M.TECH.(CSE) COURSE STRUCTURE

I SEMESTER

Subject code	Name of the Subject	Contact hours/week		Credits	Scheme of Valuation		Total Marks
		L+T	P		Internal (CIE)	External (SEE)	
MTCS101	Advanced Data Structures	4+1		3	40	60	100
MTCS102	Advanced Database Management Systems	4+1		3	40	60	100
MTCS103	Data Mining	4+1		3	40	60	100
MTCS104	Advanced Computer Networks	4+1		3	40	60	100
	Elective-I	4+1		3	40	60	100
MTCS1051	Simulation and Modelling						
MTCS1052	Object Oriented Software Engineering						
MTCS1053	High Performance Computing						
MTCS1054	Software Project Management						
	Elective-II	4+1		3	40	60	100
MTCS1061	Parallel Algorithms						
MTCS1062	Embedded Systems						
MTCS1063	Artificial Intelligence						
MTCS1064	Computer Graphics						
MTCS151	Advanced Data Structures Lab		3	2	25	50	75
MTCS152	Technical Seminar		3	2	75		75
	Total			22	340	410	750

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II SEMESTER

Subject code	Name of the Subject	Contact hours/week		Credits	Scheme of Valuation		Total Marks
		L+T	P		Internal (CIE)	External (SEE)	
MTCS201	Big Data	4+1		3	40	60	100
MTCS202	Computer Vision	4+1		3	40	60	100
MTCS203	Soft Computing	4+1		3	40	60	100
MTCS204	Advanced Operating Systems	4+1		3	40	60	100
	Elective - III	4+1		3	40	60	100
MTCS2051	Software Testing and Quality Assurance						
MTCS2052	Network Security						
MTCS2053	Distributed computing						
MTCS2054	Advanced computer Architecture						
	Elective – IV	4+1		3	40	60	100
MTCS2061	Cloud Computing						
MTCS2062	Internet of Technologies						
MTCS2063	E-commerce						
MTCS2064	Mobile computing						
MTCS251	Hadoop Lab		3	2	25	50	75
MTCS252	Mini Project		3	2	75		75
Total				22	340	410	750

III & IV SEMESTERS

Subject code	Name of the Subject	Contact hours/week		Credits	Scheme of Valuation		Total Marks
		L+T	P		Internal (CIE)	External (SEE)	
MTCS351	Dissertation			40	50	150	200
Total				40	50	150	200

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I SEMESTER

MTCS101 - ADVANCED DATA STRUCTURES

Lecture	:	4 Periods / Week	Internal Marks	:	40
Tutorial	:	1 Period / Week	External Marks	:	60
Credits	:	3	External Examination	:	3 hrs.

UNIT-I

Data Structures:Linear Datastructures The List ADT: Singly Linked, Doubly Linked, Circular Linked List. Stacks ADT, Queue ADT

Binary trees, Binary Tree traversal and iterators,Threaded Binary trees, Heaps, Binary Search trees, Selection trees, Forests.

UNIT-II

Efficient Binary Search Trees: AVL Trees, Red-Black Trees, Splay Trees, M-way Search trees, B-Trees, B+ Trees.

Searches in Graphs: Depth First Search, Breadth First Search

UNIT-III

Priority Queues: Single and Double ended Priority Queues, Leftist Trees, Binomial Heaps, Fibonacci Heaps, and Symmetric Min-Max Heaps.

Internal Sorting: Insertion Sort, Heap Sort, Merge Sort, Quick Sort

UNIT-IV

Greedy Methods: Container Loading, Knapsack Problem, Minimum Cost Spanning trees.

Dynamic Programming: 0/1 Knapsack, Travelling Salesperson Problem, Optimal Binary Search Trees

UNIT-V

Branch and Bound: The general methods LC search and FIFO Branch and Bound, 0/1 Knapsack, Travelling Sales Person Problem.

Backtracking: N-Queens Problem, Hamilton cycle, Sum of Subsets Problem

TEXT BOOKS:

1. Horowitz E, Sahni S and Mehta D., "Fundamentals of Data Structures in C++", UniversityPress, Second Edition, 2007.[1st, 2nd, 3rd Units].
2. Horowitz E, Sahni S and Rajasekharan S, "Fundamentals of Computer Algorithms", UniversityPress, Second Edition, 2007.[4th, 5th Units].

REFERENCES:

1. Cormen V C, Leiserson E, Rivset R, and Stein C, "Introduction to Algorithms", Third Edition,Prentice Hall of India, 2009.
2. Subrahmanian V. S, Morgan Kaufman, "Principles of Multimedia Database Systems", 1998.
3. Baase S and Gelder A V, "Computer Algorithms – Introduction to Design and Analysis", ThirdEdition, Pearson Education, 2000.

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MTCS102 - ADVANCED DATABASE MANAGEMENT SYSTEMS

Lecture	:	4 Periods / Week	Internal Marks	:	40
Tutorial	:	1 Period / Week	External Marks	:	60
Credits	:	3	External Examination	:	3 hrs.

UNIT - I

RELATIONAL MODEL ISSUES

ER Model - Normalization – Query Processing – Query Optimization – Transaction Processing - Concurrency Control – Recovery - Database Tuning.

UNIT - II

DISTRIBUTED DATABASES

Parallel Databases – Inter and Intra Query Parallelism – Distributed Database Features – Distributed Database Architecture – Fragmentation – Distributed Query Processing – Distributed Transactions Processing – Concurrency Control – Recovery – Commit Protocols.

UNIT - III

OBJECT ORIENTED DATABASES

Introduction to Object Oriented Data Bases - Approaches - Modeling and Design -Persistence – Query Languages - Transaction - Concurrency – Multi Version Locks –Recovery – POSTGRES – JASMINE –GEMSTONE - ODMG Model.

UNIT - IV

EMERGING SYSTEMS

Enhanced Data Models - Client/Server Model - Data Warehousing and Data Mining -Web Databases – Mobile Databases- XML and Web Databases.

UNIT – V

CURRENT ISSUES

Rules – Knowledge Bases – Active and Deductive Databases – Multimedia Databases– Multimedia Data Structures – Multimedia Query languages – Spatial Databases.

TEXT BOOKS:

1. Thomas Connolly and Carlolyn Begg, "Database Systems, A Practical Approach to Design, Implementation and Management", Third Edition, Pearson Education.

REFERENCES:

1. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Fifth Edition,Pearson Education, 2006.
2. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts",Fifth Edition, Tata McGraw Hill, 2006.
3. C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.

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MTCS103 - DATA MINING

Lecture	:	4 Periods / Week	Internal Marks	:	40
Tutorial	:	1 Period / Week	External Marks	:	60
Credits	:	3	External Examination	:	3 hrs.

Unit - I

Introduction to Data Mining: Types of Data, Data Quality, Data Processing, Measures of Similarity and Dissimilarity **Exploring Data:** Data Set, Summary Statistics, Visualization, OLAP and multi dimensional data Analysis.

Unit - II

Classification:

Basic Concepts, Decision Trees, and model evaluation: General approach for solving a classification problem, Decision Tree induction, Model over fitting: Due to presence of noise, due to lack of representation samples, Evaluating the performance of classifier. **Classification-Alternative techniques:** Nearest Neighbourhood classifier, Bayesian Classifier, Support Vector Machines: Linear SVM, Separable and Non Separable case.

Unit – III

Association Analysis:

Problem Definition, Frequent Item-set generation, Rule generation, compact representation of frequent item sets, FP-Growth Algorithms, Handling categorical, continuous attributes, concept hierarchy, sequential, sub-graph patterns

Unit – IV

Clustering: Overview, K-means, Agglomerative Hierarchical clustering, DBSCAN**Cluster Evaluation:** Overview, Unsupervised Cluster evaluation using cohesion and separation, using the proximity matrix, Scalable clustering algorithms.

Unit - V

Web Data mining:

Introduction, Web terminology and characteristics, web content mining, web usage mining, web structure mining, Search Engines: Characteristics, Functionality, Architecture, Ranking of web pages, Enterprise search

TEXT BOOKS:

1. Introduction to Data Mining, Pang-Ning Tan, Michael Steinbach, Vipin Kumar, PEA.
2. Introduction to Data Mining with Case Studies, GK Gupta , Prentice Hall.

REFERENCES:

1. Data Mining: Introductory and Advanced Topics, Margaret H Dunham, PEA, 2008.
2. Fundamentals of data warehouses, 2/e, Jarke, Lenzerini, Vassiliou, Vassiliadis, Springer.
3. Data Mining Theory and Practice, Soman, Diwakar, Ajay, PHI, 2006.
4. Data Mining, Concepts and Techniques, 2/e, Jiawei Han , Micheline Kamber , Elsevier,2006.

MTCS104 - ADVANCED COMPUTER NETWORKS

Lecture	:	4 Periods / Week	Internal Marks	:	40
Tutorial	:	1 Period / Week	External Marks	:	60
Credits	:	3	External Examination	:	3 hrs.

UNIT-I

Physical Layer: Data Transmission- Analog and Digital Transmission, Transmission Impairments, Channel Capacity. Transmission Media- Wired Transmission, Wireless Transmission, Wireless Propagation, Line-of Sight Transmission, Signal Encoding Techniques.

UNIT-II

Data link layer: TCP/IP Protocol Architecture, Framing, Reliable Transmission, Ethernet (802.3)and Token Ring (802.5)

UNIT-III

Network Layer: Connecting Devices. ARP, RARP. IP Address – Sub netting / Super netting, Packet Forwarding with Classful / Classless Addressing, Datagram Fragmentation, Components inIP software, Private IP and NAT. ICMP. Routing Protocols -Distance Vector Routing-RIP, Link-State Routing-OSPF

UNIT-IV

Transport Layer: UDP- Port Addressing, UDP datagram, UDP operation. TCP- TCP services and features, TCP segment, TCP connection, TCP state transitions, TCP module's algorithm, Flow and Error control, Congestion control. SCTP- SCTP services and features, Packet format, SCTP connection, State Transitions, Flow and Error control.

UNIT-V

Application Layer: DNS- Distribution of Name Space, Name Resolution, DNS messages, HTTP Architecture, HTTP Transaction, DHCP - Address allocation, Packet format. SNMP-SMI, MIB, SNMP PDUs, Real Time Data Transfer- RTP, RTCP, Voice over IP-Session Initiation Protocol.

TEXT BOOKS:

1. William Stallings, "Data and Computer Communications" , Pearson Education.

REFERNECES:

1. Behrouz A Forouzan, "TCP/IP Protocol Suite", Tata McGraw-Hill.
2. Peterson and Davie, "Computer Networks A systems approach" , Elsevier.
3. Kurose and Ross, "Computer Networks A systems approach" , Pearson Education.
4. Behurouz A Forouzan, "Data Communications & Networking",4th edition, McGraw-Hill.

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MTCS1051 - SIMULATION AND MODELLING

Lecture	:	4 Periods / Week	Internal Marks	:	40
Tutorial	:	1 Period / Week	External Marks	:	60
Credits	:	3	External Examination	:	3 hrs.

UNIT - I

Introduction to Simulation

Areas of Application, Systems and system Environment, Components of a System, Discrete and continuous systems, Types of Models. **General Principles**: Concepts in Discrete-Event Simulation, List Processing.

UNIT - II

Statistical Models in Simulation

Review of Technology and concepts, Useful Statistical Models, Discrete Distributions, Continuous Distributions, Poisson Process, Empirical Distributions. **Queuing Models**: Characteristics and notation, Transient and study state behavior of Queues, Long Run Measures of Performance of Queuing Systems, Study state behavior of Infinite population Markovian Models.

UNIT - III

Random Number Generation

Properties of Random Numbers, Generation of Pseudo-Random Numbers, Techniques for generating random numbers, Tests for Random Numbers. **Random Variate Generation**: Inverse transform technique, Direct Transformation for the Normal Distribution, Convolution Method, Acceptance-Rejection Technique.

UNIT – IV

Input Modeling

Data Modeling, Identifying the Distribution with Data, Parameter Estimation, Goodness-of-Fit Tests, Selecting Input models without Data, Multivariate and Time series Input Models. **Verification and Validation of Simulation Models**: Model Building, verification and validation, verification of simulation models, calibration and validation of Models.

UNIT - V

Output Analysis for a Single Model: Stochastic Nature of Output Data, Types of Simulations with Respect to output Analysis, Measure of Performance and their Estimation, Output Analysis for Terminating Simulations, Output Analysis for Steady-state Simulations. **Comparisons and Evaluation of Alternative System Design**: Comparison of Two system designs, comparison of several system designs, Statistical Models for Estimating the Effect if Design Alternatives, Meta Modeling.

TEXT BOOKS:

1. Jerry Banks, John S.Carson, II and Barry L. Nelson; "Discrete - Event System Simulation"; 2nd Edition, PHI.

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MTCS1052 - OBJECT ORIENTED SOFTWARE DESIGN

Lecture	:	4 Periods / Week	Internal Marks	:	40
Tutorial	:	1 Period / Week	External Marks	:	60
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

INTRODUCTION TO CLASSICAL SOFTWARE ENGINEERING :

Introduction to OO Paradigm. Different phases in structured paradigm and OO Paradigm. Software Process and different life cycle models and corresponding strengths and weaknesses.

UNIT – II

PLANNING AND ESTIMATION :

Estimation of Duration and Cost – COCOMO components of software. Project Management plan – one case Study.

UNIT - III

MODULES TO OBJECTS:

Cohesion and Coupling, Data Encapsulation and Information hiding aspects of Objects. Inheritance, polymorphism and Dynamic Binding aspects. Cohesion and coupling of objects. Reusability, Portability and Interoperability aspects.

UNIT - IV

REQUIEMENT PHASE:

Rapid Prototyping method, Specification phase - Specification Document- Formal methods of developing specification document

ANALYSIS PHASE:

Use case Modeling - Class Modeling - Dynamic Modeling, Testing during OO Analysis.

UNIT – V

DESIGN PHASE:

Data oriented design – Object Oriented design – Formal techniques for detailed design. One case study. Challenges in design phase.

TEXT BOOKS:

1. Object oriented and Classical Software Engineering, 7/e, Stephen R. Schach, TMH
2. Object oriented and classical software Engineering, Timothy Lethbridge, Robert Laganiere, TMH.

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MTCS1053 - HIGH PERFORMANCE COMPUTING

Lecture	:	4 Periods / Week	Internal Marks	:	40
Tutorial	:	1 Period / Week	External Marks	:	60
Credits	:	3	External Examination	:	3 hrs.

UNIT - I

Introduction: Need of high speed computing – increase the speed of computers – history of parallel computers and recent parallel computers; solving problems in parallel – temporal parallelism – data parallelism – comparison of temporal and data parallel processing – data parallel processing with specialized processors – inter-task dependency.

The need for parallel computers - models of computation - analyzing algorithms -expressing algorithms.

UNIT - II

Parallel Programming Platforms: Trends in microprocessor architectures - limitations of memory system performance – parallel computing platforms – communication costs in parallel machines – routing mechanisms for interconnection networks.

Principles of Parallel Algorithm Design: Preliminaries – decomposition techniques – characteristics of tasks and interactions – mapping techniques for load balancing – methods for containing interaction overheads – parallel algorithm models.

Basic Communication Operations: One-to-all broadcast and all-to-one reduction – all-to-all broadcast reduction – all-reduce and prefix-sum operations – scatter and gather – all-to-all personalized communication – circular shift – improving the speed of some communication operations.

UNIT - III

Analytical Modeling of Parallel Programs: Sources of overhead in parallel programs – performance metrics for parallel systems – scalability of parallel systems – minimum execution time and minimum cost-optimal execution time.

Programming using the Message-Passing Paradigm: principles of message-passing programming – the building blocks – MPI – topologies and embedding – overlapping communication with computation – collective communication and computation operations – groups and communicators.

Programming Shared Address Space Platforms: Thread basics – synchronization primitives in Pthreads – controlling thread and synchronization attributes – composite synchronization constructs – tips for designing asynchronous programs – Open MP.

UNIT - IV

Dense Matrix Algorithms: Matrix-vector multiplication – matrix-matrix multiplication – solving a system of linear equations – FFT.

Sorting: Issues in sorting on parallel computers – sorting networks – bubble sort and its variants – Quicksort – bucket and sample sort – other sorting algorithms.

Graph Algorithms: Definitions and representation – minimum spanning tree – single-source shortest paths – all-pairs shortest paths.

UNIT - V

Search Algorithms for Discrete for Discrete Optimization Problems: Definitions and examples, sequential search algorithms, search overhead factor, parallel depth-first search, parallel best-first search, speedup anomalies in parallel search algorithms.

Dynamic Programming: Overview.

TEXT BOOKS:

1. Ananth Grama, Anshul gupta, George Karypis and Vipin Kumar, "Introduction to Parallel Computing", Pearson Education, Second edition, 2004. (UNITs II to V)
2. V. Rajaraman and C. Siva Ram Murthy, "Parallel Computers – Architecture and Programming", Prentice-Hall of India, 2003. (UNIT I)

REFERENCES:

1. Selim G. Akl, "The Design and Analysis of Parallel Algorithms", Prentice-Hall of India, 1999. (UNITs I, IV & V - as Reference)
2. M.J. Quinn, "Parallel Computing – Theory and Practice", McGraw-Hill, 1994.
3. Michael Jay Quinn, "Parallel Programming in C with MPI and OpenMP", McGraw-Hill, 2003.

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MTCS1054 - SOFTWARE PROJECT MANAGEMENT

Lecture	:	4 Periods / Week	Internal Marks	:	40
Tutorial	:	1 Period / Week	External Marks	:	60
Credits	:	3	External Examination	:	3 hrs.

UNIT - I

Conventional Software Management: The waterfall model, conventional software Management performance. **Evolution of Software Economics:** Software Economics, pragmatic software cost estimation. **Improving Software Economics:** Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections. **The old way and the new:** The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

UNIT - II

Life cycle phases: Engineering and production stages, inception, Elaboration, construction, transition phases. **Artifacts of the process:** The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts. **Model based software architectures:** A Management perspective and technical perspective.

UNIT - III

Work Flows of the process: Software process workflows, Iteration workflows.

Checkpoints of the process: Major mile stones, Minor Milestones, Periodic status assessments.

Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning. Use of Software (Microsoft Project) to Assist in Project Planning Activities

UNIT - IV

Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations. **Process Automation:** AutomationBuilding blocks, The Project Environment. **Project Control and Process instrumentation:** The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.

UNIT - V

Tailoring the Process: Process discriminants.**Future Software Project Management:** Modern Project Profiles, Next generation Software economics, modern process transitions. **Case Study:** The command Center Processing and Display system- Replacement (CCPDS)

TEXT BOOK:

1. Software Project Management, Walker Royce: Pearson Education, 2009.

REFERENCES:

1. Software Project Management, Bob Hughes and Mike Cotterell: Tata McGraw-Hill Edition.
2. Software Project Management, Joel Henry, Pearson Education.
3. Software Project Management in practice, PankajJalote, Pearson Education.2008.
4. Microsoft Office Project 2003 Bible, Elaine Marmel, Wiley Publishing Inc

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MTCS1061 - PARALLEL ALGORITHMS

Lecture	:	4 Periods / Week	Internal Marks	:	40
Tutorial	:	1 Period / Week	External Marks	:	60
Credits	:	3	External Examination	:	3 hrs.

UNIT - I

Introduction: Parallel Processing, Background, Parallel Models, Performance of parallel Algorithms, The Work-Time Presentation Framework, The Optimality Notion.

UNIT - II

Basic Techniques: Balanced Trees, Pointer Jumping, Divide and Conquer, Partitioning, Pipelining, Accelerated Cascading, Symmetry Breaking. **Lists and Trees:** List Ranking, Euler-Tour Techniques, Tree Contraction, Lowest Common ancestors.

UNIT - III

Searching, Merging, and Sorting: Searching, Merging, Sorting, Sorting Networks, Selection.

UNIT - IV

Graphs: Connected Components, Minimum Spanning Trees, Biconnected Components, Ear Decomposition, Directed Graphs.

UNIT - V

Realistic Models of Parallel Computation: Bulk Synchronous Parallel (BSP), LogP, Shared-Memory (SMP), **Clusters of SMPs,** Communication Primitives, Sorting, 2D FFT.

TEXT BOOK:

1. Joseph, "Introduction to Parallel Algorithms", Pearson Edition Wesley.

REFERENCES:

1. David Culler and J. P. Singh with Anoop Gupta, "*Parallel Computer Architecture: A* Hardware/Software Approach"; Morgan Kaufmann Publishers.

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MTCS1062 - EMBEDDED SYSTEMS

Lecture	:	4 Periods / Week	Internal Marks	:	40
Tutorial	:	1 Period / Week	External Marks	:	60
Credits	:	3	External Examination	:	3 hrs.

UNIT - I

Introduction to Embedded System: Components of Embedded System – Classification - Characteristic of embedded system- Microprocessors & Micro controllers- Introduction to embedded processors - Embedded software architectures: Simple control loop - Interrupt controlled system - Cooperative multitasking - Preemptive multitasking or multi-threading - Micro kernels and exokernels - Monolithic kernels - Exotic custom operating systems.

UNIT - II

Embedded Hardware Architecture – 32 Bit Microcontrollers: ARM 2 TDMI core based 32 Bit microcontrollers and family of processors, Register, Memory and Data transfer, Arithmetic and Logic instructions, Assembly Language, I/O operations interrupt structure, ARM cache. ARM Bus, Embedded systems with ARM. **Networks for Embedded systems:** Serial bus protocols: The CAN bus, and the USB bus, Parallel bus protocols: The PCI Bus and GPIB bus.

UNIT - III

Software Development: Embedded Programming in C and C++ - Source Code Engineering Tools for Embedded C/C++ - Program Modeling Concepts in Single and Multiprocessor Systems - Software Development Process - Software Engineering Practices in the Embedded Software Development – Hardware / Software Co-design in an Embedded System.

UNIT - IV

Real Time Operating Systems: Tasking Models, Task States, Services and Transitions - Real-Time Scheduling Algorithms: Round-Robin, FIFO, Priority-Based Preemptive Scheduling - Rate-Monotonic Scheduling - Priority Inversion and Priority Ceiling - Deadlocks - Process Synchronization – IPC - Shared Memory, Memory Locking, Memory Allocation - Signals – Semaphore Flag or mutex as Resource key – Message Queues – Mailboxes – Pipes – Virtual Sockets.

UNIT - V

Study of Micro C/OS-II or Vx Works: RTOS System Level Functions – Task Service Functions – Time Delay Functions – Memory Allocation Related Functions – Semaphore Related Functions – Mailbox Related Functions – Queue Related Functions – Case Studies of Programming with RTOS.

TEXT BOOKS:

1. Rajkamal, "Embedded System: Architecture, Programming and Design" Tata McGraw-Hill, 2003. (UNITs I, III, IV & V).

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MTCS1063 - ARTIFICIAL INTELLIGENCE

Lecture	:	4 Periods / Week	Internal Marks	:	40
Tutorial	:	1 Period / Week	External Marks	:	60
Credits	:	3	External Examination	:	3 hrs.

UNIT - I

Introduction: History of AI - Intelligent agents – Structure of agents and its functions – Problem spaces and search - Heuristic Search techniques – Best-first search - Problem reduction - Constraint satisfaction - Means Ends Analysis.

UNIT - II

Knowledge Representation: Approaches and issues in knowledge representation- Knowledge - Based Agent- Propositional Logic – Predicate logic – Unification – Resolution - Weak slot – filler structure – Strong slot - filler structure.

UNIT - III

Reasoning under uncertainty: Logics of non-monotonic reasoning - Implementation- Basic probability notation - Bayes rule – Certainty factors and rule based systems-Bayesian networks – Dempster - Shafer Theory - Fuzzy Logic.

UNIT - IV

Planning and Learning: Planning with state space search - conditional planning-continuous planning - Multi-Agent planning. Forms of learning - inductive learning - Reinforcement Learning - learning decision trees - Neural Net learning and Genetic learning.

UNIT - V

Advanced Topics: Game Playing: Minimax search procedure - Adding alpha-beta cutoffs. **Expert System:** Representation - Expert System shells - Knowledge Acquisition. **Robotics:** Hardware - Robotic Perception – Planning - Application domains. **Swarm Intelligent Systems** – Ant Colony System, Development, Application and Working of Ant Colony System.

TEXT BOOKS:

1. Elaine Rich, Kevin Knight and Shivashankar B.Nair, "Artificial Intelligence", Tata McGraw-Hill, Third edition, 2009. (UNITs I, II, III & V).
2. Stuart J. Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education Asia, Second edition, 2003. (UNIT IV)
3. N. P. Padhy, "Artificial Intelligence and Intelligent System", Oxford University Press, Second edition, 2005. (UNIT V).

REFERENCES:

1. Rajendra Akerkar, "Introduction to Artificial Intelligence", Prentice-Hall of India, 2005.
2. Patrick Henry Winston, "Artificial Intelligence", Pearson Education Inc., Third edition,2001.
3. Eugene Charniak and Drew Mc Dermott, "Introduction to Artificial Intelligence", Addison-Wesley, ISE Reprint, 1998.
4. Nils J.Nilsson, "Artificial Intelligence - A New Synthesis", Harcourt Asia Pvt. Ltd.,Morgan Kaufmann, 1988.

MTCS1064 - COMPUTER GRAPHICS

Lecture	:	4 Periods / Week	Internal Marks	:	40
Tutorial	:	1 Period / Week	External Marks	:	60
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

Introduction: Usage of Graphics and their applications, Presentation Graphics-Computer Aided Design- Computer Art- Entertainment- Education and Training-Visualization- Image Processing- Graphical User Interfaces. **Over view of Graphics systems**: Video Display Devices- Raster Scan systems-random scan systems-Graphics monitors and workstations-Input devices-hard copy devices-Graphics software. **Output primitives**: Points and Lines-Line Drawing Algorithms- Loading the Frame buffer- Line function- Circle- Generating Algorithms- Ellipse Generating Algorithms-Other Curves- Parallel Curve Algorithms-Curve Functions-Pixel Addressing- Filled Area Primitives-Filled Area Functions- Cell Array-Character Generation. **Attributes of Output Primitives**: Line and Curve Attributes-Color and Gray scale levels- Area Fill Attributes- Character Attributes-Bundled Attributes- Inquiry Functions-Antialiasing.

UNIT – II

Two Dimensional Geometric Transformations: Basic Transformations- Matrix Representations-Homogeneous Coordinates-Composite Transformations-Other Transformations-Transformations between Coordinate Systems- Affine Transformations-Transformation Functions- Raster methods for Transformations.

UNIT – III

Two Dimensional Viewing: The viewing Pipeline-Viewing Coordinate Reference Frame-Window-to-Viewport Coordinate Transformation-Two Dimensional Viewing Functions-Clipping Operations-Point Clipping-Line Clipping-Polygon Clipping-Curve Clipping- Text and Exterior Clipping. **Structure and Hierarchical Modeling:** Concepts of Structures and Basic models-Editing - Hierarchical Modeling with Structures-GUI and Interactive Input Methods-Windows and Icons- Virtual Reality Environments.

UNIT – IV

Three Dimensional Concepts and Object representations: 3D display methods-3DGraphics-Polygon Surfaces- Curved Lines and Surfaces- Quadratic Surfaces-Super Quadrics-Blobby Objects-Spline Representations- Cubic Spline methods-Bézier Curves and Surfaces- B Spline Curves and Surfaces.

UNIT – V

Three Dimensional Geometric and Modeling Transformations: Translation - Rotation – scaling - Other Transformations - Composite Transformations - 3D Transformation Functions - Modeling and Coordinate Transformations. **Three Dimensional Viewing:** Viewing Pipeline - Viewing Coordinates- Projections-View Volumes- General Projection Transformations-Clipping-Hardware Implementations- Three Dimensional Viewing.

TEXT BOOK:

1. Donald Hearn & M. Pauline Baker, "Computer Graphics C Version", Pearson Education, New Delhi, 2004 (Chapters 1 to 12 except 10-9 to 10-22 of the TEXT BOOK)

REFERENCES:

1. David F. Rogers; "Procedural Elements for Computer Graphics"; TMH
2. J. D. Foley, S. K Feiner, A Van Dam F. H John; "Computer Graphics: Principles & Practice in C"; Pearson
3. Franscis S Hill Jr; "Computer Graphics using Open GL"; Pearson Education, 2004.

MTCS151 - ADVANCED DATA STRUCTURES LAB

Lab/Practical	: 3 Periods/week	Internal Marks	: 25
Tutorial	: 0	External Marks	: 50
Credits	: 2	External Examinations	: 3 Hrs

LIST OF EXPERIMENTS:

1. Write an interactive C program to create a linear linked list of customer names and their telephone numbers. The program should be menu-driven and include features for adding a new customer, deleting an existing customer and for displaying the list of all customers.
2. Write a C program to merge two circular linked lists.
3. Write a C program to create a circular linked list so that the input order of data items is maintained. Add the following functions to carry out the following operations on circular linked lists. a. Count the number of nodes. Write a C program to implement Polynomial ADT.
4. Write a C program that will remove a specified node from a given doubly linked list and insert it at the end of the list. Also write a function to display the contents of the list.
5. Write a C program to implement a queue in which insertions, deletions and display can be performed.
6. Write a program for evaluating post fixed expressions using array and linked list implementation of list ADT
7. Write a C program to construct a binary tree and do inorder, preorder and postorder traversals, printing the sequence of vertices visited in each case.
8. Sort a sequence of n integers using Quick sort technique and then search for a key in the sorted array using Binary search technique.
9. Write a C Program for Checking balanced parenthesis using array implementation of stack ADT
10. Write a program for Checking balanced paranthesis using linked list implementation of Stack ADT
11. Write a C program to Search tree ADT-Binary search ADT
12. Write a C program to Heap sort
13. Write a C program to Quick sort
14. Write a C Program to implement Merge Sort
15. Write a C Program to implement Shell Sort
16. Write a C Program to implement Multiway Merge Sort
17. Write a C Program to implement hashing methods.

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II SEMESTER

MTCS201 - BIG DATA

Lecture	:	4 Periods / Week	Internal Marks	:	40
Tutorial	:	1 Period / Week	External Marks	:	60
Credits	:	3	External Examination	:	3 hrs.

UNIT - I

INTRODUCTION: OVERVIEW OF Big Data Characteristics, Cloud Vs Big Data, issues and challenges of Big Data, stages of analytical evolution, State of the Practice in Analytics, the Data Scientist, Big data Technological approaches and Potential use cases for Big Data. **Big Data Analytics**- Big data Analytics in Industry Verticals, Data Analytics Lifecycle, Discovery, Data preparation, Model Planning and building, communicating Results, Operational zing Unstructured Data Analytics – Test Analytics Essentials; Big Data Visualization Techniques; Advanced system Approaches for Analytics – In Database Analytics, In-memory Databases.

UNIT – II

Technologies and Tools for Big Data Analytics: Basic Data Analytics Methods using R, and spreadsheet- like analytics, Stream Computing, Machine learning with Mahout.

UNIT – III

The Hadoop Ecosystem-, advantages of Hadoop, Query languages for Hadoop, Hadoop Distributed file System, HDFS, Overview of HBase , Hive and PIG, MapReduce Framework and MapReduce Programming.

UNIT – IV

NoSQL Data bases- Review of traditional Databases,Columnar Databases , Failover and reliability principles, Working mechanisms of NoSQL Databases- HBase, Cassandra, Couch DB, Mango DB.

UNIT – V

Challenges for Big Data : Data models for managing big data, Real – time streaming data analytics, Scalable analytics on larger data sets, Systems architecture for big data management , Main memory data management techniques, energy- efficient data processing , Benchmarking big data systems, Security and Privacy of Big Data , Failover and reliability for big data systems, importance of Cloud in Big Data Analytics.

TEXT BOOKS:

1. Big Data Now: 2012 Edition by O'Reilly Media
2. Big Data: A Revolution That Will Transform How We Live, Work, and Think (Hardcover) by Viktor Mayer-Schönberger
3. Hadoop: The Definitive Guide (Paperback) by Tom White

REFERENCES:

1. Map Reduce Design Patterns: Building Effective Algorithms and Analytics for Hadoop and Other Systems (Paperback) by Donald Miner.
2. Big Data Analytics: Turning Big Data into Big Money (English) By Frank J. Ohlhorst.

MTCS202 - COMPUTER VISION

Lecture	:	4 Periods / Week	Internal Marks	:	40
Tutorial	:	1 Period / Week	External Marks	:	60
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

Introduction: Digital Image Processing, Fundamental steps in Digital Image Processing, Components of an Image Processing System. **Digital Image Fundamentals:** Visual Perception, Image sensing & Acquisition, Image Sampling & Quantization, Some Basic Relationships between Pixels.

UNIT – II

Image Enhancement in the Spatial Domain: Some basic Gray level Transformations, Histogram Processing, Enhancement using Arithmetic/Logic Operations, Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Combining Spatial Enhancement methods.

UNIT – III

Image Enhancement in the Frequency Domain: Fourier Transform and the Frequency Domain, Smoothing Frequency-Domain Filters, Sharpening Frequency Domain Filters, Homomorphism Filtering, Implementation.

UNIT – IV

Image Restoration: Image Degradation/Restoration Process, Linear, Position-Invariant Degradations, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Constrained Least Squares Filtering. **Wavelets and MultiResolution Processing** : MultiResolution Expansions, Wavelet Transforms in One dimension, The Fast Wavelet Transform, Wavelet Transforms in Two Dimensions.

UNIT – V

Image Compression: Image Compression Models, Error-Free Compression, Lossy Compression, Image Compression Standards. **Image Segmentation:** Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region-Based Segmentation.

TEXT BOOK:

Rafael C.Gonzalez, Richard E. Woods; "Digital Image Processing ' Addison Wesley Pubs(Second Edition).

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MTCS203 - SOFT COMPUTING

Lecture	:	4 Periods / Week	Internal Marks	:	40
Tutorial	:	1 Period / Week	External Marks	:	60
Credits	:	3	External Examination	:	3 hrs.

UNIT - I

Introduction:

Uncertainty and Evidence, Shafer Dumpster belief and possibility Theory, Random sets and mass assignments, Dumpsters Rule, Fuzzy Measures and aggregation operators, Bayesian Networks. Graphical methods.

UNIT – II

Automated Learning-1 and 2:

Automated Learning-1: Supervise vs. unsupervised learning, Decision Tree induction, rule induction algorithms.

Automated Learning-2: Bayesian network learning algorithms, Evolutionary algorithms.

UNIT – III

Neural Networks and Fuzzy Methods:

Neural Networks: Adaptive Networks, Supervised Learning NN, Reinforcement Learning, Unsupervised Learning.Fuzzy set theory, fuzzy control (including model based control), and Fuzzy Decision trees.

UNIT – IV

Hybrid systems:

Neuro Fuzzy Systems, Back propagation Network supported by Fuzzy, GA based weight determination applications.

UNIT – V

Genetic Algorithms and Applications:

Encoding, Fitness functions, reproduction, Fuzzy Genetic Algorithms.

Applications: Practical Examples from areas such as Medical, Management, and control, GA in fuzzy logic controller design.

TEXT BOOKS:

1. Neuro Fuzzy and Soft Computing, A Computational approach to learning and Machine, Jyh-Shing Roger Jang, Cuen Tsai Sun, Eiji Mizurani, PEA.
2. Machine Learning, Tom Mitchell, MGH, 1997.

REFERENCES:

1. Soft Computing Techniques and Applications, Robert John, R. Birkenhead, Ralph Birkenhead.
2. Neural Networks, Fuzzy logic and genetic algorithms, S Rakasekharan, GA Vijayalakshmi, PHI.
3. Principles of Soft Computing, Sivanandam, Deepa, Wiley India, 2008.
4. Soft Computing and Intelligent Systems Design, Karry, De Silva, PEA, 2004.

MTCS204 - ADVANCED OPEARTING SYSTEMS

Lecture	: 4 Periods/week	Internal Marks	: 40
Tutorial	: 1	External Marks	: 60
Credits	: 3	External Examinations	: 3 Hrs

UNIT – I : Processes:

THREADS: Introduction to Threads, Threads in Distributed Systems; CLIENTS: User Interfaces, Client-Side Software for Distribution Transparency SERVERS: General Design Issues, Object Servers; CODE MIGRATION: Approaches to Code Migration, Migration and Local Resources, Migration in Heterogeneous Systems, Example: D'Agents**SOFTWARE AGENTS:** Software Agents in Distributed Systems, Agent Technology.

UNIT – II : Naming Systems:

NAMING ENTITIES: Names, Identifiers, and Addresses, Name Resolution, The Implementation of a Name Space, Example: DNS, X.500

LOCATING MOBILE ENTITIES: Naming versus Locating Entities, Simple Solutions, Home-Based Approaches, Hierarchical Approaches

REMOVING UNREFERENCED ENTITIES: The Problem of Unreferenced Objects, Reference Counting, Reference Listing, Identifying Unreachable Entities.

UNIT – III : Synchronization

Clock synchronization, logical clocks, global state, election algorithms, mutual exclusion, distributed transactions

UNIT – IV : Consistency and Replication

Introduction, Data-Centric Consistency Models, Client-Centric Consistency Models, Distribution Protocols, Consistency Protocols, Examples: Orca and Causally-Consistent Lazy Replication

UNIT – V : Fault Tolerance

Introduction to Fault Tolerance, Process Resilience, Reliable Client-Server Communication, Reliable Group Communication, Distributed Commit, Recovery

TEXT BOOKS:

1. Distributed Systems , Principles and Paradigms, 2/e, Tanenbaum, Maarten Van Steen, PHI.
2. Advanced concepts in Operating Systems, Mukesh Singhal, Niranjan G. Shivaratri, TMH, 2005.

REFERNCES

1. Distributed Operating Systems and Algorithm Analysis, Chow, Johnson, PEA
2. Distributed Systems Concepts and Design, 4/e, George Coulouris, Dollimore, Kindberg, PEA.
3. Distributed Operating Systems, Pradeep K. Sinha, PHI,2009.
4. Operating Systems, Internals & Design Principles, 6/e, William Stallings, PEA.
5. Distributed Systems Computing over Networks, Joel M.Crichlow, PHI.

MTCS2051 - SOFTWARE TESTING AND QUALITY ASSURANCE

Lecture	: 4 Periods/week	Internal Marks	: 40
Tutorial	: 1	External Marks	: 60
Credits	: 3	External Examinations	: 3 Hrs

UNIT - I

Software Testing Principles: Need for testing - SDLC and Testing -Psychology of testing - Testing economics – Verification and Validation - Testing levels - Unit, Integration and System Testing. Types of Testing: White box, Black box, Grey box testing – Weyuker's adequacy axioms.

UNIT - II

Testing Strategies: White box testing techniques - Statement coverage – Branch Coverage - Condition coverage - Decision/Condition coverage – Multiple condition coverage - Dataflow coverage - Mutation tests - Automated code coverage analysis - Black box testing techniques - Boundary value analysis – Robustness testing - Equivalence partitioning - Syntax testing - Finite state testing.

UNIT - III

Testing Object Oriented Software: Challenge s - Differences from testing non-OO Software - Class testing strategies - Class Modality - State-based Testing - Message Sequence Specification.

UNIT - IV

Software Quality and Testing: Introduction to software quality and quality control – Benefits of quality control - Quality assurance - quality circles and quality improvement team – Introduction to quality cost – Measuring quality cost – Total Quality Management (TQM).

UNIT - V

Testing Tools and Standards: Automated Tools for Testing - Static code analyzers - Test case generators - GUI Capture/Playback – Stress Testing - Testing Client – server applications - Testing compilers and language processors - Testing web-enabled applications. CMM Model and its stages – Introduction to PCMM, CMMI and Six Sigma concept – ISO 9000.

TEXT BOOKS:

1. Software Testing and Quality Assurance: Theory and Practice by Sagar Naik , Piyu Tripathy
2. Software Testing and Quality Assurance by Ms. Jyothi Malhotra, Ms. Bhavana S. Tiple published by Nirali Prakhashan.
3. Software Quality Assurance: From Theory to Implementation Hardcover – September 21, 2003 by Daniel Galin.

REFERENCES:

1. Software testing and quality assurance: theory and practice By Kshirasagar naik, priyadarshi tripathy, WILEY INDIA PVT. LTD
2. Software Quality Assurance: Principles and Practice Nina S. Godbole

MTCS2052 - NETWORK SECURITY

Lecture	:	4 Periods / Week	Internal Marks	:	40
Tutorial	:	1 Period / Week	External Marks	:	60
Credits	:	3	External Examination	:	3 hrs.

UNIT - I

Introduction to Network Security:

Attacks, services, Security. A model of Inter network Security, Principles of Symmetric and public key cryptography, Steganography, One time PADS.

UNIT - II

Crypto Graphic Algorithms (Block Cipher):

RC2, GOST, CAST, BLOW FISH, SAFEER, RC5, NEWDES, CRAB, Theory of Block Cipher design.

UNIT - III

Key Management and digital Signature Algorithms :.

Key lengths, Generating Keys, Transferring, Verification, Updating, Storing, Backup, Compromised, Lifetime of, Destroying Keys, key Exchange Protocols, Secure multiparty Communication, Public key Management. Authentication, Formal Analysis of Authentication, Digital Signature, DSA, DSA variants,One – Schnorr – Shamir digital Signatures, Esign,

UNIT – IV

IP and Web security:

IP Security Architecture, Authentication Header, Encapsulating Security, Pay load Key Management Issues. Web Security Web Security requirements, Secure Sockets Layer and Transport Layer Security, Secure Electronic Transaction

UNIT – V

Mail Security:

PGP, SNMP,SMIME, Intruders, Viruses and Related Threats, Firewall Design Principles, Trusted Systems.

TEXT BOOKS:

1. Applied Cryptography, 7/e, Bruce SCHNEIER John Wiley & Sons Inc.
2. Cryptography and Network Security, William Stallings, PHI.

REFERENCES:

1. Introduction to cryptography with coding Theory, 7/e, Wade Trappe, C. Washington, PEA.
2. Cryptography and Information Security, V.K. Pachghare, PHI.
3. Cryptography and Network Security, Forouzan, TMH, 2007.
4. Cryptography and Network Security, 2/e, Kahate , TMH.
5. Modern Cryptography, Wenbo Mao, PEA

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MTCS2053 - DISTRIBUTED COMPUTING

Lecture	:	4 Periods / Week	Internal Marks	:	40
Tutorial	:	1 Period / Week	External Marks	:	60
Credits	:	3	External Examination	:	3 hrs.

UNIT - I

Introduction to distributed programming:
Anatomy of a Distributed Application, Requirements for Developing Distributed Applications, What Does Java Provide?
Introduction to sockets programming: Sockets and Streams, URLs, URL Connections, and Content Handlers, The Class Loader

UNIT - II

Distributing Objects:
Why Distribute Objects?, What's So Tough About Distributing Objects?, Features of Distributed Object Systems, Distributed Object Schemes for Java, CORBA, Java RMI, RMI vs. CORBA
Threads: Thread and Runnable, Making a Thread, Managing Threads at Runtime, Networked Threads

UNIT - III

Message-Passing Systems:
Messages Defined, Why Do We Need Messages?, Message Processing, Fixed Protocols, Adaptable Protocols, Message Passing with Java Events, Using Remote Objects
Databases: An Overview of JDBC, Remote Database Applications, Multi-Database Applications

UNIT - IV

RMI: The Basic Structure of RMI, The Architecture Diagram Revisited, Implementing the Basic Objects, The Rest of the Server, The Client Application
The RMI Registry: Why Use a Naming Service? The RMI Registry, The RMI Registry Is an RMI Server, Examining the Registry, Limitations of the RMI Registry, Security Issues
Naming Services: Basic Design, Terminology, and Requirements, Requirements for Our Naming Service, Federation and Threading, The Context Interface, The Value Objects, ContextImpl, Switching Between Naming Services, The Java Naming and Directory Interface (JNDI).
The RMI Runtime: Reviewing the Mechanics of a Remote Method Call, Distributed Garbage Collection, RMI's Logging Facilities, Other JVM Parameters

UNIT – V

Service Oriented Architecture:Introduction, Defining a Service, Defining SOA, Identifying Service Candidates, Identifying Different Kinds of Services, Modeling Services, Making a Service Composable, Supporting Your SOA Efforts, Selecting a Pilot Project, Establishing Governance.

TEXT BOOKS:

Java Distributed Computing, Jim Farley, O'Reilly.

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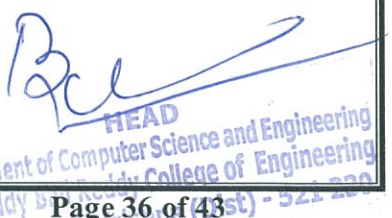
REFERENCES:

1. Java RMI Designing and Building,The Basics of RMI Applications, William Grosso, O'Reilly.
2. Java SOA Cookbook SOA Implementation Recipes, Tips, Techniques, Eben Hewitt, O'Reilly, 2009.
3. Service Oriented Architecture With Java, Malhar Barai, Vincenzo Caselli, Binildas A. Christudas, Packt Publishing, 2008.
4. Distributed Programming with Java, Qusay H. Mahmoud, Manning Publisher 2000.
5. Java in Distributed Systems, Concurrency, Distribution and Persistence, Marko Boger, 2001.
6. Developing Distributed and E-commerce Applications, Darrel Ince, 2/e, Wesly, 2004.
7. Java Message Service (O'Reilly Java Series), Richard Monson-Haefel, David Chappell.
8. Sun SL 301 Distributed Programming with Java.
9. Java Tutorial, http://java.sun.com/docs/books/tutorial/index.html



MTCS2054 - ADVANCED COMPUTER ARCHITECTURE

Lecture	:	4 Periods / Week	Internal Marks	:	40
Tutorial	:	1 Period / Week	External Marks	:	60
Credits	:	3	External Examination	:	3 hrs.

UNIT - I

Parallel Computer Models, Program and Network Properties:

Parallel Computer Models: Multiprocessors and Multicomputers, Multivector and SIMD Computers, Program and Network Properties: Conditions of Parallelism, Program Partitioning and Scheduling, Program Flow Mechanisms, System Interconnect Architectures

UNIT - II

Principles of Scalable Performance:

Performance Metrics and Measures, Parallel Processing Applications, Speedup Performance Laws, Scalability Analysis and Approaches

UNIT – III

Processors and Memory Hierarchy:

Advanced Processor Technology, Superscalar and Vector Processors, Memory Hierarchy Technology, Virtual Memory Technology

UNIT – IV

Bus, Cache, and Shared Memory:

Backplane Bus Systems, Cache Memory Organizations, Shared-Memory Organizations, Sequential and Weak Consistency Models

UNIT - V

Pipelining and Superscalar Techniques:

Linear Pipeline Processors, Nonlinear Pipeline Processors, Instruction Pipeline Design, Arithmetic Pipeline Design, Superscalar and Super pipeline Design

Multiprocessors and Multicomputers:

Multiprocessor System Interconnects, Cache Coherence and Synchronization Mechanisms, Three Generations of Multicomputers, Message-Passing Mechanisms

TEXT BOOKS:

1. Kai Hwang, Advanced computer Architecture: Parallelism, Scalability, Programmability, TMH, 2000.
2. Computer Architecture – A quantitative approach, 4/e, John L. Hennessey , David A. Patterson, Morgan Kaufmann / Elsevier, 2007.

REFERENCES:

1. Parallel Computing Architecture: A hardware/ software approach , David E. Culler, Jaswinder Pal Singh, Morgan Kaufmann / Elsevier, 1997.
2. Computer Organization and Architecture – Designing for Performance, 7/e, William Stallings, PEa, 2006.
3. Computer Organization and Design, 4/e, Patterson , Elsevier, 2008.
4. Computer Architecture & Parallel Processing, Kai Hwang, Faye A. Briggs, TMH

MTCS2061 - CLOUD COMPUTING

Lecture	:	4 Periods / Week	Internal Marks	:	40
Tutorial	:	1 Period / Week	External Marks	:	60
Credits	:	3	External Examination	:	3 hrs.

UNIT - I

Foundations: Introduction to Cloud Computing, Migrating into a Cloud Enriching the 'Integration as a Service' Paradigm for the Cloud Era, Cloud Computing for Enterprise Applications

UNIT – II

Infrastructure as a Service (IaaS): Virtual Machines Provisioning and Migration Services, On the Management of Virtual Machines for Cloud Infrastructures, Enhancing Cloud Computing Environments using a Cluster as a Service.

UNIT - III

Platform and Software as a Service (PaaS/IaaS): Aneka – Integration of Private and Public Clouds, CometCloud: An Autonomic Cloud Engine, T-Systems' Cloud-Based Solutions for Business Applications,

UNIT – IV

Software as a Service(SaaS):

Workflow Engine for Clouds, Understanding Scientific Applications for Cloud Environments, The MapReduce Programming Model and Implementations

UNIT - V

Monitoring and Management: An Architecture for Federated Cloud Computing, SLA Management in Cloud Computing: A Service Provider's Perspective, Building Content Delivery Networks Using Clouds

TEXT BOOK:

"Cloud Computing: Principles and Paradigms", Rajkumar Buyya, James Broberg, Andrzej Goscinski, Wiley, New York, USA

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MTCS2062 - INTERNET OF TECHNOLOGIES

Lecture	:	4 Periods / Week	Internal Marks	:	40
Tutorial	:	1 Period / Week	External Marks	:	60
Credits	:	3	External Examination	:	3 hrs.

UNIT - I

Introduction and overview: Introduction and overview of wireless sensor networks, Applications of wireless sensor networks, Basic Wireless Sensor Technology, Wireless Transmission Technology and Systems.

UNIT - II

Operating System for Sensor Networks: Operating System Design Issues, Examples of Operating Systems: Tiny OS, Mate, Magnet OS, MANTIS, OPSM, EYES OS, SenOS, EMERALDS, PicOS. **Medium Access Control:** Introduction, background, Fundamentals of MAC Protocols, MAC Protocol for WSN, Sensor MAC Case Study, IEEE 802.15.4 LR-WPAN standard case study.

UNIT - III

Routing Protocols for WSN: Introduction, Background, Data dissemination and gathering, Routing Challenges and Design Issues, Routing Strategies in WSN. **Performance and Traffic Management:** Introduction, background, WSN Design Issues, Performance modeling of WSN, Case Study: Simple Comparison of system lifespan.

UNIT - IV

Transport Control protocols for WSN: Traditional transport control protocols, Transport Protocol Design Issues, Examples of Existing transport control protocols, Performance of Transport control protocols

UNIT - V

Middleware for WSN: Introduction, WSN Middleware principles, Existing middleware. **Network Management for WSN:** Network management design Requirements, Traditional network management models, Networks management design issues, MANNA

TEXT BOOK:

"Wireless Sensor networks, Technology protocols and Applications", Kazem Sohraby, Daniel Minoli, Taieb Znati, john Wiley & Sons, 2007.

REFERENCES:

1. *Protocols and Architectures for Wireless Sensor Networks*. H. Karl and A. Willig. John Wiley & Sons, June 2005.
2. *Wireless Sensor Networks*. C. S. Raghavendra, K. M. Sivalingam, and T. Znati, Editors. Springer Verlag, Sep. 2006.

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MTCS2063 - E-COMMERCE

Lecture	:	4 Periods / Week	Internal Marks	:	40
Tutorial	:	1 Period / Week	External Marks	:	60
Credits	:	3	External Examination	:	3 hrs.

UNIT- I

Overview of Electronic Commerce (EC),Electronic Commerce-Frame work, anatomy of E-Commerce applications, features and functions of e-commerce, e-commerce practices v/s traditional practices, scope and limitations of e-commerce

UNIT- II

Business Model for E- Commerce: B2B, B2C, C2C, C2B. Inter Organizational Commerce - EDI, EDI Implementation, Value added networks. Intra Organizational Commerce - work Flow, Automation, Customization and internal Commerce, Supply chain Management.

UNIT- III

Modes of Electronic Commerce: Electronic Data Interchange, Electronic Commerce with www/Internet, Commerce Net Advocacy, web Commerce Going Forward. Approaches to Safe Electronic Commerce: Secure Transport Protocols, Secure Transactions, Secure Electronic Payment Protocol (SEPP), Secure Electronic Transaction (SET), Certificates for authentication Security on web Servers and Enterprise Networks.

UNIT – IV

Electronic payment systems - Digital Token-Based, Smart Cards, Credit Cards, Risks in Electronic Payment systems. Security of e-commerce: Setting up Internet security, maintaining secure information, encryption, digital signature and other security measures.

UNIT- V

Internet Resources for Commerce: Introduction, Technologies for web Servers, Internet Tools Relevant to Commerce, Internet Applications for Commerce, Internet Charges, Internet Access and Architecture, Searching the Internet. Advertising on Internet: Issues and Technologies. Introduction, Advertising on the Web, Marketing creating web site, Electronic Publishing Issues, Approaches and Technologies: EP and web based EP.

TEXT BOOKS:

1. Web Commerce Technology Handbook, by Daniel Minoli, Emma Minoli, McGraw-Hill
2. Frontiers of electronic commerce – Kalakata, Whinston, Pearson.

REFERENCES:

1. Electronic Commerce -Framework, technologies and Applications - Bharat Bhasker TMH Publications
2. Joseph PT: e-Commerce –A Managerial Perspective (PHI) & Tata McGraw Hill.
3. Daniel Amor, E Business R(Evolution), Pearson Edude.
4. Krishnamurthy, E-Commerce Management, Vikas Publishing House.
5. David Whiteley, E-Commerce: Strategy, Technologies and Applications, Tata McGraw Hill

MTCS2064 - MOBILE COMPUTING

Lecture	:	4 Periods / Week	Internal Marks	:	40
Tutorial	:	1 Period / Week	External Marks	:	60
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

Introduction to Mobile Communications and Computing:

Mobile Computing (MC): Introduction to MC, novel applications, limitations, and architecture GSM: Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, and New data services.

(Wireless) Medium Access Control:

Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA.

UNIT - II

Mobile Network Layer:

Mobile IP (Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunneling and encapsulation, optimizations), Dynamic Host Configuration Protocol (DHCP).

Mobile Ad hoc Networks (MANETs):

Overview, Properties of a MANET, spectrum of MANET applications, routing and various routing algorithms, security in MANETs

UNIT - III

Mobile Transport Layer:

Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission /time-out freezing, Selective retransmission, Transaction oriented TCP.

UNIT - IV

Database Issues:

Hoarding techniques, caching invalidation mechanisms, client server computing with adaptation, power-aware and context-aware computing, transactional models, query processing, recovery, and quality of service issues.

Data Dissemination: Communications asymmetry, classification of new data delivery mechanisms, push-based mechanisms, pull-based mechanisms, hybrid mechanisms, selective tuning (indexing) techniques.

UNIT - V

Protocols and Tools:

Wireless Application Protocol-WAP. (Introduction, protocol architecture, and treatment of protocols of all layers), Bluetooth (User scenarios, physical layer, MAC layer, networking, security, link management) and J2ME.

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REFERENCES:

1. Mobile Communications, 2/e, Jochen Schiller, 2004, *Addison-Wesley*.
2. Handbook of Wireless Networks and Mobile Computing, Stojmenovic , Cacute, *Wiley*, 2002
3. Mobile Computing Principles, Designing and Developing Mobile Applications with UML and XML, Reza Behravanfar, Cambridge, University Press, 2004.
4. Fundamentals of Mobile and Pervasive Computing, Adelstein, Frank, Gupta, Sandeep KS. Richard Golden , Schwiebert, Loren, TMH , 2005.
5. Principles of Mobile Computing, 2/e, Hansmann, Merk, Nicklous, Stober, *Springer*, 2003.
6. Mobile and Wireless Design Essentials, Martyn Mallick, Wiley *DreamTech*, 2003
7. Mobile Computing, Rajkamal, Oxford, 2008
8. Adhoc Wireless Networks, 2/e, Sivaram murthy, manoj, PEA, 2009

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MTCS251 - HADOOP LAB

Lab/Practical	:	3 Periods / Week	Internal Marks	:	25
Tutorial	:	0 Period / Week	External Marks	:	50
Credits	:	2	External Examination	:	3 hrs.

EXPERIMENTS

Week: 1

1. Downloading and installing Hadoop
2. Understanding different Hadoop modes
3. Startup scripts
4. Configuration files

Week: 2

1. Setting up Hadoop on a single node cluster
   - Starting a Single node cluster
   - Stopping a Single node cluster
2. Setting up Hadoop on a large nodecluster
   - Starting up a larger cluster
   - Stopping the cluster

Week 3:

Standard word count example implemented in Java

Week 4:

First we write a program to fetch titles from one or more web pages in java Using Hadoop Streaming.

Week 5:

Practice Importing and Exporting Data from Various DBs.

Week 6:

Practice Big Data Analysis with Machine Learning

1) Supervised machine-learning algorithms
   - Linear regression
   - Logistic regression

Week 7:

Practice Big Data Analysis with Machine Learning

1) Unsupervised machine learning algorithm

Week 8:

Understanding Hive 197

1) Installing Hive
2) Setting up Hive configurations
3) Practice Hive with example

Week 9:

1) Installing HBase
2) Installing thrift
3) Practice HBase with example

Week 10:

Practice large-data-logistic-regression-with-example

Big Data Analytics with R and Hadoop--VigneshPrajapati--2013 Packt Publishing

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