HIMACHAL PRADESH UNIVERSITY
MASTER OF TECHNOLOGY in COMPUTER SCIENCE
M. Tech. (Computer Science)
Effective from 2013

About the Course

The M. Tech. (Computer Science) is a two years full time post graduation course spread over four semesters. In this course, the students will be taught, the core courses of Computer Science.

Eligibility

Candidates, who have passed Master degree with minimum of 55% marks (50% marks for SC/ST category), or equivalent Grade point, in Mathematics/ Physics/ Electronics/ Computer Application (MCA)/ Computer Science/ Information Technology/ 4-years Bachelor's degree in Engineering/ Technology.

OR

Any examination, of university in foreign country, recognized as equivalent for the above purpose by equivalence committee of its own or on recommendation of Association of Indian Universities with 55% marks (50% marks for SC/ST).

Mode of Selection

The admission to M. Tech. (Computer Science) will be through the merit of an entrance test of duration 3 hours to be conducted by H.P. University, Shimla. The entrance test shall be of 200 MCQ type questions of one mark each, comprising of the following components:

Section	Contents	Marks
A	Logical Ability	40
B	Mathematics of Graduation level	40
C	English and General Awareness	20
D	Computer Ability	100
	Total	**200**

The Candidates who have qualified GATE/ NET/ SLET in Computer Science or Engineering will be given 20% extra of the marks obtained in the entrance test for calculating the merit for the purpose of admission.

Minimum pass marks in the entrance test shall be 35% i.e. 70 marks out of a total of 200.

Number of Seats

Total number of seats 18 + 5 seats for in-service candidates

In case, any of these seats remain vacant due to the unavailability of suitable eligible candidates, seats for in-service candidates shall remain vacant and under no circumstances, conversions shall be allowed.

Being a self financing course, in case the numbers of selected candidates after entrance exam are less than nine (09), then the course will not be run for that academic year.

Reservation for M. Tech.:
As per the H.P. University rules 75% seats will be filled out of the candidates who have passed their qualifying examination from Himachal Pradesh University and remaining 25% seats will be filled on all India basis. The other reservation rules of H.P. University shall be applicable as per the roster followed for M.C.A. admission.

In-service Candidates
The 'in-service' candidate shall be a candidate who is an employee (on a regular or contract basis) of Govt. of Himachal Pradesh (including Colleges in & Universities under the Govt.) or Govt. of India or Boards/Corporations under state or centre governments having their office(s) in the state and is serving the organization in which currently employed for at least last 2 years. An in-service candidate has to submit the following along with the application form:

a) The appointment letter from the employer and a certificate from the employer that he/she has been working with the concerned organization for at least last two years and shall continue to be on their roll for at least whole of the duration of the course,

b) NOC on the prescribed proforma provided in the prospectus from his employer that in case the candidate is selected for the admission, he/she shall be granted a study leave for a period of two years from the date of the commencement of the course as mentioned in the prospectus for the course.

Upon confirmation of the admission, a letter on the prescribed proforma provided in the prospectus from the employer sanctioning study leave for a period of 2 years is to be submitted in the department on or before the stipulated last date of admission along with an affidavit from the court duly signed by the notary clearly stating that if the information supplied in any of the above mentioned documents is found to be contrary to the facts at any stage, the candidate shall be held responsible for it and the university shall have the right to cancel the admission/degree of the candidate.

The admission of such candidates shall be confirmed only if a letter from the employer sanctioning the study leave of two years is deposited within the stipulated period for the admission as mentioned in the prospectus. The validity of the above mentioned documents shall be assessed by the Department and the Department shall also have the right of corresponding with the employer of the candidate in case of any doubts regarding these documents. The decision of the Department in rejecting or accepting these documents shall be final. In any case, notwithstanding the admission to the said course, if the department finds that the candidate has supplied false or misleading information through any of the above mentioned documents, the university shall have the right to a) cancel the admission/degree of the candidate, and b) to initiate civil/criminal proceeding against the candidate.

Fee Structure

a) From all students, except for the in-service candidates, a fee of Rs.30,000/- (Rupees thirty thousand only) p.a. and an Equipment Fee of Rs.5,000/- (Rupees five thousand only) p.a. along with other university dues as mentioned in the prospectus shall be charged by the department. Two demand drafts of Rs.30,000/- and Rs.5,000/- payable at Shimla in favour of the

Chairman, Department of Computer Science, HPU, Shimla-5 are to be deposited at the time of admission and subsequently in the beginning of the 2nd year.

b) For in-service students, the fee shall be Rs.50,000/- (Rupees fifty thousand only) p.a. and an Equipment Fee of Rs.5,000/- (Rupees five thousand only) p.a. along with other university dues as mentioned in the prospectus shall be charged by the department. Two demand drafts of Rs.50,000/- and Rs.5,000/- payable at Shimla in favour of the Chairman, Department of Computer Science, HPU, Shimla-5 are to be deposited at the time of admission and subsequently in the beginning of the 2nd year.

c) The other university dues as mentioned in the prospectus shall be deposited at the time of admission and in the beginning of the 2nd year on the main cash counter of H.P. University, Shimla.

d) All the students shall have to pay an amount of Rs.2,500/- (Rupees two thousand five hundred only) as the dissertation thesis submission fee in the beginning of fourth semester in the form of a demand draft in favour of the Chairman, Department of Computer Science, H.P. University, Shimla.

Other Conditions

English will be the medium of instruction and examination.

Scheme of the Examination:

1. Each theory paper shall be of 3 hours duration and shall carry 100 marks (75 marks for end semester theory examination and 25 marks for continual internal assessment).
2. In each theory paper, nine questions are to be set. Two questions are to set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.
3. Each practical paper shall be of 3 hours duration and will carry 100 marks (50 marks for end semester practical examination and 50 marks for continual internal assessment).
4. In the III semester each student shall be:

a)Attached to a teacher of the Department who shall act as a guide for seminar, minor project and Dissertation work of the students in III & IV semesters.

b)Assigned a topic by the guide and the students are required to prepare and present a seminar.

c)Assigned a topic for carrying out a minor project which normally may be related to the findings of a thorough study on a research area of significance which is relevant to the field of Computer Science. At the end of III semester, each student has to submit 4 nos. of copies of spiral bound report of his findings on the topic allotted to him/her in the office of the Department along with the softcopy of the same on a CDROM/DVD.

d)Assessed and evaluated for minor project by an external examiner.

5. In the IV semester, each student is required to:
    a) Work on a topic in a significant area of research relevant to the field of Computer Science for dissertation thesis under the guidance of his/her guide.
    b) Submit 5 nos. of hard bound copies of the dissertation work in the office of the Department along with the softcopy of the same on a CDROM/DVD.
    c) Ensure the quality of the research work carried out by them in the III & IV semester, each student, hence is required to participate in some relevant regional/national level conferences/ workshops/ seminars

during these semesters. Therefore, it is mandatory for each student to publish at least one research paper (Full paper or abstract or extended abstract in the proceedings in print version/ e-version) in a regional/ national level conference/ workshop/ Seminar. The certificate/proof of the published paper along with the paper shall form the part of the submitted dissertation work. The students shall not be allowed to submit their dissertation work without completing this requirement.

6. A copy of the Dissertation work of each candidate shall be sent to the external examiner well in advance by the examination branch of HPU before the conduct of the viva-voce examination.
7. The dissertation will be jointly evaluated by internal guide and external examiner.
8. Internal assessment will be given on the basis of class tests (best of 2 in a semester), seminars, surprise quizzes, class participation and regularity of the student in the class.

Honourarium

1. Since the M. Tech. course is being run in the self financing mode, all the teachers shall be paid an honourarium on lecture basis as per university norms for all the lectures taken for engaging theory as well as practical classes in the M. Tech. course in the department.
2. The external examiner shall be paid an honourarium of Rs.200/- (Rupees two hundred only) per student for evaluating minor project in the III semester subjected to an evaluation of a maximum of 10 students in a single examination session by an examiner.
3. The experts invited for conducting the viva-voce examination for evaluating the M. Tech. students in the IV semester shall be paid an honourarium of Rs.500/- (Rupees five hundred only) per thesis for its evaluation and Rs.200/- (Rupees two hundred only) per student for conducting viva-voce per dissertation thesis subjected to a maximum of 5 thesis in a single examination session by an expert.
4. All the teachers guiding the students in M. Tech. IV semester dissertation work shall be paid on honourarium of Rs.1,000/- (Rupees one thousand only) per student.
5. All the expenditure incurred with respect to the honourarium etc. shall be met out of the funds generated through the running of M. Tech. course.

Promotion Rule

The promotion norms in the MCA course are to be followed for the M. Tech. course too.

MASTER OF TECHNOLOGY in COMPUTER SCIENCE
M. Tech. (Computer Science)

First Semester

Paper No.	Title	Periods per Week	Max Marks (Theory)	Continual Internal Assessment	Exam Duration Hours
MT-101	Computer Architecture and Parallel Processing	4	75	25	3
MT-102	Software Engineering	4	75	25	3
MT-103	Computer Oriented Optimization Method	4	75	25	3
MT-104	Data Structure & Algorithm Analysis in C	4	75	25	3
MT-105	Operating System and Case Study	4	75	25	3
MT-106	Practical on MT-103	6	50	50	3
MT-107	Practical on MT-104	6	50	50	3

Second Semester

Paper No.	Title	Periods per Week	Max Marks (Theory)	Continual Internal Assessment	Exam Duration Hours
MT-201	Object Oriented Programming with JAVA	4	75	25	3
MT-202	Computer Networks	4	75	25	3
MT-203	Distributed Data Base Management System	4	75	25	3
MT-204	Data Warehousing and Data Mining	4	75	25	3
MT-205	Software Quality and Testing	4	75	25	3
MT-206	Practical on MT-201	6	50	50	3
MT-207	Practical on MT-203	6	50	50	3

Third Semester

Paper No.	Title	Periods per Week	Max Marks (Theory)	Continual Internal Assessment	Exam Duration Hours
MT-301	Research Methodology in Computer Science	4	75	25	3
MT-302	Elective – 1	4	75	25	3

Paper No.	Title	Periods per Week	Max Marks	Continual Internal Assessment	Evaluation Marks
MT-303	Seminar	8 in computer lab 4 in library	100	25	75 (by Department)
MT-304	Minor Project	8 in computer lab 4 in library	200	100	100 (by External Examiner)

Fourth Semester

Paper No.	**Title**	**Periods per Day**	**Marks**			
			Maximum Marks	**Continual Internal Assessment**	**Publications**	**Viva-Voce Examination**
MT-401	Dissertation	5	500	125	125	250

List of Electives

MT-E01	Advanced Software Engineering Concepts
MT-E02	Artificial Intelligence & Expert System
MT-E03	Automata Theory and Compiler Design
MT-E04	Cyber Law
MT-E05	Cloud Computing
MT-E06	Distributed Systems
MT-E07	Graph Theory
MT-E08	Research Methodology
MT-E09	Service Oriented Architecture

MT-101 Computer Architecture & Parallel Processing L T
3 1

UNIT – I

RTL, Bus and memory transfer, Arithmetic microoperations, Logic microoperations, Shift microoperations, Arithmetic Logic Shift unit
Instruction codes, Computer registers and instructions, Timing and control, Instruction cycle, MRIs, I/O and Interrupts, Complete computer description, Design of basic computer, Design of Accumulator logic

UNIT – II

Control memory, Address sequencing, Computer configuration,
Microinstruction format, Symbolic microinstructions, Design of control unit
Introduction to CPU, General Register and stack organization, Instruction formats, Addressing modes, Data transfer and manipulation, RISC, CISC
Parallel Computer Models: The state of computing, Multiprocessors and multicomputers, Multivector and SIMD Computers, PRAM and VLSI models

UNIT – III

Program and Network Properties: Conditions of Parallelism, Program partitioning and scheduling, Program flow mechanisms, System interconnect architectures
Principles of Scalable Performance: Performance metrics and measures, Parallel processing applications, Speedup Performance laws, scalability analysis and approaches.
Processor and Memory Hierarchy: Advanced processor technology, Superscalar and vector processors

UNIT – IV

Memory hierarchy technology, Virtual memory technology, Bus, Cache and Shared Memory: Backplane bus systems, cache memory organizations,
Shared memory Organizations, Sequential and weak consistency models
Pipelining and Superscalar Techniques: Linear pipeline processors, nonlinear pipeline processors, Instruction Pipeline design, Superscalar and superpipeline design
Multiprocessors and Multicomputers: Multiprocessor system interconnects, Cache coherence and synchronization mechanisms, Three generations of multicomputers, Message passing mechanisms

Text Books:

M. Morris Mano, "Computer System Architecture", Pearson Education, 2004.
Kai Hwang, "Advanced Computer Architecture: Parallelism, Scalability, Programmability", McGraw Hill, 1993.

Reference Book:

Kai Hwang and Faye A. Briggs, "Computer Architecture and Parallel Processing. McGraw Hill, 1985.

Note: In each theory paper, nine questions are to be set. Two questions are to be set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MT – 102 Software Engineering L T
3 1

UNIT – I

Evolving Role of Software, Software Engineering, Changing nature of Software, Software Myths, Terminologies, Role of management in software development
Software Process and desired Characteristics, Software Life Cycle Models: Build & Fix Model, Water Fall Model, Incremental Process Model, Evolutionary Process Models, Unified Process, Comparison of Models, Other Software Processes, Selection of a Model
Software Requirements Analysis & Specifications: Requirements Engineering, Types of Requirements, Feasibility Studies, Requirements Elicitation, Requirements - Analysis Documentation, Validation and Management

UNIT – II

Software Architecture: Its Role, Views, Component & Connector View and its architecture style, Architecture Vs Design, Deployment View & Performance Analysis, Documentation, Evaluation
Software Project Planning: Size estimation, Cost Estimation, COCOMO, COCOMO – II, Software Risk Management

UNIT – III

Function Oriented Design: Design principles, Module level Concepts, Notation & Specification, Structured Design Methodology, Verification
Object-Oriented Design: OO Analysis & Design, OO Concepts, Design Concepts, UML – Class Diagram, Sequence & Collaboration Diagram, Other diagrams & Capabilities, Design Methodology – Dynamic and Functional Modeling, Internal Classes & Operations
Detailed Design: PDL, Logic/Algorithm Design, State Modeling of Classes, Verification – Design Walkthroughs, Critical Design Review, Consistency Checkers

UNIT – IV

Coding: Programming Principles & Guidelines, Coding Process, Refactoring, Verification
Software Metrics: What & Why, Token Count, Data Structure Metrics, Information Flow Metrics, Object-Oriented Metrics, Use Case Oriented Metrics, Web Engineering Project Metrics, Metric Analysis
Software Maintenance & Certification: Maintenance, Maintenance Process and Models, Estimation of Maintenance Costs, Regression Testing, Reverse Engineering, Software Re-engineering, Configuration Management, Documentation, Requirements of Certification, Types **Text Books:**

1. Pankaj Jalote, "An Integrated Approach to Software Engineering", 3rd Edition, Narosa Publishing House, 2005.
2. K.K. Aggrawal and Yogesh Singh, "Software Engineering", 3rd Edition, New Age International (P) Ltd, 2008.

Reference Books:

1. Pressman, R.S., "Software Engineering – A Practitioner's Approach", Third Edition, McGraw Hills, 2008.
2. Mall Rajib, "Fundamentals of Software Engineering", PHI, New Delhi, 2005.

Note: In each theory paper, nine questions are to be set. Two questions are to set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short

answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MT-103 Computer Oriented Optimization Methods L T
3 1

UNIT – I

Introduction to O.R. – Definition, Uses and Limitations of Optimization method.The Linear Programming Problem: Introduction, Formulation Of LPP, Graphical Solution And Some Exceptional Cases, Canonical And Standard Form Of LPP.

The Simplex Method: Solution of LPP By Simplex Method, Exceptional Cases, Artificial Variable Techniques (Big M), Two Phase Of Simplex Method, Problem of Degeneracy.

UNIT – II

The Dual Simplex Method: Dual And Primal Problem, Duality And Simplex Method, dual simplex method,Revised Simplex Method, Solution Of LPP Using Revised Simplex Method. Networking Scheduling By PERT/CPM:
Introduction, Basic Concepts, Constraints In Network, Construction Of The Network, Time Calculation In Networks, Critical Path Method (CPM), PERT, PERT Calculation, Advantage Of Network (PERT/CPM).

UNIT – III

The Transportation Problem: Introduction, Basic Feasibility Solution, Standard Transportation Problem, Balanced Transportation Problem, Multicommodity Transportation Problem, Row Minimum, Column Minimum, Matrix Minimum Method, Vogel Approximation Method (VAM), Optimality In Transportation Problem,(stepping stone and modified distribution methods) Degeneracy In Transportation Problem, Assignment And Routing Problem.

UNIT – IV

Game theory: Significance, essential features and limitations; Maximax and minimax principle, Game with pure & mined strategies, sul-game method (caseof 2xn or mx2 methods), Probability method, graphic method, algebraic method

Inventory Control: Introduction, Inventory Control, Selective Control Techniques, ABC Analysis Procedure, Economics Lot Size Problems, Problem of EQQ With shortage, Inventory Control Techniques Uncertain Demand, Stochastic Problems.

Text Book:

1. Kanti Swarup, P.K. Gupta and Manmohan, “Operations Research”, Sultan Chand & Sons.New Delhi.

Reference Books:

1. H.A. Taha, “Operation Research - An Introduction”, Macmillan Publications.
2. S.D. Sharma, “Operation Research”, Kedar Nath Ram Nath & Company, Meerut.
3. K.K. Chawla, Vijay Gupta, Bhushan K Sharma, “Operations Research: Quantization Analysis for Management”, Kalyani Publishers, Kolkata.
4. V.K. Kapoor, “Operation Research”, Sultan Chand & sons, New Delhi.

Note: In each theory paper, nine questions are to be set. Two questions are to set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MT-104 Data Structures and Algorithm Analysis in C **L T**
3 1

UNIT – I

Preliminaries: Concept & notation, common operation on data structures, algorithm complexity, time-space trade off between algorithm, physical & logical representation of different data structures.

Arrays: Arrays defined, representing arrays in memory, Various operation (traversal, insertion, deletion), Multidimensional arrays, Sequential allocation, Address calculation, Sparse arrays.

List: Simple Array Implementation of Lists, Linked Lists, Doubly Linked Lists, Circularly Linked list.

Stack: Stack Model, Implementation of Stacks, Applications of Stacks.

UNIT – II

Queue: Queue Model, Array Implementation of Queues, Applications of Queues.

Trees: Implementation Of Trees, Tree Traversal with an application, Binary Trees-Implementation, Expression trees, Binary Search Tree, Binary Search Trees, Various Operations On BST- MakeEmpty, Find, FindMin and FindMax, Insert, Delete, Average-Case Analysis, AVL Trees- Single Rotation , Double Rotation, B-trees.

Hashing: Definition, Hash Fuction, Separate Chaining, Open Addressing-Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing.

UNIT – III

Priority Queues: Model, Simple Implementation, Binary Heap-Structure Property, Heap Order Property, Basic Heap Operation, Application Of Priority Queues- The Selection Problem, Event Simulation, d-Heaps.

Sorting: Preliminaries, Insertion Sort- Algorithm, Analysis Of Insertion Sort, Shellsort- Analysis Of Shellsort, Heapsort- Analysis Of Heapsort, Mergesort-Analysis Of Mergesort, Quicksort- Picking the Pivot, Partitioning Strategy, Small Arrays, Analysis Of Quicksort , Bucket Sort.

UNIT – IV

Graphs: Definitions, Representation Of Graphs, Topological Sort, ShortestPath Algorithms- Unweighted Shortest Paths, Dijkstra's Algorithm, Graph

With Negative Edge Costs, Acyclic Graphs, All- Pairs Shortest, Minimal Spanning Tree- Prim's Algorithm, Kruskal's Algorithm, Application Of DepthFirst Search- Undirected Graphs, Biconnectivity, Euler Circuits, Directed Graphs.

Algorithm Design Techniques: Greedy Algorithms- A Simple Scheduling Problem, Huffman Codes, Divide And Conquer- Running Time Of Divide and Conquer Algorithms, Closets-Points Problem, The Selection Problem,

Dynamic Programming- Using A Table Instead Of Recursion, Ordering Matrix Multiplications, Optimal Binary Search Tree, All-Pairs Shortest Path, Backtracking Algorithms- the Turnpike Reconstruction Problem.

Text Books:

1. Mullis Cooper: Spirit of C: Jacob Publications
2. Yashwant Kanetkar: Let us C: BPB
3. Gotterfied B.: Programming in C: Tata McGraw Hill
4. Jean Paul Tremblay & Paul G. Sorenson: An Introduction to Data Structures with Applications: Tata McGraw Hill.
5. Robert L. Kruse: Data Structures & Program Design: PHI.

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MT-105 Operating System & Case Study **L T**
3 1

UNIT – I

Introduction: Definition Of The Operating System, Functions Of An Operating System, Different Types Of Systems - Simple Batch System, MultiProgrammed Batched System, Time Sharing System, Personal Computer Systems, Parallel Systems, Distributed Systems, Real Time Systems.

Process Management: Process- Process Concept, Process Scheduling, Operation On Processes, Cooperating Processes, Threads, Inter-Process Communication, CPU Scheduling–scheduling criteria, scheduling algorithms – FCFS, SJF, priority scheduling, round robin scheduling, multilevel queue scheduling, multilevel feedback queue scheduling, multiple processor scheduling, real time scheduling.

UNIT – II

Process Synchronization: The Critical Section Problem, Synchronization Hardware, Semaphores, Classical Problems of Synchronization, Critical Regions.

Deadlocks: Deadlock Characterization, Methods For Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery From Deadlock.

Memory Management: Logical & physical address space, Swapping, Continuous Allocation (single partition, multiple partition), internal , external fragmentation, Paging, Segmentation, Segmentation With Paging, Virtual Memory, Demand Paging, Performance Of Demand Paging, Page Replacement, Page Replacement Algorithms– FIFO, optimal, LRU, LRU approximation algorithms, counting algorithms Thrashing, Demand Segmentation.

UNIT – III

File System Interface: File Concept, Access Methods–sequential, direct, index, Directory Structure–single-level, two–level, tree-structured, acyclicgraph, general graph.

File System Implementation: File System Structure, Allocation Methodscontiguous allocation, linked allocation, indexed allocation, Free Space Management-bit vector, linked list, grouping, counting, Directory Implementation–linear list, hash table, Efficiency And Performance, Recovery – consistency checking, backup and restore.

Secondary Storage Structure: Disk Structure, Disk Scheduling, FCFS, SSTF, SCAN, C-SCAN, Look Scheduling, Selection of A Scheduling Algorithm, Disk Management-disk formatting, boot block, bad blocks.

UNIT – IV

Security: problem, authentication–passwords, program threats, system threats- worms, viruses, threat monitoring, encryption.

Case Study: UNIX system: Design principles, Programmer interface (File manipulation, Process control, Signals, Process groups, Information Manipulation), Process management (Process control block, CPU scheduling), Memory management (Swapping, Paging), file system (Blocks & fragments, Inodes, Directories), I/O/ system (Block buffer cache, Raw device interface, C-lists).

Case study: Windows NT: Design principles, System components (H/w abstraction layer, Kernel, Executive), File system (Internal layout, Recovery, Security, Volume management & fault tolerance, Compression), Networking (Protocols, Distributed-processing mechanism, Domains), Programmer interface (Access to kernel objects, Process management, Inter-process communication, Memory management).
Case Study: MS-DOS: User's view of MS-DOS, System's view of MS-DOS, Programmer's view of MS-DOS system calls.

Text Book:

1. Silberschatz, Galvin "Operating System Concepts", Addison Wesley Publishing Company, 1989.

Reference Books:

1. William Stallings, "Operating Systems", Macmillan Publishing Company.
2. Deitel H.M., "An Introduction To Operating System", Addison Wesley Publishing Company, 1984.
3. Tanenbaum, A.S., "Modern Operating System", Prentice Hall of India Pvt. Ltd. 1995.

Note: In each theory paper, nine questions are to be set. Two questions are to set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MT-201 Object Oriented Programming with JAVA **L T**
3 1

UNIT – I

Introduction To Object Oriented Programming: Data Abstraction, Encapsulation, Inheritance (Public, Protected And Private), Polymorphism, Information Hiding.

Java Elements: Data Types, Literal and Variables, Operators–Arithmetic, Bitwise, Relational, Boolean Logical, Assignment, The '?' Operator, Operator Precedence, Control Statements–Selection (if, switch), Iteration Statements (while, do-while, for) Jump Statements (break, continue, return), Arrays (One-dimensional, Multi-Dimensional).

UNIT – II

Introducing Classes: Class Fundamentals, Declaring Objects, Methods, Constructors, 'This' Keyword, Over loading Methods.

Inheritance: Inheritance Basics, Protected Members, Method Overriding, Multiple Inheritance, Template Classes and Functions.

Exception Handling: Fundamental, Exception Types, Uncaught Exceptions, Try And Catch, Dealing With Exceptions (try, throw, throws, finally).

UNIT – III

Java Applets: Applet Basics, The Applet Class, Applet Architecture, An Applet Skeleton, Applet Display Methods, Handling Events.

Advanced Java Programming: Multithreading–Java Thread Model, The Main Thread, Creating a Thread, Creating Multiple Threads, Thread Priorities, Synchronization, Inter-thread Communication, Multithreading.

UNIT – IV

Abstract Window Toolkit (AWT): Introduction, AWT classes, Window fundamentals, Working with frame windows, Creating frame window in an applet, Working with graphics, Working with colours, Working with fonts, Managing text output using FontMetrics.

AWT Controls: Introduction, Adding & removing Controls, Responding to controls, The HeadlessException, Labels, Buttons, Checkboxes, Choice Controls, Lists, Scroll Bar, TextField, TextArea, Layout Managers, Menu Bars And Menus, Dialog Boxes, FileDialog, Event handling by extending AWT Components.

Text Book:

1. Patrick Naughten & Herbert Schildt, "The Complete Reference Java", Seventh Edition, Tata McGraw Hill.

Reference Books:

1. Gilbert, Stephan D. And William B. Hccarthy, "Object Oriented Programming in Java", 1997, The Waite Group Press.
2. Mary Compoine And Kathy Walrath, "The Java Turtorial", AddisonWesley, 1996.
3. Horstmann, Cay S. And Gary Cornell, "Core Java 1.1: Fundamentals", Addison – Wesley, 1997.

Note: In each theory paper, nine questions are to be set. Two questions are to set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MT – 202 **Computer Networks** L T
3 1

UNIT – I

Data Communication, Network Components, Protocol & Standards, Standard Organization, Topologies, Transmission modes, Categories of Networks, Uses, Applications. The OSI Reference Model: Layered architecture, Functions of layers, TCP/IP reference model, Comparison of OSI & TCP/IP models. Internet, frame relay, ATM, Ethernet, Wireless LAN. Physical layer: Theoretical basis for data communications-Fourier analysis, bandwidth limited signals, maximum data rate of a channel, Guided and wireless transmission media, Communication satellites, Public switched telephone networks, mobile telephone system, Cable television.

UNIT – II

Data Link and Mac Layer: Design issues, Framing techniques, Flow control, Error Control, Error Detecting code and Error Correcting codes, Data link Control and Protocols-- For noiseless Channel – Simplest Protocol, Stop-andWait Protocol, For Noisy Channel-- Stop-and-Wait ARQ, Go-Back-N ARQ, and Selective-Repeat ARQ Protocol, HDLC Protocol, and PPP Protocol, Multiple Access-- Random Access-- MA, CSMA, CSMA/CD, CSMA/CA, Controlled Access—Reservation, Polling, Token passing, Channelization-- FDMA, TDMA, CDMA, and IEEE standards-- 802.3 (Ethernet), 802.4 (Token Bus), 802.5 (Token Ring), 802.11(Wireless LAN), 802.15 (Bluetooth).

UNIT – III

Network and transport Layer: Network layer design issues, Addressing, Routing algorithms-shortest path routing, flooding, distance vector routing, link state routing, hierarchical routing, broadcast routing, multicast routing, routing for mobile hosts, Congestion Control algorithms – congestion prevention policies, congestion control in virtual circuit & datagram subnetworks, definition of quality of service, Internetworking – Tunneling, internet-work routing, fragmentation, Network layer in Internet –IP protocol, IP Address, OSPF, BGP, Internet multicasting, Mobile IP, Ipv6,Transport Layer: Concept of transport service, elements of transport protocols, A simple transport protocol, Remote procedure call, Performance issues in computer networks.

UNIT – IV

Application layer services protocols & Network Security: DNS, SMTP, FTP, TELNET, HTTP,WWW, Attacks on Computers & Computer security-- Need for security, approaches, principles, types of attacks, Cryptography concept and techniques, Symmetric Key algorithms-- (DES), Asymmetric key algorithms-- RSA, Digital signature , Firewalls. Internet radio, VoIP, E-mail security, Web security, social issues in network security,

Reference Books:

1. B.A. Forouzan, “Data Communication & Networking”, 4th Edition Tata Mcgraw Hill.
2. A.S. Tanenbaum, “Computer Networks”, Prentice Hall, 1992, 4th edition.
3. William Stallings, “Data & Computer Communication”, McMillan Publishing Co.

4. Black, “Data Networks”, PHI, 1988.
5. Fred Halsall, “Data Communications, Computer Networks”, Pearson Education.

Note: In each theory paper, nine questions are to be set. Two questions are to set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MT-203 Distributed Database Management System L T
3 1

UNIT – I

Distributed Data Processing: Introduction, Fundamentals of Distributed Data Base Management System (Transparent management of distributed & replicated data, Reliability, Improved performance, System expansion), Disadvantages of Distributed Data Base Management System (Complexity, Cost, Distribution of control, Security, Distributed database design, Query processing, Directory Mgmt, concurrency control, Deadlock Mgmt, Reliability, OS support, Heterogeneous databases, Relationship).

Relational Data Base Management System: Basic Concepts, Data Modeling for a Database, Records and Files, Abstraction and Data Integration, The Three-Level Architecture Proposal for DBMS, Components of a DBMS,

Advantages and Disadvantages of a DBMS. Data Models, Data Associations, Data Models Classification, Entity Relationship Model, Relational Data Model. Normalization: Dependency structures, Normal forms.

UNIT – II

Distributed Data Base Management System Architecture: Architectural models for distributed DBMS (Autonomy, Distribution, Heterogeneity, Architectural alternatives), Client/server systems, Peer-to-peer Distributed Systems.

Distributed Database Design: Design Strategies (Top-Down Design & Bottom-Up design process), Design issues (reasons for fragmentation, alternatives, Degree & Correctness rules of fragmentation, Allocation alternatives, Information requirement. Fragmentation: Horizontal, Vertical, Hybrid Fragmentation. Allocation: Problem, Information requirement, Allocation model, Solution methods.

UNIT – III

Query Processing: Problem, objectives, Complexity of Relational Algebra operations, Characterization of query processing (Language, Types of Optimization, Optimization timing, Statistics, Decision sites, Exploitation of network topology & Replicated fragments, Use of semijoins), Layers of Query processing (Query decomposition, Data localization, Global & Local query optimizations).

Distributed Concurrency Control: Serializability theory, Taxonomy of concurrency control mechanism, Locking based concurrency control algorithm (centralized 2pl, primary copy 2pl, distributed 2pl), Timestamp based concurrency control algorithm (conservative & multiversion TO algorithm), Optimistic concurrency control algorithm, Deadlock management, prevention, avoidance, detection & resolution.

UNIT – IV

Distributed DBMS Reliability: Reliability concepts & measures (system, state & failures, reliability & availability, mean time between failures/repair), Failures & fault tolerance in distributed system (reason for failures, fault tolerance approaches & techniques), Failures in Distributed DBMS (transaction, system, media & communication failure), Local reliability protocols (architectural considerations, recovery, information execution of

LRM commands, checkpointing, handling media failure), Distributed Reliability Protocols (Components, Two-Phase commit protocol, Variation of 2PC).

Text Books:

1. M. Tamer Ozsu & Patrick Valduriez, "Principles of Distributed Database Systems", Pearson Education Asia.
2. Desai, B., "An Introduction to Database Concepts." Galgotia Publications, New Delhi.

Reference Books:

1. Date C.J., "An Introduction to Database Systems", Narosa Publishing House, New Delhi.
2. Elimsari and Navathe, "Fundamentals of Database Systems", Addison Wesley, New York.
3. Ullman, J.D, "Principals of Database Systems", Galgotia Publications, New Delhi.

Note: In each theory paper, nine questions are to be set. Two questions are to set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA – 204 Data Warehousing and Data Mining L T
3 1

UNIT – I

Introduction: DSS, Data warehouse Architecture, Data Staging & ETL, Multidimensional Model, Meta data, Accessing data warehouse, ROLAP, MOLAP, HOLAP

System Lifecycle: Risk factors, Top-down, Bottom-up, Data mart design phases, Methodological framework, Testing data marts

Data Sources: Inspecting and normalizing schemata, Integration problems, Integration phases, Mapping

User Requirements & Conceptual Modeling: Glossary based requirements analysis, Goal-oriented requirements analysis, Dimensional Fact Model, Advanced modeling, Events and Aggregation, Time, Formalizing the dimensional fact model

Conceptual Design: ER schema based design, Relational schema based design, XML schema based design, Mixed approach design

UNIT – II

Logical Modeling & Design: MOLAP, HOLAP & ROLAP systems, Views, Temporal scenarios, Fact schemata to star schemata, View materialization, View Fragmentation, Populating - reconciled databases, dimension tables, fact tables & materialized views, Cleansing data

Data Warehouse Components: Overall architecture, database, Sourcing, acquisition, cleanup and transformation tools, Metadata, Access tools, Administration and management, Info delivery System

Building a Data Warehouse: Considerations - business, design, technical & implementation, Integrated solutions, Benefits

UNIT – III

Mapping Data Warehouse to a Multiprocessor Architecture: Relational database technology, Database architectures for parallel processing, Parallel RDBMS features and vendors

DBMS Schemas & Decision Support: Data layout for best access, Multidimensional data models, Star schema

Data Tools and Metadata: Tool requirements, Vendor approaches, Access to legacy data, Transformation engines, Metadata - definition, interchange initiative, repository, trends, Reporting & Query Tools – categories

OLAP: Need, Multidimensional data model, guidelines, Multidimensional Vs multirelational OLAP, Categorization of OLAP tools

UNIT – IV

Introduction: Data mining, Measuring effectiveness, Discovery Vs prediction, Overfitting, Comparing the technologies, Decision trees, Where to use them, General idea, How do they work, Strengths and weaknesses

Techniques and Algorithms: Neural networks - uses, making predictions, different kinds, Kohonen feature map, their working, Nearest Neighbour & Clustering – uses, predictions and differences, their working, Genetic Algorithms – uses, cost minimization, cooperative strategies, their working, Rule Induction – uses, evaluation of rules, rules Vs decision trees, their working, Using the right technique, Data mining & business process

Text Books:

1. Data Warehousing, Data Mining & OLAP, Alex Berson & Stephen J. Smith, Tata McGraw-Hill, 2009.
2. Data Warehouse Design: Modern Principles and Methodologies, Matteo Golfarelli, Stefand Rizzi, Tata McGraw-Hill, 2009.

Reference Books:

1. Decision support and data warehouse systems, Efrem Mallach, Tata McGraw-Hill, 2009.
2. The Data Warehouse Lifecycle Toolkit: Practical Techniques for Building Data Warehouse and Business Intelligence Systems, John Wiley & Sons, 2008

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MCA – 205 Software Quality & Testing L T
3 1

UNIT – I

Software and Quality Concept: Objectives, overview, Software perspective, Software Quality, Software Quality Assurance, Software Quality models, Software Quality measurement and metrics.

Assuring Software Quality Assurance (SQA): Objectives, goals, responsibilities, life cycle, SQA planning, SQA monitoring and controlling, testing, setting standards and procedures, Developing and controlling relevant metrics, SQA activities- revision, process evaluation, software standards.

UNIT – II

Software Quality Meterics: Objectives, Software metrics, Software Quality metrics framework, Software Quality metrics features, Development of software quality metrics- SATC's approach, Kitchenham's approach, Abreu's approach, Victor's approach, Selection of Software Quality metrics- Size related metrics, complexity metrics, Halstead metrics, quality metrics. Software Quality Models: Objectives, Hierarchical model- factor-criteriametrics model, McCall's model, Boehm model, ISO 9126 model, Dromey's Quality model, Non-hierarchical model-Bayesian belief networks, star model, capability maturity models.

UNIT – III

Software Testing: Introduction, Definition (testing, fault, error, failure, bug, mistake), test oracle, test case, Process, Limitations of Testing.

Functional Testing: Boundary Value Analysis- Introduction & Definition, Generalising, limitations, Robustness testing, Worst case testing, Test cases. Equivalence Class Testing - Introduction & Definition, Weak normal, strong normal, Weak robust, Strong robust, Test cases.

Decision Table Based Testing- Introduction & Definition, technique, test cases.

UNIT – IV

Structural Testing: Path testing - Introduction & definition, DD-path, Test coverage metrics, McCabe's basis path method, its observations and complexity.

Data Flow Testing: Definition, data flow graphs, data flow model, Data flow testing strategies.

Levels of Testing: Traditional view of testing levels, Integration Testing (Decomposition based integration), Unit Testing, System Testing.

Metrics and Complexity: Metrics definition, objectives, Linguistic Metrics: definition, LOC, Statement counts, Related metrics, Halstead's Metrics, Token count. Structural Metrics -Definition, Cyclomatic complexity, Hybrid Metrics.

Text Books:

1. R A Khan, K Mustafa, SI Ahson, "Software Quality- Concepts and Practices", Narosa Publishing House,
2. Boris Beizer, "Software Testing Techniques", Dreamtech press.
3. Paul C. Jorgensen. "Software Testing- A Craftsman Approach", CRC Press

Reference Books:

1. Alan C Gillies, “Software Quality: Theory and Management”, Cengage Learning, India.
2. Nina S Godbole, “Software Quality Assurance: Principles and Practice”, Narosa Publishing House.
3. K.K. Aggarwal & Yogesh Singh, “Software Engineering”, New Age International Publishers.
4. Bharat Bhushan Aggarwal & Sumit Prakash Tayal, “Software Engineering”, University Science Press.
5. Aditya P. Mathur, “Fundamentals of Software Testing”, Pearson Education.

Note: In each theory paper, nine questions are to be set. Two questions are to set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MT-301 Research Methodology in Computer Science

Lectures 4 per week

UNIT-I

Research Aptitude: Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Research Methods versus Methodology, Research and Scientific Method, Importance of Knowing How Research is done.

Research Process: Reviewing the literature, Formulation of research problem, Nature and type of variables, Hypothesis - meaning, types, development of hypothesis and its testing, Meaning & Functions of Research Design

UNIT-II

Data Analysis: Sources, acquisition and interpretation of data, Quantitative and qualitative data, Graphical representation and mapping of data, Sensitivity Analysis with Data Tables, Optimization with EXCEL Solver, Summarizing Data with Histograms and Descriptive Statistics, Pivot Tables, Summarizing Data with database statistical functions, using correlation, Multiple Regression, Using Sampling to Analyze Data

UNIT-III

Significance of Report Writing : Different Steps in writing Report, Layout of the Research Report, Types of Reports, Mechanics of Writing a Research Report, Art of scientific writing- Steps to better writing, flow method, organization of material and style, Drawing figures, graphs, tables, footnotes, references etc. in a research paper

UNIT-IV

Use of internet in research work : Use of internet networks in research activities in searching material, paper downloading, submission of papers, relevant websites for journals and related research work. Introduction to Patent laws etc., process of patenting a research finding, Copy right, Cyber laws.

References:

1. Research Methodology Methods and Techniques , Kothari, C. R., Wiley Eastern

Ltd.
2. Microsoft Excel Data Analysis and Business Modeling , Wayne L. Winston, Microsoft Press, ISBN: 0735619018
3. Research Methodology: a step-by-step guide for beginners , Kumar, Pearson Education.
4. Practical Research Methods , Dawson, C., UBSPD Pvt. Ltd.
5. Research Methodology , Sharma, N. K., KSK Publishers, New Delhi.

Note: In each theory paper, nine questions are to be set. Two questions are to be set from each Unit and candidate is required to attempt at least one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

Electives

MT-E01 Advanced Software Engineering Concepts L T
3 1

UNIT – I

Introduction to Software Engineering: Software Engineering Development, Software Engineering Development, Software Life Cycle Models, Standards for developing life cycle models.

UNIT – II

Object Methodology & Requirement Elicitation: Introduction to Object Oriented Methodology, Overview of Requirements Elicitation, Requirements Model-Action & Use cases, Requirements Elicitation Activities, Managing Requirements Elicitation

UNIT – III

Architecture: Model Architecture, Requirements Model, Analysis Model, Design Model, Implementation Model, Test Model
Modeling with UML: Basic Building Blocks of UML, A Conceptual Model of UML, Basic Structural Modeling, UML Diagrams
System Analysis: Analysis Model, Dynamic Modelling & Testing

UNIT – IV

System Design: Design concepts & activities, Design models, Block design, Testing
Testing Object Oriented Systems: Introduction, Testing Activities & Techniques, The Testing Process, Managing Testing Case
Studies

Text Book:

1. Stephen R. Scach, "Classical & Object Oriented Software Engineering with UML and Java", McGraw Hill, 1999.

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answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA – E02 Artificial Intelligence and Expert Systems L T
3 1

UNIT – I

Overview Of A.I.: Definition Of AI, The Importance Of AI, Previous Works In The History Of AI, AI And Related Fields, Problems, Problem Spaces And Search. Knowledge: General Concepts –Definition and Importance of Knowledge, Knowledge-Based Systems, Representation Of Knowledge, Knowledge Organization, Knowledge Manipulation, Acquisition Of Knowledge.

UNIT – II

Formalized Symbolic Logics – Syntax And Semantics For Propositional Logic, Properties of Wffs, Conversion To Clausal Form, Inference Rules, Resolution. Dealing With Inconsistencies - Truth Maintenance Systems, Symbolic Reasoning under Uncertainty, Statistical Reasoning. Structural Knowledge – Graph, Frames and Related Structures.

UNIT – III

Natural Language Processing: Overview of Linguistics, Grammer and Languages, Syntactic Processing, Semantic Analysis, Morphological, Discourse and Pragmatic Processing, Natural Language Generation, Natural Language Systems.

UNIT – IV

Pattern Recognition: Introduction, Recognition and Classification Process, Learning Classification Pattern, Recognizing and Understanding Speech. Expert Systems: Definition, Rule Based System Architecture, NonProduction System Architecture, Basic Components of E.S.

Text Book:

1. Dan W. Patterson, “Introduction to Artificial Intelligence and Expert Systems.” Prentice-Hall, India.

Reference Books:

1. A.Rich and K. Knight, “Artificial Intelligence”, Tate McGraw Hill.
2. E. Charnaik and D.Mcdermott, “Introduction to Artificial Intelligence”, Addison-Wesley Publishing Company.

Note: In each theory paper, nine questions are to be set. Two questions are to set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MT – E03 Automata Theory and Compiler Design L T
3 1

UNIT – I

Finite Automata and Regular Expression: Finite State System, Basic Definition, Deterministic and Non-Deterministic Finite Automata (Only Definition), Finite Automata With Output, Regular Expression.

Turing Machines: Definition Of Various Version Of Touring Machines, Deterministic, Non-Deterministic, Two-Way, Infinite Tape, Multi Tape, Multi Head, Statements Of Their Equivalence (Without Proof), Construction Of Turing Machines (Any Model) For Log N; N! , N2;

UNIT – II

Context Free Grammars: Context Free Grammars, Derivation Trees, Simplification of Context-Free Grammars, Chomsky Normal Form, Greibach Normal Form.

Properties Of Context -Free Languages : The Pumping Leema For CFL'S Closure Properties Of CFL'S , Decision Algorithms For CFL'S.

UNIT – III

Introduction To Compiling: Compilers, Analysis Of Source Program, The Phases Of A Compiler, One Pass Compiler, Overview, Syntax Definition, Syntax-Directed Translation, Parsing, Lexical Analysis, Role of The Lexical Analyzer.

Syntax Analysis, The Role Of Parser, Context Free Grammars, Writing A Grammer, Top-Down Parsing (Recursive-Descent Parsing, Predictive Parsing, Transition Diagram For Predictive Parsing,

UNIT – IV

Non Recursive Predictive Parsing, First And Follow, Ll(1) Grammers, Error Recovery In Predictive, Parsing .

Bottom-Up Parsing: Handles, Handle Pruning, Stack Implementation In Shift Reduce Parsing, Conflicts In Shift Reducing Parsing, LR-Parsers, LR Algorithm, LR Grammars, Constructing SLR Parsing Tables, Using Ambiguous Grammars, Error Recovery In LR Parsing.

Text Book:

1. Johan E. Hopcroft, Jeffery D. Ullman, "Introduction To Automata Theory Languages Computation", Narosa Publishing House.

Reference Books:

1. Alfred V.Aho, Ravi Sethi, Jeffery D. Ullman, "Compilers Principles, Techniques and Tools", Addison-Wesley Publishing Company.
2. William A. Barrett, Bates, John D. Couch", Compiler Construction Theory and Practice.

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MT – E04 Cyber Law L 3 T 1

UNIT – I

Cyber Law: Introduction, Definition, nature & Scope of Cyber Laws. Sociolegal Implications of Computer Science, Cyber Laws.

Cyber Crimes: Definition & Kinds of Cyber Crimes. International and Foreign Developments. Common Cyber Offences: Pheakering, Internet Frauds, Hackers, Stalking, E-Mail, Security Invasion, Money Laundering, DataDiddling, Theft of Information.

UNIT – II

Contractual Aspects: Hardware Contracts: User Requirement Specification, Negotiation, Sales & Leases, Delivery & Payment, Seller's Obligations, Buyer's Remedies. Software Contract: Selecting Software, Types of Software, What is Software, Software License, Principal Commercial Terms, Warranties, Software Maintenance.
Liability: Contractual Liability, Strict Liability, Negligence, Criminal.
Miscellaneous (Briefly); Copyright & Patent Protection, Evidence, Protecting Confidential Information.

UNIT – III

The Information Technology Act, 2000:
Introduction: Definition, A Brief Summary of the Act.
Digital Signature & Electronic Governance (Sections 3 to 10)
Secure Electronic Records & Secure Digital Signatures (Sections 14 to 16).

UNIT – IV

Regulation of Certifying Authorities (Sections 17 to 34).
Digital Signature Certificates (Sections 35 to 39).
Duties of Subscribers (Sections 40 to 42).
Penalties, Adjudication Offences (Sections 45 to 47 & Sections 65 to 78). Cyber Regulations Appellate Tribunal (Sections 48 to 64).

Text and Reference Books:

1. The Information Technology Act, 2000.
2. Chris Reed (Ed.), Computer Law, 1996: Universal Law Publishing Co. Pvt. Ltd.
3. Mittal D.P., Law of Information Technology (2000): Taxmann's.

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MT-E05 Cloud Computing

4 Hours per week

UNIT-I

Introduction to Cloud Computing, Definition, Characteristics, Components, Cloud provider, SAAS, PAAS, IAAS and Others, Organizational scenarios of clouds, Administering & Monitoring cloud services, benefits and limitations, Deploy application over cloud, Comparison among SAAS, PAAS, IAAS
Cloud computing platforms: Infrastructure as service: Amazon EC2, Platform as Service: Google App Engine, Microsoft Azure, Utility Computing, Elastic Computing

UNIT-II

Roots of SOA : Characteristics of SOA - Comparing SOA to client-server and distributed internet architectures - Anatomy of SOA- How components in an SOA interrelate - Principles of service orientation.
Web services: Service descriptions - Messaging with SOAP -Message exchange. Patterns - Coordination -Atomic Transactions - Business activities - Orchestration - Choreography - Service layer abstraction - Application Service Layer - Business. Service Layer - Orchestration Service Layer.
Service oriented analysis: Business-centric SOA - Deriving business services-service modeling - Service Oriented Design - WSDL basics - SOAP basics - SOA composition guidelines - Entity-centric business service design - Application service design - Task centric business service design.

UNIT-III

Cloud Technology: Introduction to Cloud Technologies, Study of Hypervisors Compare SOAP and REST Webservices, AJAX and mashups-Web services: SOAP and REST, SOAP versus REST, AJAX: asynchronous 'rich' interfaces, Mashups: user interface services
Virtualization Technology: Virtual machine technology, virtualization applications in enterprises, Pitfalls of virtualization
Multitenant software: Multi-entity support, Multi-schema approach, Multi-tenance using cloud data stores, Data access control for enterprise applications,
Data in the cloud: Relational databases, Cloud file systems: GFS and HDFS, BigTable, HBase and Dynamo.

UNIT-IV

Cloud security fundamentals, Vulnerability assessment tool for cloud, Privacy and Security in cloud
Cloud computing security architecture: Architectural Considerations- General Issues, Trusted Cloud computing, Secure Execution Environments and Communications, Micro-architectures; Identity Management and Access control-Identity management, Access control, Autonomic Security
Cloud computing security challenges: Virtualization security management-virtual threats, VM Security Recommendations, VM-Specific Security techniques, Secure Execution Environments and Communications in cloud.

Text Books:

1. Cloud Computing for Dummies by Judith Hurwitz, R.Bloor, M.Kanfman, F.Halper (Wiley India Edition)
2. Enterprise Cloud Computing by Gautam Shroff,Cambridge
3. Thomas Erl, "Service Oriented Architecture: Concepts, Technology, and Design", Pearson Education, 2005
4. Cloud Security by Ronald Krutz and Russell Dean Vines, Wiley-India

Reference Books:

1. Google Apps by Scott Granneman,Pearson
2. Cloud Security & Privacy by Tim Malhar, S.Kumaraswammy, S.Latif (SPD,O'REILLY)
3. Cloud Computing : A Practical Approach, Antohy T Velte, et.al McGraw Hill,
4. Cloud Computing Bible by Barrie Sosinsky, Wiley India
5. Stefano Ferretti et.al.,QoS–aware Clouds", 2010 IEEE 3rd International Conference on Cloud Computing

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MCA – E06 Distributed Systems L T
3 1

UNIT – I

Introduction and Architectures: Definition of a Distributed System, Goals and Types of distributed systems, Architecture Styles, System Architectures, Middleware, Self-management in Distributed Systems with examples of Astrolabe, Globule and Jade.

Processes: Threads, Virtualization, Clients, Servers and Code Migration

UNIT – II

Communication: Remote Procedure Call, Message-Oriented, Stream Oriented and Multicast Communication

Naming: Names, Identifiers and Addresses, Flat naming, Structured Naming and Attribute-Based Naming.

UNIT – III

Synchronization: Clock Synchronization, Logical Clocks: Lamport's Logical Clocks and Vector Clocks, General Introduction to the Concepts of Replication and Fault Tolerance

Distributed File Systems: Client-Server Architecture in NFS, Cluster-based Architecture in Google, Symmetric Architectures, RPC in NFS.

UNIT – IV

Distributed Web-Based Systems: Architecture, Processes i.e. clients, Apache Web Server and Web Server Clusters, Communication i.e. HTTP and Simple Object Access Protocol, Web Proxy Caching.

Case studies of Mach, Chorus and Amoeba distributed operating systems

Text Book:

1. Distributed Systems: Principles and Paradigms, 2nd ed by Tanenbaum, A. and van Steen, M., Prentice Hall, 2007.

Reference Books:

1. Distributed Systems: Concepts and Design, 4rd ed by Coulouris, G, Dollimore, J., and Kindberg, T., Addison-Wesley, 2006.
2. Introduction to Reliable Distributed Programming - Rachid Guerraoui and Louis
3. Rodrigues, Springer-Verlag, Berlin, Germany, 2006.
4. Elements of Distributed Computing - Vijay K. Garg, Wiley, 2002.
5. Distrubuted Computing: Principles and Applications by M. L. Liu, Pearson Education, 2008

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MT – E07 Graph Theory L T
3 1

UNIT – I

Introduction – Definition of a graph, application of graphs, finite and infinite graphs, incidence and degree, isolated vertex, pendant graph, null graph. Path and circuits-Isomorphism, subgraphs, walks, paths, circuits, connected graphs, disconnected graphs and its componenets, Euler graph, operations on graphs, Hamiltonian paths and circuits, travelling salesman problem.

UNIT – II

Trees and fundamental circuits- Trees, properties of the trees, pendant vertices in a tree, distance and centres in a tree , rooted and binary trees, on counting trees, spanning tree, fundamental circuits, finding all spanning trees of a graph, spanning tree in a weighted graph.

UNIT – III

Planar and Dual graphs- combinatorial Vs. Geometric Graphs, planar graphs, diffirent representations of a planar graph, detection of planarity,
Geometric Dual, combinatorial dual, thickness and crossings,
Matrix representation of graphs- Incidence graph, submatrices of A(G), circuit matrix, cut-set matrix, path matrix adjacency matrix.

UNIT – IV

Directed Graphs- Definition of a directed graph, types of digraphs, digraphs and binary relations, directed path and connectedness, trees with directed edges, fundamental circuits in a digraph, adjacency matrix of a graph, acyclic digraphs and decyclization.
Graph algorithms- algorithm for connectedness, a spanning tree, a set of fundamental circuits, directed circuits, shortest path algorithm, depth search first on a graph, algorithm for planarity testing, algorithm for isomorphism.

Text Book:

1. Narsingh Deo, “Graph Theory”, Prentice Hall of India.

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