<u>Stream wise syllabus for Recruitment Exam for the Post of Scientific Assistant</u>

(Information Technology)

1. Engineering Mathematics

Mathematical Logic: Propositional Logic; First Order Logic:

Probability: Conditional Probability; Mean, Median, Mode and Standard Deviation; Random Variables; Distributions; uniforms, 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, spanning trees, Cut vertices & edges, covering, matching, independent sets, Colouring, Planarity, Isomorphism.

Linear Algebra: Algebra of Matrices, determinants, systems of linear equations, Eigen values and Eigen vectors.

Numerical Methods: LU decomposition for systems of linear equations, numerical solutions of non-linear algebraic equations by Secant, Bisection and Newton-Raphson Methods; Numerical integration by trapezoidal and Simpson's rules.

Calculus: Limit, Continuity & differentiability, Mean value Theorems, Theorems of integral calculus, evaluation of definite & improper integrals, Partial derivatives, Total derivatives, Maxima & Minima.

2. Information Technology

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

Computer Programming: 'C' programming, Expressions and Console I/O, Statements, Arrays and Strings, Pointers, Functions, Structures, Unions, Enumerations, and Typedef, File I/O, Pre-processor and Comments

Object Oriented Techniques: Basics of Object Orientation, Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams, Object Oriented Analysis, Object oriented design, Object design, Combining three models, Introduction to Java, History, Features, Object Oriented concept of Java, Classes and Objects, Inheritance, Packages, Interface, abstract method, Polymorphism.

Data Structures And Algorithms: Linear Data Structures, Basic Analysis, Searching and Sorting, Algorithmic Strategies and problem solving, Non-Linear Data Structures, Stacks, Queues, Linked Lists, Trees, Binary search trees, Binary heaps.; Greedy approach, Dynamic programming, Divide-and-conquer, Tree and graph traversals, Connected competent, Spanning trees, Shortest paths; Hashing, Sorting, Searching.

Design and Analysis of Algorithms: Fundamental characteristics of an algorithm. Basic algorithm, Fundamental Algorithmic Strategies, Brute Force, Greedy method, Branch and Bound, Backtracking and Dynamic Programming, Asymptotic analysis (best, worst, average cases) of time and space, upper and lower bounds, Basic concept of complexity classes –P, NP, NP-hard, NP-complete, Graph and Tree Algorithms, Depth and Breadth first traversal, Tractable and Intractable Problems.

Information Management System(DBMS): ER-model, Relational Model (relational algebra, tuple calculus), Database design (integrity constraints, normal forms), Query languages (SQL), File structures (sequential files, indexing, B and B+ trees), Transactions and concurrency control

Operating Systems: Operating System Principles, Concurrency, Scheduling and Dispatch, Memory Management, File Systems, Deadlock, Security and Protection, Virtual Machines, Device Management, Linux/Unix

Computer Architecture And Organization: Basics of Digital Electronics, Register Transfer and Micro operations, Basic Computer Organization, Control Unit, Central Processing Unit, Computer Arithmetic, Input-Output Organization, Memory Unit, Introduction to Parallel Processing

Computer Networks: ISO/OSI stack, LAN technologies (Ethernet, Token ring), Flow and error control techniques, Routing algorithms, Congestion control, TCP/UDP and sockets, IPV4, IPV6, Application layer protocols, (ICMP, DNS, SMTP, POP, FTP, HTTP), Basic concepts of hubs, switches, gateways, and routers. Wireless technologies, Network security – basic concepts of public key and private key cryptography, digital signature, firewalls.

Software Engineering: Importance of Software and Software Evolution, Software Process models (Waterfall, Incremental, Evolutionary, Agile), CASE Tools and Environments, Requirements Engineering, Software Design, Software Construction, Software Verification and Validation, Software Quality Assurance, Formal Methods, Technical Metrics for Software, Software Cost Estimation, Software Project Management

Internet Web Programming: Working with User Interfaces, JAVA database connectivity-JDBC, Introduction to HTML Server side scripting Languages-JSP, I/O–AWT–Event handling–Introduction to Threads, Basics of Networking, TCP and UDP sockets, connecting to the Web, e-Commerce and e-Governance