Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
PET Syllabus 2016-17
Part A: Research Methodology

Unit I
Research Methodology an Introduction: What is Science, Computer Science, Computer Science objective and methods (Modeling, Theoretical, Experimental, Simulation, etc.), Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method.

Unit II
Overview of Research Domain in Computer Science: Signal & Image Processing, Pattern Recognition, Artificial Intelligence, Machine Learning, HCI, Computer Network & Parallel Computing, Geo Spatial Technology, Advanced Data Structure, Theory of Computation, Embed System and Robotics, Biometrics and Network Security, Data Mining& WareHousing.

Unit III
Research Design & Modeling: Literature Servey, Finding Research Papers, information gathering, How to select Research Topic, Reading and understanding research papers, Critical Reading, Evaluation of Paper, Developing a Literature Review, Formulating a Research Problem, Constructing Hypotheses, Research & Sampling Design

Unit IV
Empirical and deductive methods in computer science: Traditional Methods: Methods of Data Collection, Processing and Analysis of Data, Sampling Fundamentals, Testing of Hypotheses, Chi-square Test, Analysis of Variance and Covariance, Multivariate Analysis Techniques, Classification Technique, Validation, Interpretation of Data, Empirical and deductive methods

Computer Science Methods: Choosing or proposing a project, Commercial and economic considerations in CSIT research, CSIT industry and Professional Organization. Review of legal, ethical, social and professional (LSEP) issues including data protection and standards, Quality Research Strategies, Standard Measures & Parameters of research outcomes (impact factor, citation, various indexing parameters like I-index, H-index, P-index, i10-index, etc.), what is citation and how we can search citation?

Unit V
Technical Writing:Kinds of Publication, How to write the first draft, Research Proposal, Paper Writing Formats (IEEE, Springer, ACM, etc.), Presentation skills, Processing and Displaying Data, written and oral, referencing, bibliographies, Writing Ethics, Report Writing, Thesis Writing, Book Writing, Project Writing, Patent Writing, Plagiarism concept.

Part B: Computer Science & Engineering

Unit I:

Discrete Mathematics: Propositional and first order logic. Sets, relations, functions, partial orders and lattices. Groups. Graphs: connectivity, matching, coloring. Combinatorics: counting, recurrence relations, generating functions.

Linear Algebra: Matrices, determinants, system of linear equations, eigenvalues and eigenvectors, LU decomposition.

Calculus: Limits, continuity and differentiability. Maxima and minima. Mean value theorem. Integration.

Probability: Random variables. Uniform, normal, exponential, poisson and binomial distributions. Mean, median, mode and standard deviation. Conditional probability and Bayes theorem.

Unit II:

Digital Logic: Boolean algebra. Combinational and sequential circuits. Minimization. Number representations and computer arithmetic (fixed and floating point).

Computer Organization and Architecture: Machine instructions and addressing modes. ALU, data-path and control unit. Instruction pipelining. Memory hierarchy: cache, main memory and secondary storage; I/O interface (interrupt and DMA mode).

Unit III:

Programming and Data Structures: Programming in C. Recursion. Arrays, stacks, queues, linked lists, trees, binary search trees, binary heaps, graphs.

Algorithms : Searching, sorting, hashing. Asymptotic worst case time and space complexity. Algorithm design techniques: greedy, dynamic programming and divide-and-conquer. Graph search, minimum spanning trees, shortest paths.

Unit IV:

Operating System: Processes, threads, inter-process communication, concurrency and synchronization. Deadlock. CPU scheduling. Memory management and virtual memory. File systems.

Theory of Computation: Regular expressions and finite automata. Context-free grammars and push-down automata. Regular and contex-free languages, pumping lemma. Turing machines and undecidability.

Compiler Design: Lexical analysis, parsing, syntax-directed translation. Runtime environments. Intermediate code generation.

Unit V

Computer Networks: 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.

*Databases:*ER-model. Relational model: relational algebra, tuple calculus, SQL. Integrity constraints, normal forms. File organization, indexing (e.g., B and B+ trees). Transactions and concurrency control.

Prof. Ratnadeep R. Deshmukh
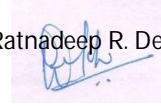
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