TG ECET-2026

SYLLABUS FOR COMPUTER SCIENCE & ENGINEERING

MATHEMATICS (50 Marks)

UNIT-I: MATRICES AND DETERMINANTS

Definition of Matrix, Types of matrices-Algebra of matrices-Transpose of a matrix-Symmetric, skew symmetric matrices-Minor, cofactor of an element-Determinant of a square matrix up to third order – Properties - Laplace's expansion-singular and non-singular matrices- Adjoint and multiplicative inverse of a square matrix-System of linear equations in 3 variables-Solutions by Cramer's rule, Matrix inversion method-Gauss-Jordan method.

Partial Fractions: Resolving a given rational function into partial fractions.

Logarithms: Definition of logarithm and its properties, meaning of 'e', exponential function and logarithmic function.

UNIT–II: TRIGONOMETRY

Properties of Trigonometric functions– Ratios of Compound angles, multiple angles, sub multiple angles – Transformations of Products into sum or difference and vice versa. Properties of triangles: sine rule, cosine rule, tangent rule and projection rule. Solution of a triangle when (i) three sides (SSS), (ii) two sides and an included angle (SAS), (iii) one side and two angles are given (SAA). Inverse Trigonometric functions, Hyperbolic functions.

Complex Numbers: Definition of a complex number, Modulus, amplitude and conjugate of complex number, arithmetic operations on complex numbers - Modulus-Amplitude form (Polar form) - Euler form (exponential form).

UNIT–III: ANALYTICAL GEOMETRY

Straight Lines–different forms of Straight Lines, distance of a point from a line, angle between two lines, intersection of two non-parallel lines and distance between two parallel lines.

Circles - Equation of circle given center and radius, given ends of diameter-General equation-finding center and radius, center and a point on the circumference, 3 non-collinear points, center and tangent, equation of tangent and normal at a point on the circle.

Conic section – Properties of parabola, ellipse and hyperbola – Standard forms with vertex at origin and axis along co-ordinate axes only, simple problems.

UNIT–IV: DIFFERENTIATION AND ITS APPLICATIONS

Functions and limits – Standard limits – Differentiation of sum, product, quotient of functions, function of function, trigonometric, inverse trigonometric, exponential, logarithmic, hyperbolic functions, implicit, explicit and parametric functions–Derivative of a function with respect to another function-Second order derivatives – Geometrical applications of the derivative(angle

between curves, tangent and normal)–Increasing and decreasing functions–Maxima and Minima(single variable functions) using second order derivative only, Physical application – Rate measure - Partial differentiation–Partial derivatives up to second order–Euler's theorem.

UNIT–V: INTEGRATION AND ITS APPLICATIONS

Indefinite integral – Standard forms – Integration by substitution, Integration of trigonometric, algebraic, exponential, logarithmic and hyperbolic functions—Integration of reducible and irreducible quadratic factors, Integration by decomposition of the integrand, Integration by parts – Definite integrals and properties, Definite integral as the limit of a sum – Application of integration to find areas under plane curves and volumes of solids of revolution– Mean and RMS values, Trapezoidal rule and Simpson's 1/3 rule for approximation of integrals.

UNIT–VI: DIFFERENTIAL EQUATIONS

Definition of a differential equation-order and degree of a differential equation- formation of differential equations-solution of differential equation of the type first order first degree, variable-separable, homogeneous equations, exact, linear differential equation of the form $dy/dx+Py=Q$, Bernoulli's equation, 2^{nd} order linear differential equations with constant coefficients both homogeneous and non-homogeneous and finding the particular integrals for the functions e^{ax}, sin ax, cos ax, $ax^2 + bx + c$ (a, b, c are real numbers) and general solutions.

UNIT–VII: LAPLACE TRANSFORMS

Laplace Transforms (LT) of elementary functions-Linearity property, first shifting property, change of scale property, multiplication by t^n and division by t - LT of derivatives and integrals, Unit step function, LT of unit step function, second shifting property, evaluation of improper integrals, Inverse Laplace transform (ILT)-shifting theorems, change of scale property, multiplication by s^n and division by s, ILT by using partial fractions and convolution theorem. Applications of LT to solve linear ordinary differential equations up to second order with initial conditions.

UNIT–VIII: FOURIER SERIES

Fourier series, Euler's formulae over the interval (C, C+2π) for determining the Fourier coefficients. Fourier series of simple functions in (0, 2π) and (–π, π), Fourier series for even and odd functions in the interval (–π, π) – Half range Fourier series – sine and cosine series over the interval (0, π).

PHYSICS (25 Marks)

UNIT-I: UNITS, DIMENSIONS AND MEASUREMENTS

Physical quantity – Fundamental and derived quantities, unit – definitions – system of units – Advantages of S.I. units.

Dimensions and dimensional formula – definitions, units and dimensional formulae for physical quantities, Dimensionless quantities, Principle of homogeneity, Applications of dimensional analysis – Checking the correctness of physical equations – conversion of unit from one system to another system – problems on density, force and energy.

UNIT-II: VECTORS

Scalar and Vector quantities – definition and examples, representation of a vector, Classification of vectors - Proper vector, Equal vectors, Unit vector, Negative vector, null vector and Position vector, Resolution of a vector.

Lami's theorem, Parallelogram law of vectors – statement- expression for magnitude and direction of resultant vector – derivation, Representation of a vector in unit vectors **i**, **j** and **k** – numerical problems.

Scalar product of vectors - application to work done by force and power – properties of scalar product – Numerical problems.

Vector product of vectors – Right hand thumb rule and right hand screw rule - application to torque - properties of vector product - Application to area of parallelogram and triangle - numerical problems.

UNIT-III: MECHANICS

Concept of Friction - Normal reaction, Angle of friction, Motion of a body over a rough horizontal surface - expressions for Acceleration, Displacement, Time taken to come to rest - derivations, inclined plane - Motion of a body over a smooth inclined plane and rough inclined plane–forces acting on the body - angle of repose, Application of friction – brake system in bicycle – numerical problems.
Projectile motion – definition – examples, Horizontal projection - Oblique projection, Expression for path of a projectile in oblique projection – derivation, Maximum height, Time of ascent, Time of descent, Time of flight, Horizontal range and maximum horizontal range in oblique projection – derivations, numerical problems.
Circular motion – definition of angular displacement, angular velocity, angular acceleration, frequency and time period, Relation between linear and angular velocity – derivation – related numerical problems, Central force – examples, Expressions for centripetal and centrifugal forces (no derivation), Applications of centripetal and centrifugal forces - Banking of roads and its expression, bending of cyclist and principle of centrifuge - related numerical problems.

UNIT-IV: PROPERTIES OF MATTER

Elasticity – Elastic body – definition - examples, Stress and Strain – definitions and expressions, types of stress and strain, elastic limit - Hooke's law – statement – modulus of elasticity,

significance of stress and strain curve -Young's modulus – Derivation, numerical problems.

Surface tension - Capillarity –angle of contact – definition- examples for capillarity- Formula for Surface tension based on capillarity (no derivation), effect of temperature and impurity on surface tension, applications and illustrations of surface tension, numerical problems.

Viscosity - Newton's formula for viscous force – derivation - Coefficient of viscosity - Poiseuille's equation (formula only), Effect of temperature on viscosity of liquids and gases, applications of viscosity, numerical problems.

Concept of fluid motion – streamline and turbulent flow, Reynold's number, equation of continuity, Bernoulli's theorem (only formula) and applications - related problems.

UNIT-V: CONSERVATION LAWS AND ENERGY SOURCES

Work, Power and Energy – explanation, Potential Energy and Kinetic energy –examples – expressions for Potential energy and Kinetic energy – derivations, Work-Energy theorem – derivation, Law of conservation of energy – examples, Law of conservation of energy in the case of freely falling body – proof – Illustration of conservation of energy in the case of simple pendulum, related problems.

UNIT-VI: HEAT

Heat – thermal expansion of solids – Coefficients of expansions, Boyle's law – statement, concept of absolute zero - Absolute scale of temperature, Charles' laws, Ideal gas equation – derivation - value of universal gas constant 'R', Gas equation in terms of density, Isothermal and Adiabatic processes - Differences between isothermal and adiabatic processes, Internal energy and External work done, Expression for work done – derivation, first law of thermodynamics – application of first law to isothermal and adiabatic processes, second law of thermodynamics, specific heats of a gas, related numerical problems.

UNIT-VII: SIMPLE HARMONIC MOTION

Periodic motion - Simple Harmonic Motion (SHM) – definition – examples, Conditions for SHM, Time period, frequency, amplitude and phase of a particle in SHM, Expressions for Displacement, Velocity, Acceleration, Time period and frequency of a particle executing SHM – derivations.

Ideal simple pendulum – time period of simple pendulum – derivation, laws of simple pendulum, Second's pendulum - related numerical problems.

UNIT-VIII: SOUND

Stationary waves, beats - applications of beats, echo – definition - applications - relation between time of echo and distance of obstacle.

Doppler effect in sound (no derivation, formulae only) – list the applications – ultrasound and radar in medicine and engineering - derivation - Reverberation and time of reverberation - Sabine's formula - Free and forced vibrations - Resonance - Conditions of good auditorium, noise pollution – causes, effects and methods to minimize noise pollution, related numerical problems.

UNIT-IX: MAGNETISM AND ELECTRICITY

Basics of magnetism, Coulomb's inverse square law in magnetism, moment of couple on a bar magnet placed in a uniform magnetic field – derivation, expression for magnetic induction field strength at a point on the axial line of a bar magnet – derivation.
Kirchhoff's laws in electricity, Wheatstone bridge – balancing condition, application of Wheatstone bridge – Meter bridge,
Concept of electromagnetic induction – self induction and mutual induction, Faraday's Laws, Lenz's law, principle and working of transformer - types of transformers, types of magnetic materials – dia, para and ferromagnetic materials, related numerical problems.

UNIT-X: OPTICS

Light theories - dual nature, reflection, refraction, and interference.
Photo electric effect - Einstein's photo electric equation – Work function and threshold frequency - laws of photo electric effect - applications of photo electric effect – photo cell.

UNIT-XI: MODERN PHYSICS

LASER – definition, Spontaneous emission and Stimulated emission – principle and working of LASER, characteristics of LASER- types of LASER, applications of LASER.
Total internal reflection, critical angle, conditions for total internal reflection, Principle and working of Optical fiber – types - Applications of optical fiber –Nano technology, nano particles and nano materials - applications and devices, Superconductivity - basic concept - applications of Superconductors.

UNIT-XII: SEMICONDUCTOR PHYSICS

Energy bands in solids - valence band- conduction band – forbidden gap – Energy band diagram of conductors, insulators and semiconductors – concept of Fermi level - Intrinsic semiconductors - examples - Concept of holes in semiconductors - Doping - Extrinsic semiconductors - P-type and N-type semiconductors, PN Junction diode – Forward Biasing and Reverse Biasing - Volt-Ampere (V-I) characteristics - Applications of PN diode - Diode as rectifier (half wave rectifier), Light Emitting Diode – principle and working, solar cell – principle and working.

CHEMISTRY (25 Marks)

UNIT-I: FUNDAMENTALS OF CHEMISTRY

Atomic Structure: Introduction – Atomic number – Mass number - Isotopes and Isobars - Bohr's Atomic Theory - Orbitals - Shapes of s, p and d orbitals – Aufbau principle - Hund's rule - Pauli's exclusion principle - Electronic configuration of elements

Chemical Bonding: Introduction – Electronic theory of valency - Types of chemical bonds - Ionic, Covalent, Co-ordinate covalent, Metallic and Hydrogen bonds with examples - Properties of Ionic and Covalent compounds - Types of Hydrogen bonds – Effect of hydrogen bonding on physical properties.

Oxidation - Reduction: Electronic concept of Oxidation, Reduction, Oxidation Number - Calculations.

UNIT-II: SOLUTIONS AND COLLOIDS

Introduction - Solution – Solubility - Classification of solutions based on physical state - Atomic weight, Molecular weight, Equivalent weight - Mole concept – Molarity and Normality - Numerical problems on mole, molarity and normality – Colloids - Types of colloids - Lyophilic and Lyophobic colloids - Protective Colloids - Gold number - Properties of Colloids - Industrial applications of colloids.

UNIT-III: ACIDS AND BASES

Introduction - Theories of acids and bases and limitations - Arrhenius theory - Bronsted -Lowry theory - Lewis's acid base theory - Ionic product of water - pH and related numerical problems - Buffer solutions - buffer action - Applications of buffer solutions - Ostwald's theory of indicators.

UNIT-IV: ENVIRONMENTAL SCIENCE

Introduction - Environment - Scope and importance of environmental studies - Important terms - Concept of ecosystem - Producers, consumers and decomposers - Food chain - Food web - Carbon and nitrogen cycles - Biodiversity, definition and threats to Biodiversity - Forest resources - Deforestation – Green Chemistry – E-waste – Management of e-waste.

UNIT-V: WATER TECHNOLOGY

Introduction - Soft and hard water - Causes of hardness – Types of hardness - Disadvantages of hard water using in industries - Degree of hardness - Softening methods - Permutit process and Ion exchange process - Drinking water - Municipal treatment of water for drinking purpose – Osmosis and Reverse Osmosis - Advantages of Reverse osmosis – Desalination by Electro dialysis – Defluoridation – Nalgonda Technique.

UNIT-VI: ELECTROCHEMISTRY

Conductors, insulators, electrolytes – Types of electrolytes - Arrhenius theory of electrolytic dissociation - Electrolysis – Electrolysis of fused NaCl and aqueous NaCl –Applications of electrolysis - Faraday's laws of electrolysis - Numerical problems.

UNIT-VII: METALLURGY

Characteristics of metals - Distinguish between metals and non metals - Mineral, Ore, Gangue, Flux, Slag - Concentration of ore - Construction and operation of Reverberatory furnace and Blast furnace - Methods of extraction of crude metal - Roasting, Calcination, Smelting – Alloys - Purpose of making alloys - Composition and uses of Brass, German Silver, Nichrome, Stainless Steel and Duralumin.

UNIT – VIII: CORROSION

Corrosion - Factors influencing the rate of corrosion – Dry and wet theories of corrosion – Composition cell, Stress cell and Concentration cell - Rusting of iron and its mechanism - Prevention of corrosion – Protective coatings - Cathodic protection - Paint – Constituents of paint – Functions of constituents of paint.

UNIT – IX: POLYMERS

Polymers - Polymerization - Types of polymerizations – Addition polymerization and Condensation polymerization - Plastics - Types of plastics - Advantages of plastics over traditional materials - Disadvantages of using plastics - Preparation and uses of the following plastics: 1. Polythene 2. PVC 3. Teflon 4. Polystyrene 5. Urea formaldehyde 6. Bakelite - Compounding and moulding of plastics – Natural rubber – Vulcanization of natural rubber - Elastomers – Preparation and uses of Butyl rubber, Buna-S rubber and Neoprene rubber - Fibre - Preparation and uses of Nylon 6,6 and Polyester (Polyethylene terephthalate) - Biodegradable polymers and their general applications.

UNIT – X: FUELS AND LUBRICANTS

Definition and classification of fuels - Characteristics of good fuels - Calorific value - HCV and LCV - Calculation of oxygen required for combustion of methane and ethane – Preparation method, composition, calorific value, and uses of some gaseous fuels; a) CNG b) LPG c) Water gas, d) Producer gas, e) Coal gas, and f) Bio gas – Explosives – Classification of explosives – Applications of explosives – Lubricants – Classification and functions of lubricants.

UNIT XI: ELECTROCHEMICAL CELL - BATTERIES

Galvanic cell - Standard electrode potential - Reference electrodes - Types of reference electrodes - Electro chemical series - EMF of cell – batteries - Types of batteries - Fuel cells.

UNIT – XII: ENVIRONMENTAL STUDIES

Introduction - Classification of air pollutants based on origin and states of matter - Air pollution – Causes, effects and controlling methods of air pollution - Water pollution – Causes, effects and controlling methods of water pollution – Soil pollution – Causes of soil pollution – General effects of soil pollution - Controlling methods of soil pollution – Carbon Trading.

COMPUTER SCIENCE & ENGINEERING (100 Marks)

UNIT-I: DIGITAL ELECTRONICS

Number systems–Number conversions– Codes – Logic gates: AND, OR, NOT, NOR, NAND and XOR – Boolean algebra – Boolean expressions – De-Morgan's theorems – SOP and POS forms –K-Map (up to 4 variables) –Digital logic families – TTL, CMOS and ECL– Characteristics of Digital ICs –Combinational Circuits –Adders – Multiplexers and De-multiplexers –Encoders and Decoders –Comparators –Sequential logic circuits –Latches –Flip-flops – Edge and level triggering –Registers –Counters –Memories – RAM, ROM, Applications of Flash ROM.

UNIT-II: COMPUTER ARCHITECTURE

Functional blocks of Digital computer – Stored program concept – Fixed point, Floating point number representations – Complements –Instruction formats – Addressing modes– Memory hierarchy –Virtual memory, Associative memory – Cache memory – I/O Organization – Modes of data transfer – Programmed I/O, Interrupt initiated I/O, and DMA – Bus system – Parallel processing –Pipeline processing: Arithmetic & instruction pipeline –Vector processing – Flynn's classification – Comparison between RISC and CISC processors.

UNIT-III: C PROGRAMMING AND DATA STRUCTURES

Algorithms – Flowcharts – C Tokens – Data types – Operators – Expressions – Precedence and Associativity of operators –Type conversions – Preprocessor directive statements–Decision making statements –Looping statements – break and continue – 1D and 2D Arrays –Strings – String handling functions – Scope and lifetime of variables– Functions– Parameter passing– Storage classes–Recursion – Structures– Unions – Files: File opening modes, Open/Closing files.

Data Structures: Pointers – Address of(&) and Dereferencing(*) operators–Pointer Arithmetic– Arrays and pointers– Structures and pointers – Dynamic Memory allocation– Data structures classification– Abstract Data Types– Asymptotic Notations: Big-Oh, Omega, Theta– Stacks and Queues –Linked Lists: Single Linked List, Double Linked List, Circular Linked List– Trees– Binary trees– Tree traversal techniques.

Sorting Techniques: Bubble, Selection, Insertion, Quick and Merge sort– Searching Techniques: Linear and Binary search.

UNIT-IV: OBJECT ORIENTED PROGRAMMING THROUGH C++

OOPs concepts – Keywords of C++ –Classes and objects– Array of objects– Passing and returning objects– Pointer to objects– References– this pointer– I/O manipulators – File and I/O functions –Constructors and destructors –Function overloading, Constructor overloading and Operator overloading– Inheritance types: Single, Multiple, Multilevel, Hierarchical, Hybrid and Multipath–Virtual functions – friend functions –inline functions – Templates: function and class templates.

UNIT-V: RELATIONAL DATABASE MANAGEMENT SYSTEMS

Database System Concepts – Data Abstraction – Data Independence– Data Models– Entity-Relationship (ER) Model – Structure of Relational database – Types of Keys– Functional dependencies – Normal Forms: 1st, 2nd, 3rd and BCNF – Transactions – ACID Properties – SQL – data types, operators, constraints – Database Languages: DDL, DML – SQL functions: numeric, aggregate, scalar, date and string functions – JOIN statements – views, sequences, synonyms and indexes – PL/SQL: data types, control statements, functions, procedures, recursion, exceptions, cursor management, and triggers.

UNIT-VI: COMPUTER HARDWARE & NETWORKING

BIOS – Components of Motherboard – SMPS –Processors – Memories –Mass Storage devices – Input devices– Output devices.

Networking: Classification of networks: LAN, MAN, WAN –Network topologies: Bus, Ring, Star, Mesh, and Hybrid –OSI reference model – TCP/IP reference model – LAN components: Coaxial, Twisted-pair, Optical fiber cables and connectors – Ethernet – LAN devices: Repeaters, Hubs, Bridges, Switches, Gateways, Network Interface Cards(NICs), Routers, Modems – Protocols: HTTP, HTTPS, FTP, SMTP, Telnet –TCP/IP addressing scheme – IP Address classes – IP Subnetting.

UNIT-VII: OPERATING SYSTEMS

Operating System Concepts – Goals– Services– Types– System calls – Process Management: PCB, Process states, Threads – CPU Scheduling criteria –CPU Scheduling Algorithms: FCFS, SJF, Round Robin, Priority, Multilevel Scheduling, Multilevel Feedback Scheduling – Inter Process Communication –Process Synchronization – Semaphores – Monitors – Deadlocks: Necessary conditions, Prevention, Avoidance, Detection and Recovery – Memory Management – Overlays, Swapping, Fragmentation, Paging, Segmentation - Virtual Memory– Demand Paging – Page Replacement Algorithms: FIFO, LRU, Optimal – Thrashing – Disk Scheduling – Disk Scheduling Algorithms: FIFO, SSJF, SCAN, C-SCAN – File management: File operations, Access methods, Directory Structure.

UNIT-VIII: JAVA PROGRAMMING

Java – features, tokens, data types, variables, operators, arrays, selection and iteration statements – Classes and objects – Constructors – Method overloading –Static and final usage – String class and String class methods– Inheritance types – this, super keywords – Method overriding – Interfaces –Packages – Access specifiers: public, private, protected, default – Applets – AWT – AWT Controls: Label, Button, Checkbox, CheckboxGroup, TextField, TextArea, Choice, List, Scrollbar – Event Sources, Event Classes, Event Listener Interfaces – Event handling – Exception handling – Multithreading – JDBC – Servlets.

UNIT-IX: PYTHON PROGRAMMING

Python – features, variables, data types, indentation, decision making statements, looping statements – Data Structures: Lists, Tuples, Sets and Dictionaries –Classes and objects – Constructors – Modules – Packages: math, datetime package– Exception handling – Multithreading– GUI using Tkinter package – Geometry managers: Pack, Grid, Place – Widgets: Label, Entry, Text, Button, Checkbutton, Radiobutton, Listbox, Canvas, Scale, Scrollbar– Regular expressions – File operations.

UNIT-X: WEB TECHNOLOGIES

Internet fundamentals – HTML, Tags with Attributes: <h1> to <h6>, <q>, , <big>, <small>, <ins>, <del>, <b>, <i>, <u>, <strike>, <sub>, <sup>,<font>, <marquee>, <table>, <form>, <frame> tags – Cascading Style Sheets (CSS) –XML – Java script: data types, operators, conditional and iteration statements, procedures, functions and arrays – PHP: data types, variables, operators, conditional and looping statements, strings and string methods, arrays and Array class methods, functions, classes and objects – Concept of accessing databases – Sessions and Cookies.