SCHEME AND SYLLABUS OF
M. TECH PROGRAMME
(COMPUTER SCIENCE & ENGG.)
SESSION 2013-14

HIMACHAL PRADESH TECHNICAL UNIVERSITY, HAMIRPUR

Scheme of Examination										
First Semester						Exam Schedule		Practical Schedule		
Course No.	**Subjects**	**L**	**T**	**P**	**Total**	**Theory**	**Sess.**	**Pract.**	**Sess.**	**Total**
CSE1-511	Computer Architecture and Parallel Processing	4	0	0	4	100	50	-	-	150
CSE1-512	Software Engineering	4	0	0	4	100	50	-	-	150
CSE1-513	Computer Oriented Optimization Method	4	0	0	4	100	50	-	-	150
CSE1-514	Data Structure & Algorithm Analysis in C	4	0	0	4	100	50	-	-	150
CSE1-515	Operating System and Case Study	4	0	0	4	100	50	-	-	150
(Practical)										
CSE1-516	Practical on CSE1-513	-	-	3	3	-	-	25	25	50
CSE1-517	Practical on CSE1-514	-	-	3	3	-	-	25	25	50
TOTAL		**20**	**0**	**6**	**26**	**500**	**250**	**50**	**50**	**850**

Scheme of Examination										
Second Semester						Exam Schedule		Practical Schedule		
Course No.	**Subjects**	**L**	**T**	**P**	**Total**	**Theory**	**Sess.**	**Pract.**	**Sess.**	**Total**
CSE1-521	Object Oriented Programming with JAVA	4	0	0	4	100	50	-	-	150
CSE1-522	Computer Networks	4	0	0	4	100	50	-	-	150
CSE1-523	Distributed Data Base Management System	4	0	0	4	100	50	-	-	150
CSE1-524	Data Warehousing and Data Mining	4	0	0	4	100	50	-	-	150
CSE1-525	Software Quality and Testing	4	0	0	4	100	50	-	-	150
(Practical)										
CSE1-526	Practical on CSE1-521	-	-	3	3	-	-	25	25	50
CSE1-526	Practical on CSE1-523	-	-	3	3	-	-	25	25	50
TOTAL		**20**	**0**	**6**	**26**	**500**	**250**	**50**	**50**	**850**

Scheme of Examination								
Third Semester					**Exam Schedule**			
Course No.	**Subjects**	**L**	**T**	**Total**	**Theory**	**Sess.**	**viva**	**Total**
CSE1-631	Computer Graphics	4	0	4	100	50	-	150
CSE1-E**	Elective-I	4	0	4	100	50	-	150
CSE1-590	Seminar	--	--	3	--	100	-	100
CSE1-600	Dissertation I	--	--	24	--	Satisfactory/not satisfactory		
TOTAL		**8**	**0**	**33**	**200**	**200**	**-**	**400**

Scheme of Examination					
Fourth Semester					**Exam Schedule**
Course No.	**Subjects**	**L**	**T**	**Total**	
CSE1-600	Dissertation II	--	--	33	Satisfactory/not satisfactory

List of Electives
CSE1-E01 Advanced Software Engineering Concepts
CSE1-E02 Artificial Intelligence & Expert System
CSE1-E03 Automata Theory and Compiler Design
CSE1-E04 Cyber Law
CSE1-E05 Cloud Computing
CSE1-E06 Distributed Systems
CSE1-E07 Graph Theory
CSE1-E08 Research Methodology
CSE1-E09 Service Oriented Architecture

Computer Architecture & Parallel Processing CSE1-511

Course Code	CSE1-511		L-4 T-0, P-0
Name of The Course	**Computer Architecture & Parallel Processing**		
Lectures to be Delivered	**52(1 Hr each, for each semester)**		
Semester End Examination	**Max. Time: 3 Hrs**	**Max. Marks: 100**	**Min. Pass Marks: 50**
Continuous Assessment (Based on sessional Tests 50%, Tutorials/ Assignments 30%, Quiz/Seminar 10%, Attendance 10%)		**Max. Marks: 50**	

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.

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.

Software Engineering CSE1-512

Course Code	CSE1-512		L-4 T-0, P-0
Name of The Course	**Software Engineering**		
Lectures to be Delivered	**52(1 Hr each, for each semester)**		
Semester End Examination	**Max. Time: 3 Hrs**	**Max. Marks: 100**	**Min. Pass Marks: 50**
Continuous Assessment (Based on sessional Tests 50%, Tutorials/ Assignments 30%, Quiz/Seminar 10%, Attendance 10%)		**Max. Marks: 50**	

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.

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.

Computer Oriented Optimization Methods CSE1-513

Course Code	**CSE1-513**		**L-4 T-0, P-0**
Name of The Course	**Computer Oriented Optimization Methods**		
Lectures to be Delivered	**52(1 Hr each, for each semester)**		
Semester End Examination	**Max. Time: 3 Hrs**	**Max. Marks: 100**	**Min. Pass Marks: 50**
Continuous Assessment (Based on sessional Tests 50%, Tutorials/ Assignments 30%, Quiz/Seminar 10%, Attendance 10%)		**Max. Marks: 50**	

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.

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.

Data Structures and Algorithm Analysis in C CSE1-514

Course Code	CSE1-514		L-4 T-0, P-0
Name of The Course	**Data Structures and Algorithm Analysis in C**		
Lectures to be Delivered	**52(1 Hr each, for each semester)**		
Semester End Examination	**Max. Time: 3 Hrs**	**Max. Marks: 100**	**Min. Pass Marks: 50**
Continuous Assessment (Based on sessional Tests 50%, Tutorials/ Assignments 30%, Quiz/Seminar 10%, Attendance 10%)		**Max. Marks: 50**	

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.

UNIT – I

Preliminaries: Concept & notation, common operation on data structures, algorithm complexity, time-space tradeoff 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, Shortest Path 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 Depth First 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.

Operating System & Case Study CSE1-515

Course Code	CSE1-515		L-4 T-0, P-0
Name of The Course	**Operating System & Case Study**		
Lectures to be Delivered	**52(1 Hr each, for each semester)**		
Semester End Examination	**Max. Time: 3 Hrs**	**Max. Marks: 100**	**Min. Pass Marks: 50**
Continuous Assessment (Based on sessional Tests 50%, Tutorials/ Assignments 30%, Quiz/Seminar 10%, Attendance 10%)		**Max. Marks: 50**	

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.

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 Methods contiguous 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

Object Oriented Programming with JAVA CSE1-521

Course Code	CSE1-521		L-4 T-0, P-0
Name of The Course	**Object Oriented Programming with JAVA**		
Lectures to be Delivered	**52(1 Hr each, for each semester)**		
Semester End Examination	**Max. Time: 3 Hrs**	**Max. Marks: 100**	**Min. Pass Marks: 50**
Continuous Assessment (Based on sessional Tests 50%, Tutorials/ Assignments 30%, Quiz/Seminar 10%, Attendance 10%)		**Max. Marks: 50**	

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.

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.

Computer Networks CSE1-522

Course Code	CSE1-522		L-4 T-0, P-0
Name of The Course	**Computer Networks**		
Lectures to be Delivered	**52(1 Hr each, for each semester)**		
Semester End Examination	**Max. Time: 3 Hrs**	**Max. Marks: 100**	**Min. Pass Marks: 50**
Continuous Assessment (Based on sessional Tests 50%, Tutorials/ Assignments 30%, Quiz/Seminar 10%, Attendance 10%)		**Max. Marks: 50**	

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.

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.

Distributed Database Management System CSE1-523

Course Code	**CSE1-523**		**L-4 T-0, P-0**
Name of The Course	**Distributed Database Management System**		
Lectures to be Delivered	**52(1 Hr each, for each semester)**		
Semester End Examination	**Max. Time: 3 Hrs**	**Max. Marks: 100**	**Min. Pass Marks: 50**
Continuous Assessment (Based on sessional Tests 50%, Tutorials/ Assignments 30%, Quiz/Seminar 10%, Attendance 10%)		**Max. Marks: 50**	

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.

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.

Data Warehousing and Data Mining CSE1-524

Course Code	CSE1-524		L-4 T-0, P-0
Name of The Course	**Data Warehousing and Data Mining**		
Lectures to be Delivered	**52(1 Hr each, for each semester)**		
Semester End Examination	**Max. Time: 3 Hrs**	**Max. Marks: 100**	**Min. Pass Marks: 50**
Continuous Assessment (Based on sessional Tests 50%, Tutorials/ Assignments 30%, Quiz/Seminar 10%, Attendance 10%)		**Max. Marks: 50**	

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.

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

Software Quality & Testing CSE1-525

Course Code	CSE1-525		L-4 T-0, P-0
Name of The Course	**Software Quality & Testing**		
Lectures to be Delivered	**52(1 Hr each, for each semester)**		
Semester End Examination	**Max. Time: 3 Hrs**	**Max. Marks: 100**	**Min. Pass Marks: 50**
Continuous Assessment (Based on sessional Tests 50%, Tutorials/ Assignments 30%, Quiz/Seminar 10%, Attendance 10%)		**Max. Marks: 50**	

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.

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.

Computer Graphics CSE1-631

Course Code	CSE1-631		L-4 T-0, P-0
Name of The Course	**Computer Graphics**		
Lectures to be Delivered	**52(1 Hr each, for each semester)**		
Semester End Examination	**Max. Time: 3 Hrs**	**Max. Marks: 100**	**Min. Pass Marks: 50**
Continuous Assessment (Based on sessional Tests 50%, Tutorials/ Assignments 30%, Quiz/Seminar 10%, Attendance 10%)		**Max. Marks: 50**	

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.

UNIT – I

Introduction: Definition Of Computer Graphics And Its Applications, Video Display Devices- Raster-Scan Displays, Random-Scan Displays, Color CRT Monitors, Direct View Storage Tubes, Flat Panel Displays Input Devices: Keyboard, Mouse, Trackball and Spaceball, Joysticks, Digitizers, Image Scanners, Touch Panels, Light Pens, Voice Systems.

UNIT – II

Output Primitives: Line Drawing Algorithms (DDA, Bresenhaum's Circle) Generating Algorithm: Midpoint Circle Drawing Algorithm, Ellipse Generating Algorithm, Midpoint Ellipse Generating Algorithm, Character Generation, 2D Transformations: Translation, Rotation, Scaling, Reflection, Shear, Composite Transformation-Translation, Rotations, Scaling.

UNIT – III

Two Dimensional Viewing: Window-To-Viewport Coordinate Transformation, Clipping Operations, Point Clipping, Line Clipping–(Cohen-Sutherland Line Clipping, Liang-Barsky Line Clipping, Nicholl-Lee-Nicholl Line Clipping), Polygon Clipping–(Sutherland-Hodgeman Polygon Clipping, Weiler-Atherton Polygon Clipping), Curve Clipping, Text Clipping.

Three Dimensional Concepts: Three Dimensional Display Methods–Parallel Projection, Perspective Projection, Surface Rendering. Three Dimensional Transformations: Translation, Rotation, Scaling, Reflection, Shear.

UNIT – IV

Curves and Surfaces: Bezier Curves, B-Spline Curves, Fractal Geometory Methods, Octrees. Visible-Surface Detection Methods: Back Face Detection, Depth Buffer Method, A-Buffer Method, Scan Line Method, Depth Sorting Method. Concept of Shading: Modeling Light Intensity, Diffuse And Specular Reflection, Refracted Light, Concept Of Shading Methods.

Text Book:

1. Donald Hearn & M. Pauline Baker, "Computer Graphics." Prentice Hall India.

Reference Books:

1. F. S. Hill Jr., "Computer Graphics", Macmillan Publishing Company.
2. David F. Rogers, "Procedural Elements for Computer Graphics", Tata MacGraw Hill.

Electives

Advanced Software Engineering Concepts CSE1-E01

Course Code	CSE1-E01		L-4 T-0, P-0
Name of The Course	**Advanced Software Engineering Concepts**		
Lectures to be Delivered	**52(1 Hr each, for each semester)**		
Semester End Examination	**Max. Time: 3 Hrs**	**Max. Marks: 100**	**Min. Pass Marks: 50**
Continuous Assessment (Based on sessional Tests 50%, Tutorials/ Assignments 30%, Quiz/Seminar 10%, Attendance 10%)		**Max. Marks: 50**	

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.

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.

Electives

Artificial Intelligence and Expert Systems CSE1-E02

Course Code	CSE1-E02		L-4 T-0, P-0
Name of The Course	**Artificial Intelligence and Expert Systems**		
Lectures to be Delivered	**52(1 Hr each, for each semester)**		
Semester End Examination	**Max. Time: 3 Hrs**	**Max. Marks: 100**	**Min. Pass Marks: 50**
Continuous Assessment (Based on sessional Tests 50%, Tutorials/ Assignments 30%, Quiz/Seminar 10%, Attendance 10%)		**Max. Marks: 50**	

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.

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.

Electives

Automata Theory and Compiler Design CSE1-E03

Course Code	CSE1-E03		L-4 T-0, P-0
Name of The Course	**Automata Theory and Compiler Design**		
Lectures to be Delivered	**52(1 Hr each, for each semester)**		
Semester End Examination	**Max. Time: 3 Hrs**	**Max. Marks: 100**	**Min. Pass Marks: 50**
Continuous Assessment (Based on sessional Tests 50%, Tutorials/ Assignments 30%, Quiz/Seminar 10%, Attendance 10%)		**Max. Marks: 50**	

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.

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.

Electives

Cyber Law CSE1-E04

Course Code	CSE1-E04		L-4 T-0, P-0
Name of The Course	Cyber Law		
Lectures to be Delivered	52(1 Hr each, for each semester)		
Semester End Examination	Max. Time: 3 Hrs	Max. Marks: 100	Min. Pass Marks: 50
Continuous Assessment (Based on sessional Tests 50%, Tutorials/ Assignments 30%, Quiz/Seminar 10%, Attendance 10%)		Max. Marks: 50	

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.

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, Data Diddling, 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.

Electives

Distributed Systems CSE1-E06

Course Code	CSE1-E06		L-4 T-0, P-0
Name of The Course	Distributed Systems		
Lectures to be Delivered	52(1 Hr each, for each semester)		
Semester End Examination	Max. Time: 3 Hrs	Max. Marks: 100	Min. Pass Marks: 50
Continuous Assessment (Based on sessional Tests 50%, Tutorials/ Assignments 30%, Quiz/Seminar 10%, Attendance 10%)		Max. Marks: 50	

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.

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

Electives

Graph Theory CSE1-E07

Course Code	CSE1-E07		L-4 T-0, P-0
Name of The Course	Graph Theory		
Lectures to be Delivered	52(1 Hr each, for each semester)		
Semester End Examination	Max. Time: 3 Hrs	Max. Marks: 100	Min. Pass Marks: 50
Continuous Assessment (Based on sessional Tests 50%, Tutorials/ Assignments 30%, Quiz/Seminar 10%, Attendance 10%)		Max. Marks: 50	

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.

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.