VISHWAKARMA UNIVERSITY
Maximising Human Potential

| Syllabus for Ph.D. (Department of Computer Applications) Entrance Exam Paper -II | |
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| **UNIT-1** | **Computer Organization and Architecture System** |
| Digital Logic: Boolean algebra. Combinational and sequential circuits, Minimization; Number representations and computer arithmetic (fixed and floating point) Computer Organization: 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).<br>System Software and Operating System<br>System Software: Machine, Assembly and High-Level Languages; Compilers and Interpreters; Loading, Linking and Relocation; Macros, Debuggers Operating System: Processes, threads, inter-process communication, concurrency and synchronization; Multicore Programming, Multithreading Models Deadlock; CPU scheduling; Memory management and virtual memory; File systems | |
| **UNIT-2** | **Programming Languages** |
| Programming in C: Elementary Data Types; Tokens, Identifiers, Data Types, Sequence Control, Subprogram Control, Arrays, Structures, Union, String, Pointers, Functions, File Handling, Command Line Arguments, Preprocessors Programming in C++ : Class, Object, Instantiation, Inheritance, Encapsulation, Abstract Class, Polymorphism, Tokens, Identifiers, Variables and Constants; Data types, Operators, Control statements, Functions Parameter Passing, Virtual Functions; Programming in Java: The Java Virtual Machine, Data types, Conditional and looping Statements, Arrays, Methods and functions, Constructors, Overloading methods, Garbage collection, Packages<br>Data Structures and Algorithms<br>Data Structures: Arrays, Stacks, Queues, Linked Lists, Trees, Forests, Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree, B Tree, B+ Tree, B* Tree, Graphs, Sorting, Searching. Algorithms: Performance Analysis of Algorithms – Time and Space complexities, Divide and Conquer, Dynamic Programming, Greedy Algorithms, Backtracking, Branch and Bound, Breadth-First Search, Depth-First Search, Shortest Path, Minimum Spanning Tree, P and NP Class Problems. | |
| **UNIT-3** | **Software Engineering and Data Communication and Computer Networks** |
| Software Engineering: The Waterfall Model, Incremental Process Models Evolutionary Process Models, Concurrent Models. Agility and the Cost of Change, Agile Process, Extreme Programming (XP), Adaptive Software Development (ASD), Scrum; Requirements Modelling: Requirements Analysis, Scenario-Based Modelling, UML Models, Design Concepts: The Design Process, Design Concepts, the Design Model, Architectural design, and component-level design. Quality management. Data Communication: simplex, half-duplex and full-duplex mode of data transmission, packet switching and circuit switching, Analog and Digital Signals; Noiseless and Noisy Channels; Digital and Analog Transmission; Data Encoding and Modulation Techniques; switching; Flow and error control techniques Computer Networks: Network Hardware, LAN, MAN, WAN, OSI Reference Model, - Protocol IPv4/IPv6, routers and routing algorithms (distance vector, link state); TCP/UDP and sockets, congestion control. Application layer protocols (DNS, SMTP, POP, FTP, HTTP). Network Security: authentication, basics of public key and private key cryptograph | |
| **UNIT-4** | **Database Management Systems** |

Database System Concepts: Data Models, Schemas, Architecture, ER Model, Relational Model, Relational Algebra, Relational Calculus. Functional Dependency, Multi valued Dependency, Join Dependency, and Normalization Forms. SQL: Types of commands, Constraints, Views, Stored Procedures, Functions, Triggers. Deadlock – Prevention and Avoidance, Heap File Organization, ISAM, Hashing and Indexing

| UNIT-5 | **Advanced Technologies** |
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Artificial Intelligence & Machine Learning: Artificial Intelligence: Intelligent Agent, State Space Representation, Heuristic Search Techniques, Adversarial Search Techniques, Knowledge Representation, Uncertain Knowledge Representation, Planning, Linear and Non-Linear, Goal Stack, Hierarchical, STRIPS. Machine Learning: Machine Learning, Types of Learning, Supervised, Unsupervised, Semi Supervised, Reinforcement Learning Techniques, Models, Tree, Rule, Linear, Distance-Based, Probabilistic. IoT: Introduction, Characteristics, Elements, Transducers and types, Applications

**References:**


**Algorithms:** Introduction to Algorithms by Rivest, Cormen, Stein, Leiserson, MIT Press

**Operating System:** "Operating System Concepts" by Galvin, Silberschatz. WILEY Publishers

**Theory of Computation:** "Introduction to Automata Theory, Languages and Computation" by Hopcroft, Ullman. Pearson Education Computer Networks: "

**Computer Networking:** A top-down approach" by Kurose-Ross. Pearson Education "Computer Networks" by Tanenbaum, Prentice Hall

**Computer Organization:** "Computer Organisation" by Carl Hamacher. McGraw Hill

**Programming:** "Computer Systems: A Programmer's Perspective", Randal E. Prentice Hall "Java: The Complete Reference, 8th Edition", Herbert Schildt. McGraw Hill

**Database Systems:** "Fundamentals of Database Systems" – Ramez Elmasri and Shamkant B Navathe, Pearson Publications. "Database Management Systems" – Raghu Ramakrishnan and Johannes Gehrke, McGraw Hill Publications.

**Software Engineering:** Roger S Pressman, "Software Engineering- A Practitioners Approach", Sixth Edition, Mc Graw Hill publishers. Lan SommerVille, "Software Engineering", Eigith Edition, Pearson Education, 2009.

Software Engineering: "Software Engineering: A Practitioner's Approach" by Pressman. Prentice Hall

**Data Structure :"**Fundamentals of Data Structure in C" – Ellis Horowitz and Sartaj Sahni, University Press. "Data Structures and Algorithm Analysis in C" - Mark Allen Weiss, Pearson Education. "Introduction to the Design and Analysis of Algorithms" – Anany Levitin, Pearson Education.

**Artificial Intelligence:** "Artificial Intelligence" – E. Rich and K. Knight, McGraw Hill Publications.

**Machine Learning :** "Machine Learning" – Tom M. Mitchell, McGraw Hill Publications. "Machine Learning: The Art and Science of Algorithms that makes sense of Data" – Peter Flach, Cambridge University Press.

**IoT:** Bahga, Arshdeep, and Vijay Madisetti. "Internet of Things: A Hands-On Approach." (2014)