Syllabus of Entrance Examination

1. M.Tech (Computer Science & Engg.)

2. M.Tech (Electronics & Communication Engg.)

3. M.Tech (Electrical & Electronics Engg.)

4. MCA (Master of Computer Application)

5. MBA (Master of Business Administration) ()

6. B.Tech (Bachelor of Technology)

7. B.Pharma (Bachelor of Pharmacy)

8. B.Ed (Bachelor of Education)

Some use full information

Type of Question - Multiple Choice Questions (MCQ)

No. of Questions - 120

Duration of Exam - 2 hours

Master of Technology (M.Tech)
Computer Science & Engineering

Mathematical Logic: Propositional Logic; First Order Logic.

Probability: Conditional Probability; Mean, Median, Mode and Standard Deviation, Random Variables, istributions, uniform, normal, exponential, Poisson, Binomial.

Set Theory & Algebra: Sets; Relations; Functions; Groups; Partial Orders; Lattice; Boolean Algebra.

Combinatorics: Permutations; Combinations; Counting; Summation; generating functions; recurrence relations; asymptotics .

Graph Theory: Connectivity; spainning trees; Cut vertices & edges; covering; matching; independent sets; Colouring; Planarity; Isomorphism.

Linear Algebra: Algebra of matrices, determinants, system of linear equations; Eigen Values and Eigen vectors.

Digital Logic: Logic functions; Minimization, Design and synthesis of combinational and sequential circuits; Number representation and computer arithmetic (fixed and floating point).

Computer Organization and Architecture: Memory interface, I/O interface (Interrupt and DMA mode), Instruction pipelining, Cache and main memory, Secondary storage.

Programming & Data Structures: Programming in C; Functions, Recursion, Parameter passing, Scope, Binding; Abstract data types, Arrays, Stacks, Queues.

Algorithms: Asymptotic analysis (best, worst, average cases) of time and space, upper and lower bounds, Basis concepts of complexity classes –P, NP, NP-hard, NP-complete.

Compiler Design: Lexical analysis, Parsing, Syntax directed translation, Runtime environments, Basis of code optimization.

Operating System: Processes, Threads, Inter-process communication, Concurrency, Synchronization, Deadlock, CPU scheduling, File system, I/O system.

Databases: ER-model, Relational model (relational algebra, tuple calculus), Database design (integrity constraints, normal forms).

Information Systems and Software Engineering: information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project.

Computer Networks: ISO/OSI stack, LAN technologies (Ethernet, Token ring), Flow and error control techniques, Routing algorithms, Congestion control, TCP/UDP and sockets, IP (v4).

Web Technologies: HTML, XML, basic concepts of client-server computing.

Master of Technology (M.Tech)
Electronics & Communication Engg.

Electric Circuits (Network Theory): Network graphs : matrices associated with graphs; incidence, fundamental circuit cut set and fundamental circuit matrices. Network theorems. Wye-Delta transformation. Steady state sinusoidal analysis using phasors. Linear constant coefficient differential equations; time domain analysis of simple RLC circuit,2 – port network parameters, Network Synthesis.

Electronic Devices: Energy bands in silicon, intrinsic and extrinsic silicon, Carrier transport in silicon: diffusion current, drift current,mobility, and resistivity. Generation and recombination of carriers. P-n junction diode, Zener diode, tunnel diode, BJT, JFET, MOS capacitor, MOSFET, LED, p-i-n and avalanche photo diode, Basics of LASERs.

Analog Circuits: Small Signal Equivalent circuits of diodes, BJTs, MOSFETs and analog CMOS. Clipping, clamping, rectifier. Biasing and bias stability of transistor and FET amplifiers. Amplifiers : single-andmulti-stage, differential and operational, feedback, and power. Frequency response of amplifiers. Simple op-amp circuits. Filters. Sinusoidal oscillators; criterion for oscillation;. Function generators and wave-shapping circuits, 555 Timers, Basics of VLSI design.

Digital Circuits: Boolean algebra, minimization of Boolean functions; logic gates; Combinatorial circuits; arithmetic circuits, multiplexers, decoders, PROMs and PLAs. Sequential circuits: latches and flip-flops, counters and shift registers. Sample and hold circuits. ADCs, DACs Semiconductor memories. Microprocessor (8085): architecture, programming, memory and I/O interfacing.

Signals and Systems: Definitions and properties of Laplace transform, continuous time and discrete time Fourier Series, Continuous-time and discrete-time Fourier Transform, DFT and FFT, z-transfomr. Sampling theorem. Linear Time-Invariant (LTI) Systems.

Control Systems: Basic control system components; block diagrammatic description, reduction of block diagrams. Open loop and closed loop (feedback) systems and stability analysis of these systems. Signal flow graphs transient and steady state analysis of LTI control systems and frequency response. root loci, Routh-Hurwitz criterion, Bode and Nyquist plots. Control system compensators elements of Proportional – Integral – Derivative (PID) control. solution of state equation of LTI control systems.

Communications: Random signals and noise : probability, random variables, probability density function, autocorrelation, power spectral density. Analog communication systems : amplitude and angle modulation and demodulation systems, superheterodyne receivers; elements ofhardware, realizations of analog communication systems; signal-to-noise ratio(SNR) amplitude modulation and frequency modulation. Fundamentals of information theory and channel capacity theorem. pulse code modulation (PCM), differential pulse code modulation (DPCM), amplitude, phase and frequency shift keying schemes (ASK, PSK, FSK), Basics of TDMA, FDMA and CDMA and GSM, DPSK, MSK, GMSK, Satellite common, GPS, DBS-TV, VSAT.

Electromagnetics: Elements of vector calculus: divergence and curl; Gauss' and Stokes' theorems, Maxwell's equations: differential and integral forms. Wave equation, Poynting vector. Plane waves: propagation through various media; reflection and refraction; phase and group velocity; skin depth. Waveguides: modes in rectangular waveguides; boundary conditions; cut-off frequencies; dispersion relations. Basics of propagation in dielectric waveguide and optical fibers. Dipole antennas; radiation pattern; antenna gain.

Wireless Communication: Cellular Concept, AMPS, IS-95, GSM (2G), CDMA2000, IMT2000, UMTS, W-CDMA, 3G and 4G Cellular Standard, Packet Switched Network, GPRS, NGN.

Radio & TV Engineering: Radio wave propagation, various kinds of antenna, Yagiuda antenna, Horn antenna, Parabolic antenna, Basics of monochrome and colour TV.

Microwave and RADAR: IMPATT, TRAPATT, Two Cavity Klystron, Reflex Klystron, TWT, Circulator, Isolator, Directional Coupler, Basic Pulsed RADAR, MTI RADAR, Continuous Wave RADAR, Range equation.

Data Communication & Networking: Topologies, LAN, WAN, MAN, OSI Model, TCP/IP Model, ISDN, ATM, Circuit Switching, Packet Switching, Message Switching, X.25, Frame relay, DTE, DCE, MODEM, Internetworking device, Repeater, Bridge, Router, Gateways, Cryptography.

Master of Technology (M.Tech)
Electrical & Electronics Engg.

Electrical Machines: Construction, performance, testing and Parallel operation of transformers, Autotransformers and three-winding transformer, Construction, performance starting and testing of threephase and single – phase induction motors, Induction generators. Construction, modeling and performance of salient and non-salient pole synchronous machines. DC Machines; Construction, working principle and characteristics of dc motor and generator. Starting and testing of dc machines. Special motors: Universal motor, permanent magnet DC machines, hysteresis motor, reluctance motor, stepper motor etc.

Power System Engineering: Electrical Characteristics of O.H. Lines, Performance of OH transmission lines, insulators and mechanical design of OH lines, underground cables, installation and substation. Load flow analysis, economic operation of power system, fault analysis, stability analysis, distribution systems. Electrical Power Generation: Thermal power plants, hydro electric power plants, nuclear power plants, diesel and gas plants. Power System Protection: Protective relay, protection scheme, circuit breakers, Power system transients.

Electrical Measurement And Instrumentation: Standards and Errors of Measurement, Electromechanical Instruments, Bridges and Potentiometers, Instrument Transformers and wattmeters and energy meters. Digital instruments, Display Devices Data Transmission: Transducers, Special Instruments: maximum demand indicator, measurement of iron loss.

Circuit Theory: Network analysis and transient response, resonance and magnetic circuit, network theorems, network functions, two port networks. Special networks and multiport networks, electric filters, realization of network function, graph theory and network equation, state variable analysis.

Power Electronics: Power Semiconductor Devices and their Characteristics, Triggering Circuits. AC-DC Converters, DC-DC Converters, Inverters, AC voltage regulators, SMPS and UPS, Thyristor controlled resistors, inductors and capacitors. Resonant converters. Dual and cyclo converters.

Electric Drives: Characteristics of different types of mechanical loads, stability of motor-load systems. Thermal loading of motors, estimation of motor rating for different types of loads. Different methods of speed control and electric braking of DC motors. Rectifier controlled and chopper controlled DC motor drives. Methods of speed control and electric braking of induction motors. Closed Loop AC and DC Drives.

Control System: Components of control system, Mathematical modeling of mechanical and electrical systems. Block diagram and signal flow diagram representation and transfer function of control systems. Time domain and frequency domain analysis. Control System Design : Phase lead and lag compensation. System analysis using state variables. State Feedback Technique for continuous and discreet systems-their analysis and stability Analysis and Stability of non-linear Systems.

Microprocessor System: Elements of Microcomputer, Architecture and assembly language programming of 8085 and 8086 microprocessors. Input-output techniques and data transfer. Memory and Input – output interface.

Electromagnetic Field Theory: Electrostatic field, magnetostatic fields, time varying field, application of field theory.

Signal and Systems: Signal representation, system representation and modeling, system analysis techniques, digital filters. Laplace, Z-and Fourier Transform and their application.

Analog and Digital Electronics: B.J.T, F.E.T, Boolean algebra, minimization of Boolean functions; logic gates; Combinatorial circuits; arithmetic circuits, multiplexers, decoders, Sequential circuits: latches and flip-flops, counters and shift registers.

Master of Computer Application (MCA)

A. MATHEMATICS

Algebra: Surds, solution of simultaneous and quadratic equations, arithmetic, geometric and harmonic progression, Binomial theorem for any index, logarithms, determinants.

Probability: Definition, dependent and independent events, numerical problems on addition and multiplication of probability, theorems of probability.

Trigonometry: Simple identities, trigonometric equations, properties of triangles, use of mathematical tables, solution of triangles, height and distance, inverse functions, DeMoiver's theorem.

Co-ordinate Geometry: Co-ordinate geometry of the straight lines, pair of straight lines, circle, parabola, ellipse and hyperbola and their properties.

Calculus: Differentiation of function of functions, simple examples of maxima of minima, limits of function, integration of function (by parts, by substitution and by partial fraction), definite integral (application to volumes and surfaces of frustums of sphere, cone and cylinder).

Vectors: Position vector, addition and subtraction of vectors, scalar and vector products and their applications.

Dynamics: Velocity, composition of velocity, relative velocity, acceleration, composition of acceleration, motion under gravity, projectiles, laws of motions, principles of conservation of momentum and energy, direct impact of smooth bodies, pulleys.

Statics: Composition of co-planar, concurrent and parallel forces, moments and couples, resultant of set of coplanar forces and conditions of equilibrium, determination of centroides in simple case, problems involving friction.

B. STATISTICS

Theory of probability, mean, median, mode, dispersion and standard deviation.

C. LOGICAL ABILITY (Reasoning)

Questions to test analytical and reasoning capability.

D. COMPUTERS

Introduction to C Programming & Data Structure, Networking, Basic Computer Fundamental, Data Base Management System, Introduction Operating System.

E. CURRENT AFFAIRS

General Awareness, Ancient History, Geography.

Master of Business Administration (MBA)

The quantitative aptitude, logical & abstract reasoning and knowledge of current affairs. The following is a brief description of contents of the test paper.

Section A (English Language): Grammar, vocabulary, uncommon words, sentence completion, synonyms, antonyms, relationship between words & phrases and comprehension of passages.

Section B (Numerical Aptitude): Numerical calculation, arithmetic, simple algebra, geometry and trigonometry, Interpretation of graphs, charts and tables.

Section C (Thinking and Decision Making): Creative thinking, unfamiliar relationships, reasoning, finding patterns trends and assessment of figures & diagrams.

Section D (General Awareness): Knowledge of current affairs and other issues related to trade, industry, economy, sports, culture and science.

B. Tech
Compulsory Subjects

PHYSICS

Measurement: Dimensional analysis and error estimation, dimensional compatibility and significant figures.

Laws of motion: Force and inertia, Newton's laws of motion, and their significance.

Motion in one dimension: Average velocity, instantaneous velocity, one dimensional motion with constant accelerations, freely falling bodies.

Motion in two dimensions: Projectile motion, uniform circular motion, tangential and radial acceleration in curve-linear motion, relative motion and relative acceleration.

Work, power & energy : Work done by a constant and variable forces, kinetic and potential energy, power, Conservative and non conservative forces, conservation of energy, gravitational energy, work energy theorem, potential energy store in a spring.

Linear Momentum And Collisions: Linear momentum and impulse, conservation of linear momentum for two particle system, collision, collision in one dimension, collision in two dimension.

Rotation of rigid body about a fixed axis: Angular velocity and angular acceleration, rotational kinematics, rotational motion with constant angular acceleration relationship between angular and linear quantities, rotational energy, moment of inertia torque and angular acceleration, work and energy in rotational motion, rolling motion of a solid sphere and cylinder.

Gravitation: Gravitational field, Kepler's laws and motion of planets, planetary and satellite motion, geostationary satellite.

Oscillatory motion: Harmonic motion, oscillatory motion of mass attached to a spring, kinetic and potential energy, Time period of a simple pendulum, comparing simple and harmonic motion with uniform circular motion, forced oscillations, damped oscillations and resonance.

Mechanics of solids and fluids: States of matter young's modulus, bulk modulus, shear modulus of rigidity, variations of pressure with depth, Bernoulli's theorem and its application, surface energy, surface tension, angle of contact, capillary rise, coefficient of viscosity, viscous force, terminal velocity, Stoke's law, stream line motion.

Heat and thermodynamics: First law of thermodynamics, specific heat of an ideal gas at constant volume and constant pressure, relation between them, thermodynamics process (reversible, irreversible, isothermal, adiabatic), second law of thermodynamics, concept of entropy and concept of absolute scale, thermal conductivity, Newton's law of cooling, black body radiation, Wien's displacement law, Stefan's law.

Wave : Wave motion, phase, amplitude and velocity of wave, Newton's formula for a longitudinal waves, propagation of sound waves in air, effect of a temperature and pressure on a velocity of sound, Laplace's End correction, principle of superposition, formation of standing waves, standing waves in strings and pipes, beats , Doppler's effect.

Electromagnetizm: Coulomb's law, electric field and potential due to point charge, dipole and its field along the axis and perpendicular to axis, electric flux, Gauss's theorem and its application to find the field due to infinite sheet of charge, and inside the hallow conducting sphere, capacitance, parallel plate capacitor with air and dielectric medium between the plates, series and parallel combination of capacitors, energy of a capacitor, displacement currents. Concept of free and bound electrons, drift velocity and mobility, electric current, Ohm's law , resistivity, conductivity, temperature dependency of resistance, resistance in series and parallel combination, kirchoff's law and their application to network of resistances , principle of potentiometer, effect of temperature on resistance and its application. Magnetic field due to current, Biot-Savart's law, magnetic field due to solenoid, motion of charge in a magnetic field, force on a current carrying conductors and torque on current loop in a magnetic field, magnetic flux, forces between two parallel current carrying conductors.

The magnetization of substance due to orbital and spin motions of electrons, magnetic moment of atoms, diamagnetism, paramagnetism, ferromagnetism, earth's magnetic field and its components and their measurement. Induced e.m.f. Faraday's laws, Lenz's law, electromagnetic induction, self and mutual induction.

Optics : Source of light, luminous intensity, luminous flux, illuminarce, photometry, wave nature of light, Huygens's theory for propagation of light and rectilinear propagation of light, reflection of light, total internal reflection, reflection and refraction at spherical surfaces, focal length of a combination of lenses, spherical and chromatic aberration and their removal, refraction and dispersion of light due to a prism, simple and compound microscope, reflecting and refracting telescope, magnifying power and resolving power.

Modern Physics: Photo electric equation, matter wave, quantization, Planck's hypothesis, Bohr's model of hydrogen atom and its spectra, ionisution potential, Rydberg constant, solar spectrum and Fraunhofer lines, fluorescence and phosphorescence, x-rays and their productions, characteristics and continuous spectra. Classifications of conductors, insulators and semi conductors on the basis of energy bands in solids, PN junction, PN diode, junction, transistors, transistors as an amplifier and oscillator.

Principles of a logic gates (AND, OR and NOT) difference between a radio and television, signal propagation, principles of LESER and MASER, population inversion, spontaneous and stimulated emission.

MATHEMATICS

Algebra: Sets relations & functions, De-morgan's Law, Mapping Inverse relations, Equivalence relations, Peano's axioms, Definition of rationals and integers through equivalence relation, Indices and surds, Solutions of simultaneous and quadratic equations, A.P., G.P. and H.P., Special sums i.e. $\sum n^2$ and $\sum n^3$ $(n\sum n)$, Partial fraction, Binomial theorem, Binomial theorem for any index, Exponential series, logarithm and logarithmic series. Determinants and their use in solving simultaneous linear equations, Matrices, algebra of matrices , Inverse of a matrix, Use of matrix for solving equations.

Probability: Definition, Dependent and independent events, Numerical problem on addition and multiplication, Theorem of probability.

Trigonometry: Identities, Trigonometric equations, Properties of triangles, Solutions of triangles, heights and distances, Inverse function, complex numbers and their properties, Cube roots of unity, De-moivre's theorem.

Co-Ordinate Geometry: Pair of straight lines, Circles, general equation of second degree, Parabola, Ellipse and hyperbola, tracing of conics.

Calculus: Limits and continuity of functions, Differentiation of function of function, Tangents & normal, simple examples of maxima and minima, Indeterminate forms, integration of function by parts, by substitution and by partial fraction, Definite order, application to volumes and surfaces of frustums of sphere, Cone and cylinder, Differential equations of first order and of first degree.

Vectors: Algebra of vectors, scalar and vector products of two and three vectors and their applications

Dynamics: Velocity, composition of velocity, relative velocity, acceleration, composition of acceleration, motion under gravity, Projectiles, Laws of motion, principles of conservation of momentum and energy, direct impact of smooth bodies.

Statics: Composition of coplanar, concurrent and parallel forces moments and couples resultant of set of coplanar forces and condition of equilibrium, determination of centroid in simple cases, problems involving friction.

Optional Subjects (any one)

CHEMISTRY

Atomic Structure: Bohr's concept, Quantum numbers, Electronic configuration, molecular orbital theory for homonuclear molecules, Pauli's exclusion principle.

Chemical Bonding: Electrovalency, co-valency, hybridization involving s,p and d orbitals hydrogen bonding.

Redox Reactions: Oxidation number, oxidising and reducing agents, balancing of equations

Chemical Equilibrium and Kinetics: Equilibrium constant (for gaseous system only) Le chaterlier's principle, ionic equilibrium, Ostwald's dilution law, hydrolysis , pH and buffer solution, solubility product, common-ion effect, rate constant and first order reaction.

Acid-Base Concepts: Bronsted & Lowry concept and Lewis concept.

Electrochemistry: Electrode potential and electro chemical series,

Catalysis: Types and applications.

Colloids: Types and preparation, Brownian movement, Tyndall effect, Coagulation and Peptization.

Colligative Properties of Solution: Lowering of vapour pressure, osmotic pressure, depression of freezing point, elevation of boiling point, determination of molecular weight.

Periodic table: Classification of elements on the basis of electronic configuration, properties of s,p and d block elements, ionization potential, electronegativity and electron affinity.

Preparation and Properties of: Hydrogen peroxide, copper sulphate, silver nitrate, plaster of paris, borax, Mohr's salt, alums, white and red lead, microcosmic salt, bleaching powder and sodium thiosulphate.

Thermochemistry: Exothermic & endothermic reactions, heat of reaction, heat of combustion & formation, neutralisation, Hess's law.

General Organic Chemistry: Shape of organic compounds, inductive effect, mesomeric effect, electrophiles & nucleophiles, reaction intermediates, carboniumion, carbanions & free radical, types of organic reactions, cannizzaro, friedel craft, perkin, aldol condensation.

Isomerism: Structural, Geometrical & Optical.

IUPAC: Nomenclature of simple organic compounds **Polymers:** Addition & condensation polymers **Carbohydrates:** Monosaccharides

Preparation and Properties of: Hydrocarbons, monohydric alcohols, aldehydes, ketones, monocarboxylic acids, primary amines, benzene, nitrobenzene, aniline, phenol, benzaldehyde, benzoic acid, Grignard Reagent.

Nuclear Chemistry: Radioactive decay law, mass defect, emission of α, β & γ rays, Nuclear fission, Nuclear fusion and Nuclear reactor, Nuclear instability.

Solid State: Structure of simple ionic compounds, Crystal imperfections (point defects only), Born-Haber cycle.

Petroleum: Important industrial fractions, cracking, octane number, anti knocking compounds.

BIOTECHNOLOGY

Basic Biotechnology: Introduction to biotechnology, Tissue culture, Application of enzyme, Antigen-antibody interaction, Antibody production, Diagnostic aids.

Biochemistry and Physiology: Carbohydrates, Proteins, Lipids, Nucleic acids, Enzyme, Vitamins, Hormones, Metabolism-Glycolysis, TCA cycle, Oxidative Phosphorylation, Photosynthesis. Nitrogen Fixation, Fertilization and Osmoregulation, Vertebrates-Nervous system, Endocrine system, Vascular system, Immune system, Digestive system and Reproduction System.

Molecular Biology: Nucleic acids (DNA, RNA), structure, function and their types, DNA denaturation & renaturation, Central dogma, DNA replication, Transcription, Translation, gene expression & regulations (lac operon, trp operon), Mutations.

Cell Biology: Cell membrane – model, structure & functions, cell cycle, mitosis, meiosis, cell signaling, cytoskeletal elements, cell organelles (Mitochondria, Chloroplast, Endoplasmic Reticulum, Golgi apparatus etc.).

Microbiology: History and introduction of microorganisms, structural functions of Virus, Bacteria, Fungi, Protozoa, Pathogenic microorganism, Isolation and culture of Bacteria.

Genetic Engineering: Isolation of DNA, RNA, competent cells, transformation, gene cloning, vectors – plasmid, Restriction Enzymes, Finger Printing.

Plant Biotechnology: Plant tissue culture techniques, *in vitro* pollination and fertilization, embryo culture and its applications, embryogenesis and organogenesis, micropropagation, haploids and their application, somaclonal variations and applications, Endosperm culture and production of triploids.

BIOLOGY

Zoology:

Origin of Life: Oparin's theory, Miller's Experiment, Viruses - structure, properties, distribution, classification and pathogenesis (*e.g.* AIDS, CANCER), Viroids & Prions, Biotic balance.

Organic Evolution: Relationship among organisms and Evidences of organic Evolution.

Principles of Evolution - Lamarkism, Darwinism and Speciation.

Mechanism of Organic Evolution: Variations - Definition, causes and types, Mutations (Principles of Hugo de Veries), Role of mutations in speciation. Evolution through ages and human evolution Human Genetics and Eugenics: Human hereditary traits, study of Twins, A, B, O blood groups and their inheritance, Rh-factor, Sex determination. Chromosomal aberrations, Important human syndromes, Sex linked characters and their inheritance, Applied Genetics - eugenics, euthenics, euphenics & I.Q. Test.

Applied Biology: Wild life of India - Endangered species: Biosphere Reserves, National Parks and sanctuaries, Project Tiger, Conservation of wild life, Bio-energy, Poultry, Fisheries (edible fishes), Human Population, Population explosion, problems & control. Test - Tube babies, & Amniocentasis, Application of Biotechnology in human welfare. Human Ageing.

Mammalian Anatomy (eg. Rabbit): Reproductive system (excluding embryonic development) Osteology, structure and organization of different systems.

Animal Physiology:

A. Animal Nutrition: Food, Balanced diet, Nutritional imbalances and deficiency diseases, Digestion, Absorption, Assimilation of food, (comparison between human and Rabbit).

B. Animal Excretion and Osmoregulation: Chemical nature of excretory products in various animals, Physiology of excretion, Function of liver and kidney (Homeostatic regulatory functions of kidneys), Formation of urine, Osmoregulation by kidneys.

C. Respiratory system: Exchange and transport of gases (O_2 and CO_2) factors affecting O_2 and CO_2 transport, Cellular respiration, different lung volumes, breathing and sound production.

D. Nervous systems: Central, autonomic and peripheral nervous system, Receptors, Effectors, Reflex Action. Nature and conduction of Nerve- impulses, Synapse, Sense organs - Structure & working of Eye & Ear, Biochemistry of vision and taste buds.

E. Endocrine System: Different endocrine glands and Hormones - definition, types, characteristics and their functions (in relation to human beings), Hormonal disorders and pheromones.

F. Circulatory System: Circulation of body fluids- Blood and lymph, Open and closed vascular systems, Structure and working physiology of Heart, Comparison between arteries and veins, Lymphatic system.

G. Animal Diversity: Classification of Animal kingdom (Based on Storar & Eusinger), Characteristic features of different phyla and classes with examples.

Detailed studies of:

A. Protozoa

   i) *Amoeba*- Habit & Habitat, structure, locomotion, reproduction, Osmoregulation, Parastic amoebae - *Entamoeba histolytica* and *Entamoeba gingivalis*, structure, diseases caused by them and their control measures.

   ii) *Plasmodium vivax*-lifecycle, malaria therapy and control.

   iii) Protozoan and diseases

B. Porifera: A simple sponge (*Leucosolenia*); detailed study of structure & physiology, Sponge industry.

C. Coelenterata: *Hydra* - Habit and Habitat, morphology, tissue differentiation in relation to physiological division of labour and regeneration.

D. *Aschelminthes*: *Ascaris*- morphology, life-cycle, therapy and control.

E. Annelida: *Pheretima posthuma* - Bionomics and economic importance.

F. Arthropoda: (*Periplanata*): Structure- external and internal. Comparison between *Periplaneta* and *Blatta*.
  i) Housefly & Mosquito: structure and lifecycle.
  ii) Economic importance of insects & their control.

Botany

Plant Cell: Structure & functions, electron microscopic structure of mitrochondria, plastids, centrosomes. lysosomes, microsomes, endoplasmic reticulum, nucleus, DNA & RNA cytoplasm, golgi bodies, membrane and cell wall.

Protoplasm: structure, components, physical and chemical properties.

Cell divison (formation) - free cell formation, amitosis & miosis, duplication of DNA.

Ecology: Ecological factors (atmospheric, edaphic, climatic, geological & biotic factors).

Ecosystem: Structure, components of ecosystem eg. Water soluble minerals and gases, producers consumers, decomposers, pond and forest ecosystem. Atmospheric pollution-causes and control, types of pollution - detergents, chemicals automobile exhaust, radioactive matter, smog, sound, pesticides.

Genetics: Mendelism, Mendels experiment and law of inheritance.

Modern Classification of plant kingdom- (according to Ostwald & Tippo) (outline).

Seeds in angiospermic plants: description of development of angiospermic plants (life history of angiospermic plants).

Fruits: Dispersal of fruits and seeds

Cell differentiation Plant Tissue: Meristematic classification of meristematic & permanet tissue and functions and classification of tissue system.

Anatomy of root, stem and leaf: difference between dicot and monocot stem. Secondary growth of stem and root. Anatomy of hydrophytes, xerophytes & mesophytes.

Important phylums:

Algae: Habitat, general characters & uses, description of *Ulothrix* & *Spirogyra*.

Bacteria: structure - types of nutrition, reproduction and economic importance.

Fungi: structure description of *Rhizopus* and yeast and their economic importance, Fermentation.

Bryophyta: structure and economic importance, description of *Funaria* (Moss)

Pteridophyta: general structures of pteridophytes description of fern (*Droypteris*)

General study of gymnosperms and life history of cycas.

Classification of angiosperms.

Description of families - identification and economic importanc.

Cruciferae, Malvaceae, Fabaceae, Compositeae, Cucurbitaceae.

Soil: Absorption of water through root hairs osmosis, translocation and root pressure Nitrogen cycle.

Special modes of nutrition in plants (Autotrophic, heterotrophic, parasites, saprophytes, symbionts insectivorous and their ecological relation.

Photosynthesis: Chloroplast, light, chlorophyll and Carbon dioxide, Mechanism of photosynthesis formation of ATP and their functions and importance of photosynthesis.

Transpiration: factors and importance, Mechanism of opening and closing of stomata. Respiration: aerobic, anaerobic respiration, mechanism of respiration (Glycolysis, Kreb's cycle, ETS)

Growth & movement: definition of growth, Region of growth & their measurements, types of movements in plants, growth hormone.

COMPUTER SCIENCE

Computer Fundamentals: Evolution of computer, Basic of computer and its operation: Functional Components and their Evolution of computer, concept of booting, Use of Operating System for directory listing, hierarchical directory structure, renaming, deleting files/folders, formatting floppy, copying files, concepts of path and pathname, switching between tasks, installation/removal of application.

Software Concept: Types of Software-System Software, Utility Software and Application Software, System Software: Operating System, Compilers, Interpreters and Assembler, Operating System: Need for operating system, Functions of Operating System (Processor Management, Memory Management, File Management Device Management), Types of operating system-Interactive (GUI based), Time Sharing, Real Time and Distributed.

1. Introduction to MS Office
2. Input and Output devices
3. Introduction to Data and Information

B. Pharma
Compulsory Subjects

PHYSICS

Measurement: Dimensional analysis and error estimation, dimensional compatibility and significant figures.

Laws of motion: Force and inertia, Newton's laws of motion, and their significance.

Motion in one dimension: Average velocity, instantaneous velocity, one dimensional motion with constant accelerations, freely falling bodies.

Motion in two dimensions: Projectile motion, uniform circular motion, tangential and radial acceleration in curve-linear motion, relative motion and relative acceleration.

Work, power & energy : Work done by a constant and variable forces, kinetic and potential energy, power, Conservative and non conservative forces, conservation of energy, gravitational energy, work energy theorem, potential energy store in a spring.

Linear Momentum And Collisions: Linear momentum and impulse, conservation of linear momentum for two particle system, collision, collision in one dimension, collision in two dimension.

Rotation of rigid body about a fixed axis: Angular velocity and angular acceleration, rotational kinematics, rotational motion with constant angular acceleration relationship between angular and linear quantities, rotational energy, moment of inertia torque and angular acceleration, work and energy in rotational motion, rolling motion of a solid sphere and cylinder.

Gravitation: Gravitational field, Kepler's laws and motion of planets, planetary and satellite motion, geostationary satellite.

Oscillatory motion: Harmonic motion, oscillatory motion of mass attached to a spring, kinetic and potential energy, Time period of a simple pendulum, comparing simple and harmonic motion with uniform circular motion, forced oscillations, damped oscillations and resonance.

Mechanics of solids and fluids: States of matter young's modulus, bulk modulus, shear modulus of rigidity, variations of pressure with depth, Bernoulli's theorem and its application, surface energy, surface tension, angle of contact, capillary rise, coefficient of viscosity, viscous force, terminal velocity, Stoke's law, stream line motion.

Heat and thermodynamics: First law of thermodynamics, specific heat of an ideal gas at constant volume and constant pressure, relation between them, thermodynamics process (reversible, irreversible, isothermal, adiabatic), second law of thermodynamics, concept of entropy and concept of absolute scale, thermal conductivity, Newton's law of cooling, black body radiation, Wien's displacement law, Stefan's law.

Wave : Wave motion, phase, amplitude and velocity of wave, Newton's formula for a longitudinal waves, propagation of sound waves in air, effect of a temperature and pressure on a velocity of sound, Laplace's End correction, principle of superposition, formation of standing waves, standing waves in strings and pipes, beats , Doppler's effect.

Electromagnetizm: Coulomb's law, electric field and potential due to point charge, dipole and its field along the axis and perpendicular to axis, electric flux, Gauss's theorem and its application to find the field due to infinite sheet of charge, and inside the hallow conducting sphere, capacitance, parallel plate capacitor with air and dielectric medium between the plates, series and parallel combination of capacitors, energy of a capacitor, displacement currents. Concept of free and bound electrons, drift velocity and mobility, electric current, Ohm's law , resistivity, conductivity, temperature dependency of resistance, resistance in series and parallel combination, kirchoff's law and their application to network of resistances , principle of potentiometer, effect of temperature on resistance and its application. Magnetic field due to current, Biot-Savart's law, magnetic field due to solenoid, motion of charge in a magnetic field, force on a current carrying conductors and torque on current loop in a magnetic field, magnetic flux, forces between two parallel current carrying conductors.

The magnetization of substance due to orbital and spin motions of electrons, magnetic moment of atoms, diamagnetism, paramagnetism, ferromagnetism, earth's magnetic field and its components and their measurement. Induced e.m.f. Faraday's laws, Lenz's law, electromagnetic induction, self and mutual induction.

Optics : Source of light, luminous intensity, luminous flux, illuminarce, photometry, wave nature of light, Huygens's theory for propagation of light and rectilinear propagation of light, reflection of light, total internal reflection, reflection and refraction at spherical surfaces, focal length of a combination of lenses, spherical and chromatic aberration and their removal, refraction and dispersion of light due to a prism, simple and compound microscope, reflecting and refracting telescope, magnifying power and resolving power.

Modern Physics: Photo electric equation, matter wave, quantization, Planck's hypothesis, Bohr's model of hydrogen atom and its spectra, ionisution potential, Rydberg constant, solar spectrum and Fraunhofer lines, fluorescence and phosphorescence, x-rays and their productions, characteristics and continuous spectra. Classifications of conductors, insulators and semi conductors on the basis of energy bands in solids, PN junction, PN diode, junction, transistors, transistors as an amplifier and oscillator.

Principles of a logic gates (AND, OR and NOT) difference between a radio and television, signal propagation, principles of LESER and MASER, population inversion, spontaneous and stimulated emission.

CHEMISTRY

Atomic Structure: Bohr's concept, Quantum numbers, Electronic configuration, molecular orbital theory for homonuclear molecules, Pauli's exclusion principle.

Chemical Bonding: Electrovalency, co-valency, hybridization involving s,p and d orbitals hydrogen bonding.

Redox Reactions: Oxidation number, oxidising and reducing agents, balancing of equations

Chemical Equilibrium and Kinetics: Equilibrium constant (for gaseous system only) Le chaterlier's principle, ionic equilibrium, Ostwald's dilution law, hydrolysis , pH and buffer solution, solubility product, common-ion effect, rate constant and first order reaction.

Acid-Base Concepts: Bronsted & Lowry concept and Lewis concept.

Electrochemistry: Electrode potential and electro chemical series,

Catalysis: Types and applications.

Colloids: Types and preparation, Brownian movement, Tyndall effect, Coagulation and Peptization.

Colligative Properties of Solution: Lowering of vapour pressure, osmotic pressure, depression of freezing point, elevation of boiling point, determination of molecular weight.

Periodic table: Classification of elements on the basis of electronic configuration, properties of s,p and d block elements, ionization potential, electronegativity and electron affinity.

Preparation and Properties of: Hydrogen peroxide, copper sulphate, silver nitrate, plaster of paris, borax, Mohr's salt, alums, white and red lead, microcosmic salt, bleaching powder and sodium thiosulphate.

Thermochemistry: Exothermic & endothermic reactions, heat of reaction, heat of combustion & formation, neutralisation, Hess's law.

General Organic Chemistry: Shape of organic compounds, inductive effect, mesomeric effect, electrophiles & nucleophiles, reaction intermediates, carboniumion, carbanions & free radical, types of organic reactions, cannizzaro, friedel craft, perkin, aldol condensation.

Isomerism: Structural, Geometrical & Optical.

IUPAC: Nomenclature of simple organic compounds **Polymers:** Addition & condensation polymers **Carbohydrates:** Monosaccharides

Preparation and Properties of: Hydrocarbons, monohydric alcohols, aldehydes, ketones, monocarboxylic acids, primary amines, benzene, nitrobenzene, aniline, phenol, benzaldehyde, benzoic acid, Grignard Reagent.

Nuclear Chemistry: Radioactive decay law, mass defect, emission of α, β & γ rays, Nuclear fission, Nuclear fusion and Nuclear reactor, Nuclear instability.

Solid State: Structure of simple ionic compounds, Crystal imperfections (point defects only), Born-Haber cycle.

Petroleum: Important industrial fractions, cracking, octane number, anti knocking compounds.

Optional Subjects (any One)

MATHEMATICS

Algebra: Sets relations & functions, De-morgan's Law, Mapping Inverse relations, Equivalence relations, Peano's axioms, Definition of rationals and integers through equivalence relation, Indices and surds, Solutions of simultaneous and quadratic equations, A.P., G.P. and H.P., Special sums i.e. $\sum n^2$ and $\sum n^3$ ($n\sum n$), Partial fraction, Binomial theorem, Binomial theorem for any index, Exponential series, logarithm and logarithmic series. Determinants and their use in solving simultaneous linear equations, Matrices, algebra of matrices , Inverse of a matrix, Use of matrix for solving equations.

Probability: Definition, Dependent and independent events, Numerical problem on addition and multiplication, Theorem of probability.

Trigonometry: Identities, Trigonometric equations, Properties of triangles, Solutions of triangles, heights and distances, Inverse function, complex numbers and their properties, Cube roots of unity, De-moivre's theorem.

Co-Ordinate Geometry: Pair of straight lines, Circles, general equation of second degree, Parabola, Ellipse and hyperbola, tracing of conics.

Calculus: Limits and continuity of functions, Differentiation of function of function, Tangents & normal, simple examples of maxima and minima, Indeterminate forms, integration of function by parts, by substitution and by partial fraction, Definite order, application to volumes and surfaces of frustums of sphere, Cone and cylinder, Differential equations of first order and of first degree.

Vectors: Algebra of vectors, scalar and vector products of two and three vectors and their applications

Dynamics: Velocity, composition of velocity, relative velocity, acceleration, composition of acceleration, motion under gravity, Projectiles, Laws of motion, principles of conservation of momentum and energy, direct impact of smooth bodies.

Statics: Composition of coplanar, concurrent and parallel forces moments and couples resultant of set of coplanar forces and condition of equilibrium, determination of centroid in simple cases, problems involving friction.

BIOTECHNOLOGY

Basic Biotechnology: Introduction to biotechnology, Tissue culture, Application of enzyme, Antigen-antibody interaction, Antibody production, Diagnostic aids.

Biochemistry and Physiology: Carbohydrates, Proteins, Lipids, Nucleic acids, Enzyme, Vitamins, Hormones, Metabolism-Glycolysis, TCA cycle, Oxidative Phosphorylation, Photosynthesis. Nitrogen Fixation, Fertilization and Osmoregulation, Vertebrates-Nervous system, Endocrine system, Vascular system, Immune system, Digestive system and Reproduction System.

Molecular Biology: Nucleic acids (DNA, RNA), structure, function and their types, DNA denaturation & renaturation, Central dogma, DNA replication, Transcription, Translation, gene expression & regulations (lac operon, trp operon), Mutations.

Cell Biology: Cell membrane – model, structure & functions, cell cycle, mitosis, meiosis, cell signaling, cytoskeletal elements, cell organelles (Mitochondria, Chloroplast, Endoplasmic Reticulum, Golgi apparatus etc.).

Microbiology: History and introduction of microorganisms, structural functions of Virus, Bacteria, Fungi, Protozoa, Pathogenic microorganism, Isolation and culture of Bacteria.

Genetic Engineering: Isolation of DNA, RNA, competent cells, transformation, gene cloning, vectors – plasmid, Restriction Enzymes, Finger Printing.

Plant Biotechnology: Plant tissue culture techniques, *in vitro* pollination and fertilization, embryo culture and its applications, embryogenesis and organogenesis, micropropagation, haploids and their application, somaclonal variations and applications, Endosperm culture and production of triploids.

BIOLOGY

Zoology:

Origin of Life: Oparin's theory, Miller's Experiment, Viruses - structure, properties, distribution, classification and pathogenesis (*e.g.* AIDS, CANCER), Viroids & Prions, Biotic balance.

Organic Evolution: Relationship among organisms and Evidences of organic Evolution.

Principles of Evolution - Lamarkism, Darwinism and Speciation.

Mechanism of Organic Evolution: Variations - Definition, causes and types, Mutations (Principles of Hugo de Veries), Role of mutations in speciation. Evolution through ages and human evolution Human Genetics and Eugenics: Human hereditary traits, study of Twins, A,B,O blood groups and their inheritance, Rh-factor, Sex determination. Chromosomal aberrations, Important human syndromes, Sex linked characters and their inheritance, Applied Genetics - eugenics, euthenics, euphenics & I.Q. Test.

Applied Biology: Wild life of India - Endangered species: Biosphere Reserves, National Parks and sanctuaries, Project Tiger, Conservation of wild life, Bio-energy, Poultry, Fisheries (edible fishes), Human Population, Population explosion, problems & control. Test - Tube babies, & Amniocentasis, Application of Biotechnology in human welfare. Human Ageing.

Mammalian Anatomy (eg. Rabbit): Reproductive system (excluding embryonic development) Osteology, structure and organization of different systems.

Animal Physiology:

H. Animal Nutrition: Food, Balanced diet, Nutritional imbalances and deficiency diseases, Digestion, Absorption, Assimilation of food, (comparison between human and Rabbit).

I. Animal Excretion and Osmoregulation: Chemical nature of excretory products in various animals, Physiology of excretion, Function of liver and kidney (Homeostatic regulatory functions of kidneys), Formation of urine, Osmoregulation by kidneys.

J. Respiratory system: Exchange and transport of gases (O_2 and CO_2) factors affecting O_2 and CO_2 transport, Cellular respiration, different lung volumes, breathing and sound production.

K. Nervous systems: Central, autonomic and peripheral nervous system, Receptors, Effectors, Reflex Action. Nature and conduction of Nerve- impulses, Synapse, Sense organs - Structure & working of Eye & Ear, Biochemistry of vision and taste buds.

L. Endocrine System: Different endocrine glands and Hormones - definition, types, characteristics and their functions (in relation to human beings), Hormonal disorders and pheromones.

M. Circulatory System: Circulation of body fluids- Blood and lymph, Open and closed vascular systems, Structure and working physiology of Heart, Comparison between arteries and veins, Lymphatic system.

N. Animal Diversity: Classification of Animal kingdom (Based on Storar & Eusinger), Characteristic features of different phyla and classes with examples.

Detailed studies of:

G. Protozoa

   iv) *Amoeba*- Habit & Habitat, structure, locomotion, reproduction, Osmoregulation, Parastic amoebae - *Entamoeba histolytica* and *Entamoeba gingivalis*, structure, diseases caused by them and their control measures.

   v) *Plasmodium vivax*-lifecycle, malaria therapy and control.

   vi) Protozoan and diseases

H. Porifera: A simple sponge (*Leucosolenia*); detailed study of structure & physiology, Sponge industry.

I. Coelenterata: *Hydra* - Habit and Habitat, morphology, tissue differentiation in relation to physiological division of labour and regeneration.

J. *Aschelminthes*: *Ascaris*- morphology, life-cycle, therapy and control.

K. Annelida: *Pheretima posthuma* - Bionomics and economic importance.

L. Arthropoda: (*Periplanata*): Structure- external and internal. Comparison between *Periplaneta* and *Blatta*.
    iii) Housefly & Mosquito: structure and lifecycle.
    iv) Economic importance of insects & their control.

Botany

Plant Cell: Structure & functions, electron microscopic structure of mitrochondria, plastids, centrosomes. lysosomes, microsomes, endoplasmic reticulum, nucleus, DNA & RNA cytoplasm, golgi bodies, membrane and cell wall.

Protoplasm: structure, components, physical and chemical properties.

Cell divison (formation) - free cell formation, amitosis & miosis, duplication of DNA.

Ecology: Ecological factors (atmospheric, edaphic, climatic, geological & biotic factors).

Ecosystem: Structure, components of ecosystem eg. Water soluble minerals and gases, producers consumers, decomposers, pond and forest ecosystem. Atmospheric pollution-causes and control, types of pollution - detergents, chemicals automobile exhaust, radioactive matter, smog, sound, pesticides.

Genetics: Mendelism, Mendels experiment and law of inheritance.

Modern Classification of plant kingdom- (according to Ostwald & Tippo) (outline).

Seeds in angiospermic plants: description of development of angiospermic plants (life history of angiospermic plants).

Fruits: Dispersal of fruits and seeds

Cell differentiation Plant Tissue: Meristematic classification of meristematic & permanet tissue and functions and classification of tissue system.

Anatomy of root, stem and leaf: difference between dicot and monocot stem. Secondary growth of stem and root. Anatomy of hydrophytes, xerophytes & mesophytes.

Important phylums:

Algae: Habitat, general characters & uses, description of *Ulothrix* & *Spirogyra*.

Bacteria: structure - types of nutrition, reproduction and economic importance.

Fungi: structure description of *Rhizopus* and yeast and their economic importance, Fermentation.

Bryophyta: structure and economic importance, description of *Funaria* (Moss)

Pteridophyta: general structures of pteridophytes description of fern (*Droypteris*)

General study of gymnosperms and life history of cycas.

Classification of angiosperms,

Description of families - identification and economic importance

Cruciferae, Malvaceae, Fabaceae, Compositeae, Cucurbitaceae.

Soil: Absorption of water through root hairs osmosis, translocation and root pressure Nitrogen cycle.

Special modes of nutrition in plants (Autotrophic, heterotrophic, parasites, saprophytes, symbionts insectivorous and their ecological relation.

Photosynthesis: Chloroplast, light, chlorophyll and Carbon dioxide, Mechanism of photosynthesis formation of ATP and their functions and importance of photosynthesis.

Transpiration: factors and importance, Mechanism of opening and closing of stomata. Respiration: aerobic, anaerobic respiration, mechanism of respiration (Glycolysis, Kreb's cycle, ETS)

Growth & movement: definition of growth, Region of growth & their measurements, types of movements in plants, growth hormone.

COMPUTER SCIENCE

Computer Fundamentals: Evolution of computer, Basic of computer and its operation: Functional Components and their Evolution of computer, concept of booting, Use of Operating System for directory listing, hierarchical directory structure, renaming, deleting files/folders, formatting floppy, copying files, concepts of path and pathname, switching between tasks, installation/removal of application.

Software Concept: Types of Software-System Software, Utility Software and Application Software, System Software: Operating System, Compilers, Interpreters and Assembler, Operating System: Need for operating system, Functions of Operating System (Processor Management, Memory Management, File Management Device Management), Types of operating system-Interactive (GUI based), Time Sharing, Real Time and Distributed.

4. Introduction to MS Office
5. Input and Output devices
6. Introduction to Data and Information

Bachelor of Education (B.Ed.)

Section: A

General Awareness

Section: B

General Hindi or General English

Section: C

1. Reasoning
2. Mathematics
3. Teaching Aptitudes

Section: D

Graduation syllabus of allied Subject.