

Syllabus for Ph. D. Programme in Computer Science

1. Fundamental of Programming

- Programming Language , Concepts, Paradigm and Models
 - Programming in C: Element of C-Tokens, Identifiers, Data types in C, Control structure in C, Sequence selection and iteration, Structured data types in C- arrays, structure, union, pointers.
 - Object Oriented Programming Concepts (C++ and Java): Classes, Object, Constructor, Destructor, Operator Overloading, Functional Overloading, Inheritance, Dynamic Polymorphism, Templates and exception handling
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2. Data Structure

- Data Structures : Array, Linked List, Queue, Stack, Tree and Graphs
 - Sorting and Searching Algorithms
 - File Structure: Fields, records, and files sequential direct, index Sequential.
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3. Operating System

- Main functions of operating systems. Multiprogramming, multiprocessing, and multitasking.
 - Memory Management: Virtual memory, paging, fragmentation.
 - Concurrent Processing: Mutual exclusion. Critical region, lock and unlock.
 - Scheduling: CPU scheduling, I/O scheduling and Resource scheduling. Deadlock and scheduling algorithms. Banker's algorithm for deadlock handling.
 - The UNIX System: File system, process management, Kernel and shell, command line programming. Filtering utilities
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4. DBMS including RDBMS

- Database Concepts, ER diagrams, Data Models, Design of Relational Database, Normalization, SQL, Query Processing and Optimization, Parallel and Distributed Database, Concurrency and Recovery in Centralized and Distributed Database Systems.
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5. Networking

- Analog and Digital Transmission, Asynchronous and Synchronous transitions Transmission Media, Network Topologies, Networking Devices.

- Data Communication: Channel capacity, Wireless transmission - radio, microwave. Infrared and millimeter waves. Light wave transmission. Telephones - local loop, trunks multiplexing, switching, narrowband ISDN. Broadband ISDN, ATM, High speed LANS.
 - Internetworking: Switch, Hub, Bridge, Router and Gateways. Concatenated Virtual Circuits, Tunneling, Fragmentation and Firewalls.
 - OSI Reference Model, TCP/IP protocols, DNS, Email.
 - Routing: Virtual circuits and datagram, Routing and Congestion control algorithms.
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6. Software Engineering

- Software Development Models: SDLC, Water Fall Model, Prototype Model, Spiral Model.
 - Requirements Analysis and Specification.
 - Software Design: System design, Function Oriented and Object Oriented Design, User Interface Design.
 - Software Validation, Coding and Testing.
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7. Information Systems

- Information and Management System, Decision-Making, Process and Modeling, MIS and Decision-Making, Classification of Information, Methods of Data and Information Collection, System Applications in the Organization: Kinds of Information System, Types of Information System, MIS Development Process.
 - Functional Perspective of System: Various Information System like Sales and Marketing, Manufacturing and Production, Financial and Accounting, Human Resource, etc.
 - Knowledge Management, Knowledge and reasoning in rule-based systems, Case based reasoning-Case definition, uses, issues, success factors and applications.
 - Intelligent Agents-intelligence levels, components of agents, Characteristics of agents, Need of Intelligent agents and their classification, Internet-based software agents, DSS agents and multi-agents.
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8. Information Security

- Computer System Security and Access Controls, Threats - Viruses ,worms , Trojan horse, bombs, trap doors, spoofs, email virus, macro, viruses, remedies, Intruders, Malicious software, Firewalls, vulnerabilities & threats, Network Denial of service attack.
- Communication security - Encryption, classical encryption techniques, data encryptions, advances encryption techniques.

- Cryptography, Intrusion detection techniques, Security - E-Mail Security, IP security, Web security, System and Application Security - Memory security, Sandboxing.
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9. Data Warehousing & Data Mining

- Data Warehouse and Data Mart, Overview of Components, Metadata in Data Warehouse. Architectural Components - Data Warehouse Architecture and Characteristics, Architectural Framework, Technical Architecture, Infrastructure Supporting Architecture - Operational, Physical, Database Software.
 - Dimension Modeling, The STAR Schema-Dimension Table, Fact tables- Concatenated Key, Data Grain, Fully additive measures, semi additive measures, sparse data and degenerate dimensions, Data Granularity, Keys and Advantages, Updates in dimension tables. The Snowflake Schema, Aggregate Fact Tables, Snapshot and Transaction Tables, Core and Custom Tables, Value circle.
 - Primitives of Data Mining, Association rules, Data Mining techniques, Associations, and Correlations, Classification and Prediction, Cluster Analysis, Online Analytical Processing.
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10. System Software

- Assembly language fundamental (8085 based assembly language programming), Assembler-2 pass and single pass, Macros and Microprocessor, Linker, Loader, Text Editor, Programming Environments, Debugger and Program Generator.
- Compilation and Interpretation, Phase of Compilation process - Scanning, Parsing, Intermediate Codes, Memory Management, Intermediate Code Generation, Code Generation, Code Optimization, Regular Expression, Finite Automata, Grammars, Parsing Techniques, Turing Machine.
- Compiler Construction Tools: Lex and Yacc