VITEEE MATHEMATICS SYLLABUS

MATRICES AND DETERMINANTS:
Types of matrices, addition and multiplication of matrices-Properties, computation of inverses, solution of system of linear equations by matrix inversion method. Rank of a Matrix – Elementary transformation on a matrix, consistency of a system of linear equations, Cramer's rule, Non-homogeneous equations, homogeneous linear system, rank method.

THEORY OF EQUATIONS, SEQUENCE AND SERIES
Quadratic equations – Relation between roots and coefficients – Nature of roots – Symmetric functions of roots – Diminishing and Increasing of roots – Reciprocal equations. Arithmetic, Geometric and Harmonic Progressions-Relation between A.M., G. M ., and H.M. Special series: Binomial, Exponential and Logarithmic series – Summation of Series.

VECTOR ALGEBRA
Scalar Product – Angle between two vectors, properties of scalar product, applications of dot products. Vector Product – Right handed and left handed systems, properties of vector product, applications of cross product. Product of three vectors – Scalar triple product, properties of scalar triple product, vector triple product, vector product of four vectors, scalar product of four vectors. Lines – Equation of a straight line passing through a given point and parallel to a given vector, passing through two given points, angle between two lines. Skew lines – Shortest distance between two lines, condition for
two lines to intersect, point of intersection, collinearity of three points. Planes – Equation of a plane, passing through a given point and perpendicular to a vector, given the distance from the origin and unit normal, passing through a given point and parallel to two given vectors, passing through two given points and parallel to a given vector, passing through three given non-collinear points, passing through the line of intersection of two given planes, the distance between a point and a plane, the plane which contains two given lines, angle between two given planes, angle between a line and a plane. Sphere – Equation of the sphere whose centre and radius are given, equation of a sphere when the extremities of the diameter are given.

COMPLEX NUMBERS & TRIGONOMETRY:
Complex number system, conjugate – properties, ordered pair representation. Modulus – properties, geometrical representation meaning, polar form principal value, conjugate, sum, difference, product quotient, vector interpretation, solutions of polynomial equations, De Moivre's theorem and its applications. Roots of a complex number – nth roots, cube roots, fourth roots. Angle measures-
Circular function-Trigonometrical ratios of related angles – Addition formula and their applications – Trigonometric equations – Inverse trigonometric functions-Properties and solutions of triangle.

ANALYTICAL GEOMETRY
Definition of a Conic – General equation of a conic, classification with respect to the general equation of a conic, classification of conics with respect to eccentricity. Parabola – Standard equation of a parabola tracing of the parabola, other standard parabolas, the process of shifting the origin, general form of the standard equation, some practical problems. Ellipse – Standard equation of the ellipse, tracing of the ellipse (x^2/a^2)+(y^2/a^2) = 1 (a> b). Other standard

form of the ellipse, general forms, some practical problems Hyperbola – standard equation, tracing of the hyperbola (x^2/a^2)-(y^2/a^2) = 1
, other form of the hyperbola, parametric forms of a conics, chords, tangents and normals – Cartesian
form and parametric form, equation of chord of contact of tangents from a point (x1 ,y1) Asymptotes, Rectangular Hyperbola –standard equation of a rectangular hyperbola.

DIFFERENTIAL CALCULUS
Derivative as a rate measure – rate of change – velocity-acceleration – related rates – Derivative as a measure of slopetangent, normal and angle between curves. Maxima and Minima. Mean value theorem- Rolle's Theorem – Lagrange Mean Value Theorem – Taylor's and Maclaurin's series, L' Hospital's Rule, Stationary Points – Increasing, decreasing, maxima, minima, concavity convexity points of inflexion. Errors and approximations – absolute, relative, percentage errors, curve tracing, partial derivatives – Euler's theorem.

INTEGRAL CALCULUS AND ITS APPLICATIONS METHODS OF INTEGRATION STANDARD TYPES
Properties of definite integrals, reduction formulae for sin^n (x) and cos^n (x) , Area, length, volume and surface area.

DIFFERENTIAL EQUATIONS
Formation of differential equations, order and degree, solving differential equations (1st order) – variable separable homogeneous, linear equations. Second order linear equations with constant co-efficient f (x)=e^m(x), sin mx, cos mx,x, x^2.

DISCRETE MATHEMATICS
Mathematical Logic – Logical statements, connectives, truth tables, tautologies, sets, algebraic properties, relations, functions, permutation, combination, Induction. Binary Operations – Semi groups – monoids, groups (Problems and simple properties only), order of a group, order of an element.

PROBABILITY DISTRIBUTIONS:
Probability, axioms, theorems on probability, conditional probability, Random Variable, Probability density function, distribution function, mathematical expectation, variance, discrete distributions-Binomial , Poisson, continuous distribution – Normal

VITEEE PHYSICS SYLLABUS

ELECTROSTATICS

Frictional electricity, charges and their conservation; Coulomb's law-forces between two point electric charges – Forces between multiple electric charges-superposition principle. Electric field – Electric field due to a point charge, electric field lines; Electric dipole, electric field intensity due to a dipole – behaviour of dipole in a uniform electric field-application of electric dipole in microwave oven. Electric potential – potential difference-electric potential due to a point charge and due to a dipole-Equipotential surfaces – Electrical potential energy of a system of two point charges. Electric flux-Gauss's theorem and its applications to find field due to (i) infinitely long straight wire (ii) uniformly charged infinite plane sheet (iii) two parallel sheets and (iv) uniformly charged thin spherical shell (inside and outside)

Electrostatic induction-capacitor and capacitance – Dielectric and electric polarisation – parallel plate capacitor with and without dielectric medium – applications of capacitor – energy stored in a capacitor – Capacitors in series and in parallel – action of points –Lightning arrester – Van de Graaff generator.

CURRENT ELECTRICITY

Electric Current – flow of charges in a metallic conductor – Drift velocity and mobility and their relation with electric current. Ohm's law, electrical resistance – V-I characteristics – Electrical resistivity and conductivity-Classification of materials in terms of conductivity – Superconductivity (elementary ideas) – Carbon resistors – colour code for carbon resistors-Combination of resistors – series and parallel – Temperature dependence of resistance – Internal resistance of a cell – Potential difference and emf of a cell. Kirchoff's law – illustration by simple circuits – Wheatstone's Bridge and its application for temperature coefficient of resistance measurement – Meterbridge – Special case of Wheatstone bridge – Potentiometer-principle – comparing the emf of two cells. Electric Power – Chemical effect of current – Electro chemical cells – Primary (Voltaic, Lechlanche, Daniel)-Secondary – rechargeable cell – lead acid accumulator.

EFFECTS OF ELECTRIC CURRENT

Heating effect – Joule's law – Experimental verification-Thermoelectric effects – Seebeck effect – Peltier effect – Thomson effect – Thermocouple, thermoemf, neutral and inversion temperature-Measurement of thermo emf using potentiometer – Thermopile. Magnetic effect of electric current – Concept of magnetic field, Oersted's experiment – Biot-Savart law – Magnetic field due to an infinitely long current carrying straight wire and circular coil – Tangent galvanometer – Construction and working – Bar magnet as an equivalent solenoid – magnetic field lines. Ampere's circuital law and its application to straight and Toroidal solenoids. Force on a moving charge in uniform magnetic field and electric field – cyclotron – Force on current carrying conductor in a uniform magnetic field – forces between two parallel current carrying conductors – definition of ampere. Torque experienced by a current loop in a uniform magnetic field – moving coil galvanometer – Conversion to ammeter and voltmeter – Current loop as a magnetic dipole and its magnetic dipole moment – Magnetic dipole moment of a revolving electron.

ELECTROMAGNETIC INDUCTION AND ALTERNATING CURRENT

Electromagnetic induction – Faraday's law – induced emf and current – Lenz's law. Self induction – Mutual induction – Self inductance of a long solenoid – mutual inductance of two long solenoids. Methods of inducing emf – (i) by changing magnetic induction (ii) by changing

area enclosed by the coil and (iii) by
changing the orientation of the coil (quantitative treatment). AC generator – commercial generator. (Single phase, three phase). Eddy current – Applications – Transformer – Long distance transmission.
Alternating current – measurement of AC-AC circuit with resistance – AC circuit with inductor – AC circuit with capacitor – LCR series circuit – Resonance and Q – factor – power in AC circuits.

ELECTROMAGNETIC WAVES AND WAVE OPTICS

Electromagnetic waves and their characteristics – Electromagnetic spectrum-radio, microwaves, infra-red, visible, ultraviolet, X rays, gamma rays. Emission and Absorption spectrum – Line, Band and continuous spectra – Fluorescence and phosphorescence. Theories of light – Corpuscular – Wave – Electromagnetic and Quantum theories. Scattering of light – Rayleigh's scattering – Tyndal scattering – Raman effect – Raman spectrum – Blue colour of the sky and reddish appearance of the sun at sunrise and sunset. Wavefront and Huygens's principle – Reflection, total internal reflection and refraction of plane wave at a plane surface using wavefronts. Interference – Young's double slit experiment and expression for fringe width – coherent source – interference of light- Formation of colours in thin films – analytical treatment – Newton's rings. Diffraction – differences between interference and diffraction of light- diffraction grating. Polarisation of light waves – polarisation by reflection – Brewster's law – double refraction – nicol prism – uses of plane polarised light and Polaroid's – rotatory polarisation – polarimeter.

ATOMIC PHYSICS

Atomic structure – discovery of the electron- specific charge (Thomson's method) and charge of the electron (Millikan's oil drop method) – alpha scattering – Rutherford's atom model. Bohr's model – energy quantisation – energy and wave number expression – Hydrogen spectrum – energy level diagrams -
sodium and mercury spectra – excitation and ionization potentials. Sommerfeld's atom model-X-rays – Production, properties, detection, absorption, diffraction of x-rays – Laue's experiment - Bragg's law, Bragg's X-ray spectrometer – X-ray spectra-continuous and characteristic X-ray spectrum – Mosley's law and atomic number. Masers and Lasers – spontaneous and stimulated emission – normal population and population inversion – Ruby laser, He- Ne laser – properties and applications of laser light – holography.

DUAL NATURE OF RADIATION AND MATTER – RELATIVITY

Photoelectric effect – Light waves and photons – Einstein's photoelectric equation – laws of photoelectric emission – particle nature of energy – experimental verification of Einstein's photoelectric equation – work function – photo cells and their application. Matter waves – wave mechanical concept of the atom – wave nature of particles – DeBroglie relation – DeBroglie wavelength of an electron – electron microscope. Concept of space, mass, time – Frame of references – Galileon transformations, Special theory of relativity – Relativity of length, time and mass with velocity – Einstein's mass -energy equivalence.

NUCLEAR PHYSICS

Nuclear properties – nuclear radii, masses, binding energy, density, charge- isotopes, isobars and isotones – Nuclear mass defect – binding energy – Stability of nuclei – Bainbridge mass spectrometer.
Nature of nuclear forces- Neutron – discovery – properties – artificial transmutation – particle accelerator. Radioactivity – alpha, beta and gamma radiations and their properties- α-decay, â -

decay and γ -decay – Radioactive decay law – half life – mean life – Artificial radioactivity – radio isotopes – effects and uses – Geiger – Muller counter. Radio carbon dating – biological radiation hazards.
Nuclear fission – chain reaction – atom bomb – nuclear reactor – nuclear fusion – Hydrogen bomb- cosmic rays – elementary particles.

SEMICONDUCTOR DEVICES AND THEIR APPLICATIONS

Semiconductor theory – energy band in solids – difference between metals, insulators and semiconductors based on band theory- semiconductor doping – Intrinsic and Extrinsic semi conductors. Formation of P-N Junction – Barrier potential and depletion layer-P-N Junction diode – Forward and reverse bias characteristics – diode as a rectifier – Zener diode-Zener diode as a voltage regulator-LED seven segment display – LCD. Junction transistors – characteristics – transistor as a switch – transistors as an amplifier – transistor biasing – RC, LC coupled and transformer coupling in amplifiers – feed back in amplifiers – positive and negative feedback – advantages of negative feedback in amplifiers – oscillator – condition for oscillations – LC circuit – Colpitt oscillator. Logic gates – NOT, OR, AND, EXOR using discrete components – NAND and NOR gates as universal gates – difference between unipolar and bipolar devices-Integrated circuits -medium, small and very large scale integration – fabrication and applications – TTL and CMOS, ICs. Laws and theorems of Boolean algebra – operational amplifier – parameters – pin out configuration – Basic applications- Inverting amplifier-Non-inverting amplifier – summing amplifiers. Measuring Instruments – Cathode Ray oscilloscope – Principle-Functional units-uses-Multimeter- construction and uses.

COMMUNICATION SYSTEMS

Modes of propagation, ground wave-sky wave propagation. Amplitude modulation, merits and demerits – applications – frequency modulation – advantages and applications – phase modulation. Antennas and transmission lines – current and voltage distribution – directional pattern – antenna parameters – types of
antenna – design of folded dipole. Radio transmission and reception – AM and FM – superhereterodyne receiver. TV standards, TV transmission and reception – scanning and synchronising – TV Antenna – Video signal analysis. Vidicon (camera tube) and picture tube – block diagram of a monochrome TV transmitter and receiver circuits. Radar – principle – factors influencing maximum range – applications. Digital communication -data transmission and reception – principles of fax, modem, satellite communication – wire, cable and optical fiber communication.

VITEEE CHEMISTRY SYLLABUS

d AND f-BLOCK ELEMENTS

General Characteristics of d-block elements. Occurrence and principles of extraction: Copper, Silver and Zinc. Preparation, properties of 3 , 4 AgNO CuSO and 7 2 2 O Cr K and 4 KMnO . Lanthanides-Introduction, oxidation state-Chemical reactivity, Lanthanide contraction, uses and brief
comparison of Lanthanides and Actinides. Nuclear energy, Nuclear fission and fusion-Radio carbon dating – Nuclear reaction in sun – Uses of radioactive Isotopes.

COORDINATION CHEMISTRY

Introduction – Terminology in coordination chemistry – IUPAC nomenclature of mononuclear coordination compounds – Isomerism in coordination compounds – structural isomerism – Geometrical isomerism in 4-coordinate, 6-coordinate complexes – Theories on coordination compounds – Werner's theory (brief) – Valence Bond theory – Uses of coordination compounds – Biocoordination compounds (Haemoglobin and chlorophyll).

SOLID STATE

Unit cell, X-Ray crystal structure – Types of ionic crystals – Imperfections in solids – Electrical Property – Amorphous solid (elementary ideas only).

THERMODYNAMICS

I and II law of thermodynamics – Spontaneous and non spontaneous processes – entropy – Gibb's free energy – Free energy change and chemical equilibrium – Third law of thermodynamics.

CHEMICAL EQUILIBRIUM AND CHEMICAL KINETICS

Applications of law of mass action – Le Chatlier's principle. Rate expression and order of a reaction, zero order, first order and pseudo first order reaction – half life period, determination of rate constant/order of reaction Temperature dependence of rate constant – Arrhenius equation, activation energy.

ELECTROCHEMISTRY

Theory of electrical conductance – Theory of strong electrolytes – Faraday's laws of electrolysis – Specific resistance, specific conductance, equivalent and molar conductance – Variation of conductance with dilution – Kohlraush's law. Cells – Electrodes and electrode potentials – Construction of cell and EMF – Fuel cells – Corrosion and its preventions.

ALCOHOLS AND ETHERS

Nomenclature of alcohols – Classification of alcohols – General methods of preparation of primary alcohols – Properties – Methods of preparation of dihydric alcohols: Glycol – Properties – Uses – Methods of preparation of trihydric alcohols – Properties – uses – Aromatic alcohols – Preparation and properties of phenols and benzyl alcohol. Ethers – General methods of preparation of aliphatic ethers – properties – Uses – Aromatic ethers – Preparation of anisole – Reactions of anisole – Uses.

CARBONYL COMPOUNDS

Nomenclature of carbonyl compounds – Comparison of aldehydes and ketones. General methods of preparation of aldehydes – Properties – Uses. Aromatic aldehydes – Preparation of benzaldehyde – Properties and Uses. Ketones – general methods of preparation of aliphatic ketones (acetone) – Properties – Uses. Aromatic ketones – preparation of acetophenone – Properties – Uses, preparation of benzophenone – Properties.

CARBOXYLIC ACIDS

Nomenclature – Preparation of aliphatic monocarboxylic acids – formic acid – Properties – Uses. Monohydroxy mono carboxylic acids; Lactic acid – synthesis of lactic acid. Aliphatic dicarboxylic acids; Preparation of oxalic and succinic acid. Aromatic acids; Benzoic and Salicylic acid – Properties – uses. Derivatives of carboxylic acids; acetyl chloride (COCl CH3) – Preparation – Properties – Uses. Preparation of acetamide, Properties – acetic anhydride – preparation, Properties. Preparation of esters – methyl acetate – Properties.

ORGANIC NITROGEN COMPOUNDS

Aliphatic nitro compounds – Preparation of aliphatic nitroalkanes – Properties – Uses. Aromatic nitro compounds – Preparation – Properties – Uses. Distinction between aliphatic and aromatic nitro compounds. Amines; aliphatic amines – General methods of preparation – Properties – Distinction between 0 0 2 , 1 , and 0 3 amines. Aromatic amines – Synthesis of benzylamine – Properties – Aniline – Preparation – Properties – Uses. Distinction between aliphatic and aromatic amines. Aliphatic nitriles – Preparation – properties – Uses. Diazonium salts – Preparation of benzene diazoniumchloride properties.

VITEEE BIOLOGY SYLLABUS

TAXONOMY OF LIVING ORGANISMS

Linnaeus and binomial nomenclature – history and types of classification – status of bacteria and viruses – botanical garden and herbaria – zoological parks and museums and economical and cultural importance – salient features of various plant groups – classification of angiosperms up to series level (Bentham and Hooker's system) – salient features of nonchordates upto phylum level and chordates up to class level.

EVOLUTION

Darwinism, Neo-Darwinism, Lamarkism, Neo-Lamarkism – modern concepts of natural selection – theories and evidences of evolution (fossil record and biochemical evidences) – sources of variation, mutation, recombination, genetic drift, migration, natural selection – origin and concepts of species: speciation and isolation (geographical and reproductive).

CELL BIOLOGY

Cell theory (Schelieden and Schwann) – Discovery of cell and cell as a self contained unit – prokaryotic and eukaryotic cells and their ultrastructures– unicellular and multicellular organisms – tools and techniques used in cell biology – compound microscope and electron microscope – cell division: amitosis, mitosis and meiosis.

GENETICS

Heredity and variation – Mendel's laws of inheritance – chromosomal basis of inheritance – linkage and crossing over – mutation and chromosomal aberration – sex linked inheritance – Karyotyping analysis – chromosomal mapping – DNA as a genetic material: structure, replication – RNA structure and types – genetic diversity.

MICROBIOLOGY AND IMMUNOLOGY

Introduction and history of microbiology – Leeuwenhoek, Pasteur, Robert Koch, Lister – Virology: structure, genetics, culture and diseases – bacteriology: structure, genetics and diseases – Protozoan microbiology – pathogenecity of microorganisms – antimicrobial resistance and chemotherapy – innate immunity – lymphoid organs, thymus – T-cells, Bcells ; immunoglobins structure – transplantation and types – immune system disorders.

PLANT PHYSIOLOGY

Morphology of root, leaf, stem, flowers and their modifications – tissue and tissue systems – anatomy of mono and dicot roots, leaves and stems – secondary growth – Photosynthesis: light and dark reactions, C3 and C4 plants – Photophosphorylation: cyclic and noncyclic – photorespiration – transpiration – types and modes of nutrition – mechanism of respiration – glycolysis – Kreb's cycle – anaerobic pathway – compensation point and fermentation – respiratory quotient (RQ).

HUMAN PHYSIOLOGY

Nutrition: Digestion, Body-mass ratio, calorie value (ICMR standards), balanced diet, obesity – respiration: inspiration, expiration, exchange of gases, process of pulmonary respiration – Digestion: enzymes and its action – Muscular systems: mechanism of action – Circulation:

mechanisms of blood circulation, structure of heart – Excretion: ureotelism, urea biosynthesis, nephron ultrafilteration – nervous system: physiology, coordination systems, brain function and receptor organs – reproduction: spermatogenesis, oogenesis, in vitro fertilization – endocrines: harmones and their functions.

MOLECULAR BIOLOGY AND BIOTECHNOLOGY

Concept of gene – central dogma of molecular biology – gene regulation – rDNA technology — transgenic plants and microbes – gene cloning – genetically modified organisms – gene expression – gene bank – management of plant and animal genetic resources – genetic conservation – microbial type culture – genetic typing studies.

ECOLOGY AND ENVIRONMENT

Human population and explosion – ecosystems – ecological succession – conservation and biodiversity (Biosphere reserves) – wild life: legislation and conservation of wild life – global warming crisis and green house effect – biogeochemical cycle (O_2 , C and N elements) – extinction of species – waste management – pollution (water, air, soil, noise and temperature).

APPLIED BIOLOGY AND HUMAN WELFARE

Plant tissue culture and applications – livestock and management – cattle breeding and poultry – farming methods – pisciculture – crops of economic importance: food yielding rice, oil yielding : groundnut, fibre yielding cotton, timber yielding teak – food production: breeding experiments, Biofertilizers – brief account of crop and animal diseases and their control – ethical concerns – biopatent – biopiracy – genetically modified foods – biowar – bioethics – gene therapy – recent advances in vaccine development.