

Annexure-I
Syllabus for Ph.D. (Computer Engineering) Entrance Examination
Department of Computer Engineering,
Mizoram University

Research Methodology:

Research: Definitions, Importance of Research, Deciding what to Research, Writing Research Proposal.

Creativity, Communication and Management

Psychology of Research Student, Oral Communication, Written Communication, Writing Methodology, Time Management, Stress Management.

Report Writing

Writing a report: Introduction, Title, Abstracts, Keywords, Plan of Paper, Sections of Paper, Diagrams, Graph and Table, Instruction to Authors, Clarity, Conflict of Interest, Conclusion, References. Research Report.

Theory of Computation: Models of computation-Finite Automata, Pushdown Automata, Nondeterministic and NFA, DPDA and PDAs and Languages accepted by these structures. Grammars, Languages, Non-computability and Examples of non-computable problems, NP-hard and NP-complete problems.

Programming and Data Structures: Programming in C. Recursion. Arrays, stacks, queues, linked lists, trees, binary search trees, binary heaps, graphs, File structures: Fields, Records and files, Sequential, Direct, index-sequential and relative files, Hashing, Inverted lists and multi-lists.

Algorithms and Analysis: Sorting and searching algorithms. Analysis of algorithms, Interpolation and Binary search, Asymptotic notations – big ohm, mega and theta, Average case analysis of simple programs like finding of a maximum of n elements, Recursion and its systematic removal, Quick sort non-recursive implementation with minimal stack storage, Design of Algorithms (Divide and Conquer, Greedy method, Dynamic programming, Back tracking, Branch and Bound), Lower bound theory, nondeterministic algorithm,-non-deterministic programming constructs.

Computer Organization and Architecture: Boolean algebra and Minimization of Boolean functions, Combinational Circuit Design, Sequential Circuit Design. Hardwired and Micro-programmed processor design, Instruction formats, Addressing modes, memory types and organizations, Interfacing peripheral devices, Interrupts, Microprocessor architecture, Instruction set and Programming (8085, P-III/P-IV), Microprocessor applications.

Computer Networks & Internet: Concept of layering. LAN technologies (Ethernet). Flow and error control techniques, switching, IPv4/IPv6, routers and routing algorithms (distance vector, link state), TCP/UDP and sockets, congestion control. Application layer protocols (DNS, SMTP, POP, FTP, HTTP), Basics of Wi-Fi. Network security: authentication, basics of public key and private key cryptography, digital signatures and certificates, firewalls.

Operating Systems: Memory Management: Virtual memory, paging, fragmentation, Concurrent Processing: Mutual exclusion, Critical regions, Semaphores. Scheduling: CPU scheduling, I/O scheduling, resource scheduling, Deadlock and scheduling algorithms, Banker's algorithm for deadlock handling.

Database Systems: ER/EER and other semantic data models, Various Operations such as Join, Selection, sorting, expression evaluation, etc. Transaction management, Database Security: Authentication, Various Access Control Mechanisms, Object Oriented Database: OO Data Model e.g. UML, OO DBMS architectures, Spatial Databases: Data Models, various representation schemes, architectures, Query Processing, Storage Structures