in Solids and Liquids** Origin and nature of frictional forces, Laws of static friction, Laws of kinetics friction (sliding & rolling), Viscosity, Pressure due to fluid column, Pascal's law and its applications, Effect of gravity on fluid pressure, Stream-line flow, Turbulent flow, Viscous force, Newton's formula, Stoke's law, Equation for terminal velocity, Reynold's number, Bernaulli's principle and its applications

Sound

- 6) **Sound Waves** Waves and oscillations, Progressive waves (longitudinal and transverse), Characteristics of transverse waves, Characteristics of longitudinal waves, Sound as longitudinal wave motion, Relation between velocity, wavelength and frequency, Newton's formula (without derivation) for velocity of sound, Laplace's correction, Musical sound and noise, Musical scale.

Heat

- 7) **Thermal Expansion** Expansion of solids, Linear expansion and derivation for coefficient of linear expansion., Ideas of areal and volume expansion, Expansion of liquids - real and apparent (concept only), Thermal conduction, Temperature gradient, Coefficient of thermal conductivity

Light

- 8) **Refraction of Light** Refraction of monochromatic light, Snell's law, Total internal reflection, Critical angle, dispersive power., Rainbow, Scattering of light, Blue colour of sky of sky, Colour of sun at sunrise and sunset

- 9) **Lens** Refraction at a single curved surface, Lens equation, Concept of conjugate foci, Magnifying power of a simple microscope, Magnifying power of a compound microscope, M.P. of a telescope, Lens defects – chromatic and achromatic

Electricity and Magnetism

- 10) **Electrostatics** Frictional electricity, Charges and their conservation, Coulomb's law and dielectric constant, Forces between multiple electric charges, Superposition principle of forces., Continuous distribution of charges, concept of charge density, Electric field intensity due to a point charge, Electric potential due to a point charge, Relation between electric field intensity and potential, Potential difference., Volt, electron volt, Electric dipole and electric dipole moment (unit and definition), Electric lines of force
- 11) **Current Electricity** Ohm's law, Resistance, Specific resistance (different materials), Temperature dependence of resistance., Thermistor., Colour code of carbon resistor, E.M.F and internal resistance of a cell, Work done by electric current (heating), Power in electric current
- 12) **Magnetic Effect of electric current** Biot Savart law, Right hand rule, Magnetic induction at the center of a circular coil carrying current, Magnetic induction at a point along the axis of a coil carrying current., Fleming's left hand rule., Force acting on a conductor carrying current in a magnetic field., Definition of ampere, Force between two long current carrying parallel conductors
- 13) **Magnetism** General idea of origin of magnetism due to moving charges, Equivalence between magnetic dipole and a circular coil carrying electric current, Definition of magnetic dipole moment and its unit., Torque acting on magnet in uniform magnetic induction., Tangent law., Magnetic induction at a point along the axis and equator of a bar magnet

Modern Physics

- 14) **Electromagnetic Waves** Electromagnetic waves and their characteristics (qualitative idea only), Transverse nature of electromagnetic waves, Electromagnetic spectrum (radio, microwaves, infrared, visible rays ultraviolet rays, x-rays, gamma rays) including elementary facts about their uses, Propagation of electromagnetic waves in atmosphere.

Mechanics and Properties of Matter

- 15) **Circular Motion** Angular displacement, angular velocity, angular accelerations, Relation between linear velocity and angular velocity Uniform circular motion, Radial acceleration, Centripetal and centrifugal force, Banking of road, vertical circular motion, Equation for velocity and energy at different

positions of vertical circular motion, Kinematical equations for circular motion in analogy with linear motion

16) Gravitation

Newton's law of gravitation, Projection of a satellite, Periodic time, Statement of Kepler's three laws of motion, Binding energy and escape velocity of a satellite resting on the surface of the earth and moving in the circular orbit, Weightlessness condition in a satellite, Variation of 'g' due to change in altitude, latitude and depth (below the surface of earth), Communication satellite and uses of satellites

17) Rotational Motion

Definition of moment of inertia., K.E. of rotating body, Physical significance of M.I. Radius of gyration (concept and significance), Torque, principal of perpendicular, parallel axes, Application of the principle to M.I. of uniform rod, ring, disc, solid, cylindrical and solid sphere with proof I, Angular momentum and its conservation

18) Oscillations

Explanation of periodic motion, Simple harmonic motion, Differential equation for linear S.H.M., Projection of U.C.M. along a diameter as S.H.M., Phase of S.H.M., K.E. and P. E. of a particle performing S.H.M., Composition of two S.H.M.'s having same period and along the same line (analytical treatment)., Simple pendulum., Angular S.H.M. and its differential equation., Magnet vibrating in the uniform magnetic induction

19) Elasticity

Deformation., General explanation of elastic property and elasticity., Plasticity, Definition of stress and strain., Hooke's law, Elastic constants Y, K, h and relation between them, Determination of Young's modulus by Searle's method, Observation on a wire under applied increasing load, Work done in stretching a thin uniform wire by calculus method.

20) Surface Tension

S.T. on the basis of molecular theory, surface energy, surface tension, Angle of contact, Capillary and Capillary action, Effect of impurity and temperature on S.T.

Sound

21) Wave Motion

Simple harmonic progressive waves, Reflection of transverse and longitudinal waves., Change of phase, Superposition of sound waves, Formation of beats; Doppler effect

22) Stationary Waves

Study of vibrations on string, Formation of stationary waves on string, Study of vibrations of air columns, Forced vibrations., Resonance., Experiments - sonometer, resonance tube, Melde's experiment

Heat

- 23) **Kinetic Theory of Gases** Concept of an ideal gas, Assumptions of kinetic theory., Mean free path., Derivation for pressure of a gas in the container by using Cartesian coordinates, Derivation of Boyle's law, Specific heat at constant volume and constant pressure, Internal and external latent heat
- 24) **Radiation** Absorption emission, reflection of heat radiation, perfectly black body, spectrum of a black body radiation in terms of wavelength, Emissive power and absorptive power, Kirchhoff's law of radiation and its theoretical proof, Prevost's theory of heat exchange, Ritchie's experiment, Stefan's law, Newton's law of cooling and radiation correction., Solar constant and surface temperature of sun

Light

- 25) **Wave Theory of Light** Wave theory of light, Huygen's principle., Construction of plane and spherical wave front, Wave front and wave normal, Refraction at plane surface, Polarisation., Plane polarized light., Brewsters law, Nicol prism., Polaroids
- 26) **Interference and Diffraction** Interference of light, Conditions for producing steady interference pattern, Young's experiment, Analytical treatment of interference band, Measurement of wavelength by biprism experiment, Diffraction due to single slit, Rayleighs criteria, Resolving power of microscope and telescope, Difference between interference and diffraction

Electricity and Magnetism

- 27) **Electrostatics** Gauss theorem, proof and applications, Mechanical force on unit area of a charged conductor., Energy density of the medium, Concept of condenser, Capacity of a parallel plate condenser, Effect of dielectrics on capacity., Energy of a charged condenser, Condensers in series and parallel, Van-de-Graaff generator
- 28) **Current Electricity** Kirchhoff's laws, Wheatstone's bridge, Meterbridge, Potentiometer, Thermoelectricity, Seeback effect, Thomson effect and Peltier effect, Thermocouple, Neutral and inversion temperature
- 29) **Magnetic Effect of Electric current** Ampere's law and its applications, Moving coil galvanometer, Ammeter, Voltmeter, Sensitivity and accuracy of M.C.G., Theory and construction of Tangent galvanometer, Sensitivity and accuracy of T.G., Cyclotron
- 30) **Magnetism** Magnetic induction at any point due to a short magnetic dipole., Magnetic potential at any point due to short magnetic dipole, Diamagnetism, Paramagnetism and ferromagnetism on the basis of domain theory, Curie temperature

31) Electromagnetic Induction

Laws of electromagnetic induction, proof of $e = -d\phi/dt$., Eddy currents., Self induction and mutual induction., Transformer, Coil rotating in a uniform magnetic induction, Alternating currents, Reactance and impedance., Power in a.c. circuit with resistance, inductance and capacitance, Resonant circuits

Modern Physics

32) Electrons and Photons

Discovery of electron, charge and mass of electron, photoelectric effect, Einstein's equation, Photoelectric cell and its applications

33) Atoms, molecules and Nuclei

Bohr model., Hydrogen Spectrum, Maser and laser as light sources., deBroglie's hypothesis, Wavelength of an electron., Davisson and Germer experiment, Elementary idea of electron microscope

34) Semiconductors

Energy bands in solids, Intrinsic and extrinsic semiconductors, P-type and N-type semiconductors, P-N junction diodes, Rectifiers, Zener diode as a voltage regulator, Solar cell, LED., Transistor as an amplifier., Oscillators, Logic gates

35) Communication

Space communication, Ground, sky and space wave propagation; satellite communication, Application of remote sensing, Line communication, Two-wire lines, Cables, Optical Communication,

36) Non-Evaluative

Biographies of scientists., Historical prospectives of astronomy, universe., Universe., Information Camera, binoculars, Dimensions of electrical fundamental quantities., Applications of S.H.M. such as spring, liquid in U-tube, metallic block above a platform with vertical spring., Elementary idea of I.C.'s., Simple pendulum in non-inertial frame (horizontal, vertical and circular)., Carnot engine, heat pump, efficiency and coefficient of performance of heat engines, A scattering and concept of nucleus.

