SHRI G.S. INSTITUTE OF TECHNOLOGY & SCIENCE, INDORE

INFORMATION TECHNOLOGY DEPARTMENT

Subject Code	Subject Name	L	T	P	Th. Credit	Pr. Credit	Maximum Marks				Total Credit
							End Sem	Class Work	Sessional Work	End Sem	
IT38001	COMPUTER NETWORKS	3	0	2	3	1	70	30	60	40	4

Course Outcome

1. What is Computer Network? How we can relate real world with computer networks? Illustrate different networking model.
2. Explain the functionality of data link layer. Solve problems on error detection and error correction. Illustrate link layer protocol.
3. Compare different types of Channel allocation protocols like ALOHA, CSMA,CSMA/CD. Experiment with switches. What are different IEEE standards?
4. What is the concept of IP Addressing? Explain different network layer protocols. Compare different types of Routing Algorithms.
5. What are transport Layer services? Explain TCP and UDP Protocols. Interpret the use of application layer protocols.

Course Content

Unit1: Introduction to networks, network v/s distributed systems, Network hardware: broadcast, multicast, peer to peer and point to point. Introduction to LAN, MAN, WAN. Network software: protocol hierarchies, network architecture, protocol stack, Reference models: OSI, TCP/IP reference models, maximum data rate of a channel, transmission media, Switching: circuit, message, and packet switching. Virtual circuits v/s datagram subnets, sockets, DNS, HTTP.

Unit2: Data link layer: framing, error detection, error correction codes. Link layer protocols: simplex, simplex stop and wait, simplex protocol for noisy channel, sliding window, one bit sliding window, go back n, selective repeat, example layers: HDLC, SLIP, PPP.

Unit3: Channel allocation: static, dynamic, Multiple access protocols: pure ALOHA slotted ALOHA, persistent and non-persistent CSMA and CSMA/CD. Collision free protocols: bitmap, binary countdown, limited contention protocol, adaptive tree walk protocol. IEEE 802.1, IEEE 802.2, IEEE 802.3, IEEE 802.4, IEEE 802.5, IEEE 802.6 standards, spanning tree, Interconnections: hubs, link layer switches.

Unit4: Network layer design issues, IPv4 protocol overview, IPv4 packet structure, IPv addressing, subnetting, supernetting, introduction to CIDR, ARP/RARP, ICMP. Optimality principle, Routing algorithms: shortest path, flooding, distance vector, link state, hierarchical, traffic shaping: leaky bucket, token bucket. Internetworking: Concatenated virtual circuits, connectionless inter networking, NAT, Internetwork routing. Fragmentation: transparent and non-transparent fragmentation.

Unit5: Introduction to Transport layer services, Connectionless transport: UDP, UDP segment structure, Connection oriented transport: TCP, TCP segment structure, RTT estimation, flow control, TCP connection management, Email, file transfer protocols, remote access applications, introduction to firewalls.

Text Books

1. Andrews S. Tannenbaum ,"Computer Networks", 4th Edition ,Pearson Education.
2. Behrouz A. Forouzen , "TCP/IP protocol Suite" 3rd Edition,Tata McGraw-Hill.
3. William Stallings,"Computer Networking With Internet Protocols And Technology" ,3rd Edition, Pearson Education.

Reference Books

1. Behring A. Forouzen , "Data Communication and Networking", 4th Edition,Tata McGraw-Hill.
2. James F. Kurose, Keith W. Ross ," Computer Networking: A Top Down Approach" 3rdEditionPearson Education.

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Subject Code	Subject Name	L	T	P	Th. Credit	Pr. Credit	Maximum Marks				Total Credit
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IT38002	THEORY OF COMPUTATION	3	1	-	4	0	70	30	-	-	4

Course Outcome

1.Student should be able to define formal languages, grammar and automata.
2.Student should be able to construct finite automata and regular expression.
3.Student should be able to prove equivalence of finite automata, regular expression and regular grammar.
4.Student should be able to construct pushdown automata and context free grammar for given language. Student should be able to prove equivalence between pushdown automata and context free language
5. Student should be able to construct Turing machine for given language and should be able to define and explain decidability, computability and classes of problems.

Course Content

Unit1: Introduction to theory of computation, Three basic concepts:languages, grammars, and Automata, Finite Automata: DFA and transition graphs, NFA with and without ε-moves, equivalence of DFA, NFA without ε-moves and NFA with ε-moves, reduction of number of states in DFA.

Unit2: DFA with output: Mealy and Moore machine, equivalence of Mealy and Moore machine. Regular languages and regular grammars: regular expressions, connection between regular expressions and regular languages, Arden's theorem, regular grammars, Properties of regular languages: closure properties of regular languages, Kleene's theorem, and Pumping Lemma for regular languages.

Unit3: Pushdown Automata: context-free grammars, parsing and ambiguity, context-free grammars and programming languages, Simplification of CFG, normal forms of CFGs, membership algorithm, PDA, DPDA, Equivalence of PDA and CFG, Pumping Lemma for CFLs, closure properties of CFLs.

Unit4: Turing machines: Turing's thesis, Turing machines as language accepters, Turing machines as transducers, universal Turing machines, context sensitive languages, linear bounded automata, phrase structured grammar, Chomsky hierarchy, Formal Languages and Automata.

Unit5: Recursively enumerable languages, Recursive languages, Partial Recursive functions, Total Recursive Functions, unrestricted grammars. algorithmic computation: decidability and undecidability, turing machine halting problem, Turing machine models and complexity, class P and NP, basic NP-complete problems.

Text Books

1. Peter Linz, "An Introduction to Formal Languages and Automata", 4th Edition Narosa pub. House.
2. Hopcroft, Motwani & Ullman, "Automata Theory, Languages and Computations", 3rd , Pearson Education

Reference Books

1. Cohen, "Introduction to Computer Theory", 2nd Edition, Publisher: John Wiely & Sons.
2. K. L. P. Mishra & L. Chandrasekaran, " Theory of Computer Science (Automata, Languages and Computation)", 3rd Edition Second Edition, PHI
3. Lewis Papadimitrou, "Theory of Computation", Pearson Education

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IT38003	OPERATING SYSTEMS	3	-	2	3	1	70	30	40	60	4

Course Outcome

1. Introduction to OS, different feature of OS & their applications define process, Understanding about
different kinds of thread
2. Detailed study of process management, Know about the process scheduling and how it will be synchronized, understand the detailed concept of deadlock
3. Student can understand how OS can manage the memory organization through different memory management techniques like partitioning, Swapping,
Segmentation, Paging, Segmented Paging. Concept of Virtual memory
4. Student know how different files organize by OS. Detailed study of file allocation system and different kind of disk scheduling algorithm
5. Understanding about how different hardware can attach and interact with OS. How OS will secure with different kinds of malware.

Course Content

Unit1: Introduction to Operating Systems: Functions, Different Types of Operating System. Desirable Characteristics and Features of an Operating System. Operating Systems Services: Types of Services, Different Ways of Providing these Services: Utility Programs, System Calls. Introduction to Processes and Threads, Process Concept, Process State Diagram, Threads, Threads v/s Processes, Advantages of Threads, Implementation of Threads: ULT and KLT , System Calls for Process Management.

Unit2: Processes Management: Scheduling Concepts, Types of Schedulers,Scheduling Algorithms, Algorithm Evaluation. Multiple Processor Scheduling. Process Synchronization: Concurrent Processes, Mutual Exclusion, Synchronization, Inter Process Communication, Critical Sections, Locks, Synchronization Hardware, Semaphores. Classic Problems of Synchronization, Monitors. Deadlocks: Problem, Characterization, Prevention, Avoidance, Recovery. Case Studies Windows, Linux, Solaris etc.

Unit3: Memory Management: Different Memory Management Techniques: Partitioning, Swapping, Segmentation, Paging, Segmented Paging and Paged Segmentation, Comparison of These Techniques. Techniques For Supporting The Execution of Large Programs: Overlays, Dynamic Linking and Loading. Virtual Memory: Concept, Demand Paging, Page Replacement, Thrashing. Case Studies of Linux, Solaris, Windows etc.

Unit4: File Systems: File Concept, User's and System Programmer's View of File System. Access Method, Directory Structures, Disk Organization, Different Modules of a File System. Disk-Space Allocation Methods : Contiguous, Linked, Indexed. Free Space Management, Directory Structures. File Protection. System Calls For File Management. Disk Scheduling Algorithms. Case Studies Msdos, Unix, Windows, Linux etc.

Unit5: Input/Output: Principles and Programming I/O,Input/Output Problem, Asynchronous Operation, Speed Gap, Format Conversion, I/O Interfaces. Program Controlled I/O, Interrupt Driven I/O, Concurrent I/O. Protection and Security: Principal of Protection, Domain of Protection,Access Matrix, Access Control, Capability List. Security Problem, Program Threats, User Authentication.

Text Books

1. Abraham Silberschatz, Peter Galvin, and Greg Gagne, "Operating System Concepts", 8th edition, John Wiley & Sons.
2. William Stallings, "Operating Systems", 7th edition, Prentice Hall.
3. Andrew Tannenbaum, "Modern Operating Systems", 3rd edition, Prentice Hall.

Reference Books

1. Gary Nutt, "Operating Systems", 3rd edition, Addison-Wesley.
2. Deitel, "Operating Systems", 2nd edition , Addison-Wesley.

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Subject Code	Subject Name	L	T	P	Th. Credit	Pr. Credit	Maximum Marks				Total credit
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IT38007	DESIGN & ANALYSIS OF ALGORITHMS	3	-	2	3	1	70	30	40	60	4

Course Outcome

1. Analyze worst1case running times of algorithms using asymptotic analysis (time and space complexity).
2. Describe the divide1and1conquer paradigm and explain when an algorithmic design situation calls for it.
3. Describe the dynamic1programming, greedy method and explain when an algorithmic design situation calls for it. Explain the major graph algorithms and their analysis.
4. Describe backtracking, branch and bound techniques and analyze the problems of their domain.
5. Can define PRAM algorithms, approximation algorithms and the classes P and NP and explain the significance of NP1completeness.

Course Content

Unit1: Introduction to algorithms: design and analysis issues, types of algorithms, algorithm specification, Performance analysis: time and space complexity, mathematical preliminaries, functions and their growth rates, recurrence relations and series sums. Review of data structures: stack, queues, trees, dictionaries, priority queue, graphs.

Unit2: Divide and conquer approach: merge sort, quick sort, selection sort, Other sorting techniques: bubble sort, insertion sort, heap sort, counting sort, radix and bucket sort, searching minimum and maximum elements, Red-Black trees. Strassen's matrix multiplication, analysis of linear and binary search.

Unit3: Dynamic programming: elements of dynamic programming, matrix chain multiplication, parsing, 0/1 knapsack problem, The Greedy Method: elements of greedy method, dynamic programming v/s greedy method, fractional knapsack problem, Graph algorithms: topological sorting, minimum spanning trees, Prims algorithm, Kruskals algorithm: union- find data structure. depth and breadth first search. Strongly connected components. Shortest path algorithm, transitive closure of a graph, all pair shortest path.

Unit4: Geometric Algorithms: plane sweep algorithm, Convex Hull. Backtracking and branch and bound techniques: state space, state space tree, 8- Queens Problem, sum of subsets, graph coloring, Hamiltonian cycles: branch and bound methods, 0/1 Knapsack problem. Least cost branch and bound: Traveling Salesmen problem.

Unit5: Introduction to parallel algorithms: PRAM algorithms, computation model, fundamental techniques and algorithms, selection, merging and sorting. Classes of algorithm: P, NP, NP-completeness, cooks theorem, NP-Hard, introduction to reduction, satisfiability and 3-CNF SAT, Clique problem, Independent set problem, Vertex cover problem. Introduction to Approximation algorithms: Traveling Salesmen Problem.

Text Books

1. T.H. Coreman, C.E. Leiserson and R.L. Rivest, “Introduction to Algorithms”, Prentice Hall of India.
2. Jon Kleinberg, Eva Tardos, “Algorithm Design”, Pearson Education, LPE.
3. Elliz Horowitz, Sartaj Sahni, “Computer Algorithms”, Pearson Education.

Reference Books

1. Saara Base, “Computer Algorithms: Introduction to Design and Analysis”, PE, 2/e, 1988.
2. G.Brassard and P. Brately, “Algorithmic: Theory and Practice”, Prentice Hall of India. 1988.

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IT38008	OBJECT ORIENTED ANALYSIS AND DESIGN	3	-	2	3	1	70	30	40	60	4

Course Outcome

1. Describe Basics of object modeling technique and design
2. Construct all the five view of object oriented modeling
3. Implement problems in unified modeling language.
4. Define various methods of object oriented software engineering.
5. Appraise testing methods using object oriented analysis and design

Course Content

Unit1: Introduction to software engineering concepts. Agile process models. Object modeling technique(OMT): Object model, functional model, Relationships among models. Introduction to Object oriented analysis and design.

Unit2: Introduction to Modeling, Importance of modeling, Principles of modeling, Object oriented modeling, Conceptual model of UML, 4+1 architecture, Software development life cycle, Basic Structural modeling: Objects, classes, relationships,common mechanism and diagrams.

Unit3: Advanced Structural modeling: Advanced classes,relationships,Interfaces, Types, roles and packages. Unified modeling language: class diagrams, object diagrams, collaboration diagram, sequence diagram, activity diagram, state chart diagram, component diagram, use case diagram, Interaction diagrams.

Unit4: Object oriented software engineering: introduction to object oriented system. Technical metrics of object oriented systems. object oriented analysis: analysis concept, analysis activities. The Object relationship model. The object behavior model. Case study: Applying OOAD in different contexts, The Next Gen POS systems.

Unit5: Object oriented design: system design concepts, the object design process, design patterns. Object oriented testing: testing OOA and OOD models. OO testing strategies, test case design for OO software. Testing method applicable at the class level. Interclass test case design.

Text Books

1. Rumbaugh, Blaha,Eddy ,"object oriented modelling & Design", Pearson Education
2. Grady Booch, James Rumbaugh, Ivar Jacobson : The Unified Modeling Language User Guide, Pearson Education 2nd Edition.

Reference Books

1. Roger S Pressman, "S/W Engg - A practitioners Approach", 6th Edition Tata McGraw Hill
2. Applying UML and Patterns: An introduction to Object – Oriented Analysis and Design and Unified Process, Craig Larman, Pearson Education.

3. Ian Somerville “Softwaere Engineering”, 6th Edition, Pearson Education.
4. Atul Kahate: Object Oriented Analysis & Design, The McGraw Hills Companies.
5. Object-Oriented Analysis and Design with the Unified Process by John W. Satzinger, Robert **B** Jackson and Stephen D Burd, Cengage Learning.