DEPARTMENT OF INFORMATION TECHNOLOGY
SCHOOL OF MATHEMATICAL & COMPUTER SCIENCES
Syllabus of Entrance Test for Ph.D. in Information Technology-2026

Section-A: Academic Component

Programming Languages & Data Structures: History and Origin of Programming Languages, Categories of Languages, Basic Programming Constructs, Data Types and Data Structures, Loops and Conditions, Functions and Pointers, Object Oriented Programming (OOP) Fundamentals, Advanced OOP Concepts, Web Programming, Applets, AWT and JDBC.

Operating System Concepts: History and Evolution of Operating Systems, Types of OS, Operating System Structure, Process Management Concepts, CPU Scheduling and Algorithms, Inter-process Communication & Synchronization, Deadlocks, Basic Concepts of Memory and Disk Management.

Database Management System: Basic Concepts & Architecture of Database Management System (DBMS), Characteristics of database, Components of DBMS, Database system Vs file system, Advantages and Disadvantages of DBMS, Data models, Relational Database Design & Normalization.

Software Engineering: Program vs. Software, Software Characteristics, Software Crisis, Software Engineering Challenges, Software Process Models, Capability Maturity Model Integration (CMMI), Planning, Estimation, COCOMO Model, Software Requirement Analysis & Specification, Software Design, Software Testing.

Data Communication & Computer Networks: Components of Data Communication, Data Flow, Transmission Impairments, Bit rate and Baud Rate, Transmission Modes, Introduction to OSI Reference Model and TCP/IP Protocol Suite, Transmission Media, Digital Transmission Concepts, Analog Transmission Concepts, Internetworking Devices and Firewalls.

Cryptography & Network Security: Security Approaches, Principles of Security, Types of Attacks, Plain Text, Cipher Text, Encryption, Decryption, Key Range, Key Size, Steganography, Cryptographic Techniques, Symmetric Key Cryptography, Asymmetric Key Cryptography, RSA Algorithm, Digital Signatures, Digital Certificates, Internet Security Protocols, Electronic Money, Email Security, User Authentication Mechanism.

AI and Machine Learning Fundamentals: Foundations of AI: Intelligent Agents, Search Algorithms, Adversarial Search, Knowledge & Reasoning, Planning; Machine Learning (ML) Basics & Core Algorithms: Types of Learning, Supervised Learning, Unsupervised Learning, ML Core Concepts; Deep Learning & Neural Networks: Neural Network Fundamentals, Architectures, Modern Techniques.

Section-B: Research Aptitude and Methodology

Foundations of Research: Meaning, objectives, and types of research; Basic vs Applied research; Descriptive, Analytical, Experimental research; Interdisciplinary research in IT; Research lifecycle.

Research Problem Formulation: Identification of research gaps, Problem statement formulation, Research questions and hypotheses, Variables and operational definitions.

Literature Review: Purpose and process, Sources: journals, conferences, patents, technical reports, Use of indexing databases (e.g., IEEE, Scopus), Identifying research gaps, Critical analysis and synthesis.

Research Design: Qualitative vs Quantitative research, Experimental design, Sampling techniques, Control and treatment groups, Validity and reliability.

Data Collection & Analysis: Primary and secondary data, Survey methods, interviews, case studies, Big data considerations in IT, Statistical tools (mean, variance, correlation, regression), Hypothesis testing (t-test, chi-square, ANOVA), Introduction to statistical software, Usage of computers/software in research.

Research Ethics: Plagiarism and academic integrity, Copyright and IPR, Data privacy and cybersecurity ethics, Authorship and publication ethics, Human subject research ethics.

Research Proposal and Writing: Structure of a research proposal, Statement of objectives, Methodology framework, Timeline and milestones, Academic Writing: Structure of research paper, Abstract writing, Citation styles (APA, IEEE), Referencing tools.