PHYSICS


ROTATIONAL MOTION: Basic concepts of rotational motion; torque; angular momentum, moment of inertia.


KINETIC THEORY OF GASES: Equation of state of a perfect gas, Work done on compressing a gas. Kinetic theory of gases – assumptions, concept of pressure. Kinetic energy and temperature: RMS speed of gas molecules; Degrees of freedom, Law of equipartition of energy, applications to specific heat capacities of gases; mean free path, Avogadro’s number.

ELECTROSTATICS: Conductors and insulators, Dielectrics and electric polarization, capacitor, combination of capacitors in series and parallel, Energy stored in a capacitor. Capacitors in series and parallel, resistors in series and parallel.

ELECTROMAGNETIC INDUCTION AND ALTERNATING CURRENT: Electromagnetic induction; Faraday’s law, induced e.m.f. and current; Lenz’s Law, Eddy currents. Self and mutual inductance. Alternating current, peak and RMS value of alternating current/ voltage; reactance and impedance; LCR series circuit, resonance; Quality factor, Power in C circuit, wаттс current, AC generator and transformer.

ELECTROMAGNETIC WAVES: Electromagnetic waves and their characteristics, Transverse nature of electromagnetic waves.

OPTICS: Reflection and refraction of light at plane and spherical surfaces, mirror formula, Total internal reflection and its applications, Deviation and Dispersion of light by a prism, Lens Formula, Magnification, Power of a lens, Combination of thin lenses in contact, Microscope and Astronomical Telescope (reflecting and refracting) and their magnifying powers.

ELECTRONIC DEVICES: Semiconductors; semiconductor diode: I–V characteristics in forward and reverse bias; diode as a rectifier; I–V characteristics of LED, photodiode, solar cell and Zener diode; Zener diode as a voltage regulator. Junction transistor, Transistor as an amplifier (common emitter configuration) and oscillator. Logic gates (OR, AND, NOT, NAND and NOR). Transistor as a switch.
CHEMISTRY

SOME BASIC CONCEPTS IN CHEMISTRY: Matter and its nature, Dalton’s atomic theory, Concept of atom, Molecule, element and compound; Physical quantities and their measurements in Chemistry, precision and accuracy, significant figures, S.I. Units, dimensional analysis’ Laws of chemical combination; Atomic and Molecular masses, mole concept, molar mass, percentage composition, empirical and molecular formulae; Chemical equations and stoichiometry.

STATES OF MATTER:

Gaseous State – Measurable properties of gases; Gas laws- Boyle’s law, Charle’s law, Graham’s law of diffusion, Avogadro’s law, Dalton’s law of partial pressure; concept of Absolute scale of temperature; Ideal gas equation; Kinetic theory of gases (only postulates); Concept of average, root mean square and most probable velocities; Real gases, deviation from Ideal behavior, compressibility factor and van der Waals equation.

Liquid State – Properties of liquid – vapour pressure, viscosity and surface tension and effect of temperature on them (qualitative treatment only).

Solid State – Classification of solids: molecular, ionic, covalent and metallic solids, amorphous and crystalline solids (elementary idea); Bragg’s Law and its applications; Unit cell and lattices, Packing in solids (fcc, bcc and hcp lattices), voids, calculations involving unit cell parameters, imperfection in solids; Electrical and magnetic properties.

CHEMICAL BONDING AND MOLECULAR STRUCTURE:

Ionic Bonding- Formation of ionic bonds factors affecting the formation of ionic bonds; calculation of lattice enthalpy.

Covalent Bonding – Concept of electronegativity, Fajan’s rule, dipole moment; valence shell Electron Pair Repulsion (VSEPR) theory and shapes of simple molecules.
MATHEMATICS


Trigonometric Functions: Positive and negative angles. Measuring angles in radians and in degrees and conversion from one measure to another. Definition of trigonometric functions. Addition and subtraction formulae, Multiple and sub multiple angles, Sum as product.

Limits and Continuity: Limits, Indeterminate forms, Right hand and left hand limit, Continuity of a function at a point, Continuity of a function in an interval.


Applications of Derivative: rate of change, increasing / decreasing functions, tangents and normals, approximation, maxima and minima.

Integration: Integration of a variety of functions by substitution, by partial fractions and by parts. Basic properties of definite integrals and evaluation of definite integrals.

Applications of the Integrals: Area under simple curves, especially lines, areas of circles /parabolas / ellipse (in standard form only), area between the two curves.

Geometry: Coordinate Lines, parabolas, circles, equation of a circle, ellipses, hyperbolas, symmetry, transformations, polar coordinates;

Probability and Statistics: Mean, median, mode, range, standard deviation, graphs and plots, least squares regression (linear, quadratic, exponential), Multiplication theorem on probability, Conditional probability, independent events, total probability, Baye’s theorem, Random Variable and its probability distribution. Repeated independent (Bernoulli) trials and Binomial distribution.
INFORMATION PRACTICE

UNIT 1: NETWORKING AND OPEN STANDARDS

Computer Networking:

- Networking: a brief overview.
- Network Devices: Hub, Switch, Repeater, Gateway and their functions
- Types of Network: LAN, MAN, WAN, PAN
- Network Topologies: Star, Bus, Tree
- Network Protocols: HTTP, TCP/IP, PPP
- Identifying computers and users over a network: Basic concept of domain name, MAC (Media Access Control), and IP Address, domain name resolution.

Open Source Concepts:

- Open Source Software (OSS), common FOSS/FLOSS examples (e.g. Gnu/Linux, Firefox, OpenOffice, Java, netbeans, MySQL), common open standards (WWW, HTML, XML, ODF, IP, TCP).
- Indian Language Computing: Character encoding, UNICODE, different types of fonts (open type vs true type, static vs dynamic), Entering Indian Language Text - Phonetic and key map based.

UNIT 2: PROGRAMMING

Programming Fundamentals

- Basic concept of Access specifier for classes, Members and methods
- Basic concept of Inheritance.
- Commonly used libraries: String class and methods: toString(), concat(), length(), toLowerCase(), toUpperCase(), trim(), substring(), Math class methods: pow(), round()
- Accessing MySQL database using ODBC/JDBC to connect with database.
- Web application development: URL, Web Server, Communicating with the web server, concept of Client and Server Side.
• HTML based web pages covering basic tags - HTML, TITLE, BODY, H1..H6, Paragraph (P), Line Break (BR), Section Separator (HR), FONT, TABLE, LIST (UL, OL), FORM;

• Creating and accessing static pages using HTML and introduction to XML

UNIT 3: RELATIONAL DATABASE MANAGEMENT SYSTEM

Database Fundamentals

• Concept of Database Transaction, Committing and revoking a Transaction using COMMIT and REVOKE,

• Grouping Records: GROUP BY, Group functions - MAX(), MIN(), AVG(), SUM(), COUNT(); using COUNT(*), DISTINCT clause with COUNT, Group Functions and Null Values,

• Displaying Data From Multiple Tables: Cartesian product, Union, concept of Foreign Key, Equi- Join

• Creating a Table with PRIMARY KEY and NOT NULL constraints, Viewing Constraints, Viewing the Columns Associated with Constraints using DESC Command;

• ALTER TABLE for deleting a column, ALTER TABLE for modifying data types of a column

• For adding a constraint enabling constraints, dropping constraints.

• DROP Table for deleting a table;

UNIT 4: IT APPLICATIONS

• Front-end Interface - Introduction; content and features; identifying and using appropriate component (Text Box, Radio Button, CheckBox, List etc) for data entry, validation and display;

• Back-end Database - Introduction and its purpose; exploring the requirement of tables and its essential attributes;

• Front-End and Database Connectivity - Introduction, requirement and benefits

• Demonstration and development of appropriate Front-end interface and Back-end Database for e- Governance, e-Business and e-Learning applications

• Impact of ICT on Society: Social and Economics benefits and Infomania.

UNIT 5: JAVA GUI PROGRAMMING

• Rapid Application Development, Java GUI Toolkit, Java Data types, Variables, Text Interaction in Java GUIs, Operators, Expressions, Statements
• Programming Constructs

• Understanding Swing Components, Frame, Push Buttons, Labels, Textfields, Password Fields, Text area, Checkboxes, Radiobuttons, Lists, Comboboxes

• Classes and Objects, Methods, Scope, Constructors, Object Oriented Terminology, Libraries, Access Specifiers, Working with Strings, Packages

• Inheritance, Types of inheritance, Function Overloading, Interfaces, Abstract Class, GUI Dialogs and Tables, Database Connectivity to MySQL

• Java Swing Control Methods & Properties
Business Mathematics

Syllabus
Module 1: Basic Algebra
Module 2: Real numbers
Module 3: Ratio, Proportion & Percentage
Module 4: Profit & Loss
Module 5: Interest (Simple & Compound)
Module 6: Linear Equations
Module 7: Elementary Statistics, Permutation & Combination, Probability
English Language (IELTS Pattern):
1. Reading Comprehension
2. Vocabulary
3. Grammar
4. Writing (Paragraph/Essay)