DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
Vasavi College of Engineering (A), Hyderabad 500031
SCHEME OF INSTRUCTION AND EXAMINATION FOR
M.TECH. (CSE)
With effect from Academic year 2016-17
Choice Based Credit System

Sl. No.	Category	Subject code	Subject Title	Scheme of Instruction			Scheme of Examination			Total	Credits
				L	T	P	Duration in Hrs	CIE	Sem End		
I – SEMESTER											
THEORY											
1	PC	CS5110	Advanced Algorithms	3	1	-	3	30	70	100	3
2	PC	CS5120	Advanced Operating Systems	3	-	-	3	30	70	100	3
3	PC	CS5130	Artificial Intelligence	3	-	-	3	30	70	100	3
4	PC	CS5140	Object Oriented Software Engineering	3	-	-	3	30	70	100	3
5	PE	CS50XX	Professional Elective – 1	3	-	-	3	30	70	100	3
6	PE	CS50XX	Professional Elective – 2	3	-	-	3	30	70	100	3
7	EEC	HSXXXX	Finishing School: Soft Skills-1	2	-	-	1.5	15	35	50	1
LABORATORY											
8	PC	CS5111	Advanced Algorithms Lab	-	-	2	-	50	-	50	1
9	PC	CS5121	Object Oriented Software Engineering Lab	-	-	2	-	50	-	50	1
10	PC	CS5112	Seminar – I	-	-	2	-	25	-	25	1
			TOTAL	20	1	6	-	320	455	775	22
			GRAND TOTAL	27				320	455	775	22
II - SEMESTER											
THEORY											
1	PC	CS5210	Distributed Computing	3	1	-	3	30	70	100	3
2	PC	CS5220	Advanced Databases	3	-	-	3	30	70	100	3
3	PE	CS50XX	Professional Elective - 3	3	-	-	3	30	70	100	3
4	PE	CS50XX	Professional Elective - 4	3	-	-	3	30	70	100	3
5	PE	CS50XX	Professional Elective - 5	3	-	-	3	30	70	100	3
6	PE	CS50XX	Professional Elective - 6	3	-	-	3	30	70	100	3
7	EEC	HSXXXX	Finishing School: Soft Skills-2	2	-	-	1.5	15	35	50	1
LABORATORY											
8	PC	CS5211	Distributed Computing Lab	-	-	2	-	50	-	50	1
9	PC	CS5221	Advanced Databases Lab	-	-	2	-	50	-	50	1
10	PC	CS5212	Seminar -II	-	-	2	-	25	-	25	1
			TOTAL	20	1	6	-	320	455	775	22
			GRAND TOTAL	27				320	455	775	22
III - SEMESTER											
1	EEC	CS5312	Dissertation seminar	-	-	4	-	50	-	50	2
2	EEC	CS5315	Dissertation – Phase I	-	-	16	-	100	-	100	8
			TOTAL	-	-	20	-	150	-	150	10
IV - SEMESTER											
1	EEC	CS5415	Dissertation – Phase II	-	-	30	-	Viva-voce (Grade)			15
											69

Professional Elective – 1 and 2

CS 5001 Mobile Computing
CS 5002 Information Storage Management
CS 5003 Parallel Computer Architecture
CS 5004 Advanced Computer Graphics
CS 5005 Human Computer Interaction
CS 5006 Simulation Modelling
CS 5007 Embedded Systems
CS 5008 Reliability & Fault Tolerance

Professional Elective –3 and 4

CS 5009 Image Processing
CS 5010 Data Mining
CS 5011 Machine Learning
CS 5012 Parallel Algorithms
CS 5013 Neural Networks
CS 5014 Soft Computing
CS 5015 Natural Language Processing
CS 5016 Web Mining
CS 5017 Big data Analytics

Professional Elective – 5 and 6

CS 5018 Network Security
CS 5019 Cloud Computing
CS 5020 Information Retrieval Systems
CS 5021 Software Engineering For Real Time Systems
CS 5022 Software Quality & Testing
CS 5023 Software reuse techniques
CS 5024 Multimedia Technologies
CS 5025 Real Time Systems
CS 5026 Software Project Management

With effect from Academic year 2016-17

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

SYLLABUS FOR M.TECH. (CSE) – I SEMESTER

ADVANCED ALGORITHMS		
Instruction: 3 +1 Hours/ week	Semester End Exam Marks: 70	Subject Reference Code: **CS5110**
Credits: 3	Sessional Marks: 30	Duration of Semester End Exam: 3 hrs.

COURSE OBJECTIVES	**COURSE OUTCOMES**
Students should be able to	Students will be able to
• analyze the asymptotic performance of algorithms and apply various algorithm design strategies to solve engineering problems	• analyze time and space complexity of algorithms • describe the divide-and-conquer, Greedy, Dynamic programming, and explain when an algorithmic design situation calls for specific strategy • design and Analyze network flow, and number theoretic algorithms • design and analyze string, pattern matching, and geometric algorithms • differentiate between NP-complete, NP-Hard problems

UNIT-I

Algorithm Analysis: Asymptotic Notations, Amortization.

Basic Data Structure: Stacks and Queues, Vectors, Lists and Sequences, Trees, Priority Queues, Heaps, Dictionaries and Hash Tables.

Search Trees and Skip Lists: Ordered Dictionaries and Binary Search Trees, AVL trees, Bounded-Depth Search Trees.

UNIT-II

Fundamental Techniques: The Greedy Method, Divide and Conquer, Dynamic Programming.

Graphs: The Graph abstract data Type, Data Structures for Graphs, Graph Traversal, Directed Graphs.

UNIT-III

Weighted Graphs: Single Source Shortest Paths, All pairs Shortest Paths, Minimum Spanning Trees.

Network Flow and Matching: Flows and Cuts, Maximum Flow, Maximum Bipartite Matching, Minimum Cost Flow.

UNIT-IV

Text processing: Strings and Pattern Matching algorithms, Tries, Text Compression, Text Similarity testing.

Number Theory and Cryptography: Fundamental Algorithms Involving Numbers, Cryptographic Computations, Information Security Algorithms and Protocols.

UNIT-V

Computational Geometry: Range Trees, Priority Search Trees, Quad Trees and k-d Trees, Convex Hulls.

P, NP, NP-Complete, NP-Hard, cooks theorem, Reducibility.

Learning Resources :

1. M.T.Goodrich, R.Tomassia, "Algorithm design – Foundations, Analysis, and Internet Algorithms", John Wiley, 2002.
2. E Horrowitz, S salmi, S Rajasekaran, "Fundamentals of Computer Algorithms",Second Edition University Press, 2007.
3. Aho, A V craftHop Ullman JD,"The Design and Analysis of Computer Algorithms",Pearson Education,2007.
4. Hari Mohan Pandy, " Design analysis and Algorithms", University Science Press, 2009.
5. Thomas H. Cormen, Charles E. Lieserson, Ronald L. Rivest, and Clifford Stein, "Introduction to Algorithms", Second Edition, PHI,MIT press,USA, 2003.

With effect from Academic year 2016-17

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – I SEMESTER

ADVANCED OPERATING SYSTEMS		
Instruction: 3 Hours / week	Semester End Exam Marks: 70	Subject Reference Code: **CS5120**
Credits: 3	Sessional Marks: 30	Duration of Semester End Exam: 3 hrs.

COURSE OBJECTIVES	**COURSE OUTCOMES**
Students should be able to	Students will be able to
• describe different components of distributed operating system and design suitable algorithms for the better functionality of distributed operating system.	• explain architectures and issues in distributed operating systems • illustrate different distributed mutual exclusion algorithms and distributed deadlock algorithms • design distributed scheduling algorithm and describe distributed shared memory • explain failure recovery, fault tolerance and apply various cryptographic algorithms for the protection of given data • differentiate architectures of multiprocessor system and concurrency control algorithms

UNIT-I

Architectures of Distributed Systems: System Architecture Types, Distributed OS, Issues in Distributed Operating Systems.

Theoretical Foundations: Inherent Limitations of a Distributed System, Lamport's Logical clocks, Vector Clocks, Global State, Termination Detection.

UNIT-II

Distributed Mutual Exclusion: The classification of Mutual Exclusion Algorithms, Preliminaries, Non-Token-Based Algorithms, Lamport's Algorithm, The Ricart-Agrawala Algorithm, Token-Based Algorithms ,Suzuki-kasami's Broadcast Algorithm, Singhal's Heuristic Algorithm.

Distributed Deadlock Detection: Resource Vs Communication Deadlocks, A graph– theoretic Model, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Control Organizations for Distributed

Deadlock Detection, Centralized Deadlock-Detection Algorithms, The completely Centralized Algorithm, The Ho-Ramamoorthy Algorithms. Distributed Deadlock Detection Algorithms- A Path-Pushing, Edge-Chasing, Hierarchical Deadlock Detection Algorithms, The Menasce-Muntz and Ho-Ramamoorthy Algorithm.

Agreement protocols: The System Model, The Byzantine Agreement Problem, The Consensus Problem.

UNIT-III
Distributed File Systems: Mechanisms for Building Distributed File Systems, Design Issues.

Case Studies: Sun NFS, Sprite File System, Apollo DOMAIN, Coda File systems.

Distributed Shared Memory: Algorithms for Implementing DSM, Memory Coherence, Coherence Protocols, Design Issues.

Case Studies: IVY, Mirage, Clouds

Distributed Scheduling: Issues in Load Distributing, Components of a Load Distributing Algorithm, Stability, Load Distributing Algorithms, Performance Comparison.

UNIT-IV
Failure Recovery: Backward and Forward Error Recovery in Concurrent Systems, Consistent Set of Checkpoints, Synchronous And Asynchronous check Pointing and Recovery.

Fault Tolerance: Commit Protocols, Non-blocking Commit Protocols, Voting Protocols.
Resource Protection and Security: The Access Matrix Model
Data Security: Cryptography: Private Key and Public Key Cryptography
Case Study: The Kerberos System.

UNIT-V
Multiprocessor System Architectures: Motivation, Basic Multiprocessor System Architectures, Interconnection Networks for Multiprocessor Systems, Caching, Hypercube Architectures.
Multiprocessor Operating Systems: Threads, Process Synchronization, Processor Scheduling, Memory management: The Mach Operating System.
Database Operating Systems: Concurrence Control Model, Problem of Concurrency Control, Distributed Database Systems, Concurrency Control Algorithms.

Learning Resources :

1. Mukesh Singhal Niranjan G. Shivaratri, "Advanced concepts in Operating systems", Tata McGraw Hill Edition 2001

2. Pradeep K. Sinha, "Distributed Operating Systems Concepts and Design", PHI, First Edition, 2002

3. Andrew S.Tanenbaum, "Distributed Operating Systems", Pearson Education India, First Edition,2011

With effect from Academic year 2016-17

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

SYLLABUS FOR M.TECH. (CSE) – I SEMESTER

ARTIFICIAL INTELLIGENCE		
Instruction: 3 Hours/ week	Semester End Exam Marks: 70	Subject Reference Code: **CS5130**
Credits: 3	Sessional Marks: 30	Duration of Semester End Exam: 3 hrs.

COURSE OBJECTIVES	**COURSE OUTCOMES**
Students should be able to	Students will be able to
• identify and formulate solution using searching, reasoning, machine learning and natural language processing techniques to solve specific computer science problems.	• apply various search algorithms to solve a problem • differentiate knowledge representations such as propositional logic and predicate logic • explain the various components of expert systems and device a solution to the problem when the knowledge is uncertain using probabilistic theory • apply the machine learning paradigms to solve specific computer science problems • explain the linguistic knowledge representation for natural language processing and apply fuzzy set theory to deal with vague and imprecise knowledge

UNIT-I

Introduction : History, Intelligent Systems, Foundation of AI, Sub areas of AI, Applications.

Problem Solving – State – Space Search and Control Strategies: Introduction, General Problem Solving, Characteristics of problem, Exhaustive Searches, Heuristic Search Techniques, Iterative – Deepening A*, Constraint Satisfaction.

Game Playing: Bounded Look – Ahead Strategy and use of Evaluation Function, MINIMAX procedure, Alpha-Beta Pruning.

UNIT-II

Logic Concepts and Logic Programming: Introduction, Propositional Calculus, Propositional Logic, Natural Deduction System, Axiomatic System, Semantic Tableau System in Propositional Logic, resolution Refutation in Propositional Logic, Predicate Logic, Logic Programming.

Knowledge Representation: Introduction, Approaches to knowledge Representation, Knowledge Representation using Semantic Network, Extended Semantic Networks for KR, Knowledge Representation using Frames.

UNIT-III

Expert System and Applications: Introduction, Phases in Building Expert Systems, Expert System Architecture, Expert System versus Traditional Systems, Truth Maintenance Systems, Application of Expert Systems, List of Shell and tools.

Uncertainty Measure – Probability Theory : Introduction, Probability Theory, Bayesian Belief Networks, Certainty Factor Theory, Dempster – Shafer Theory.

UNIT-IV

Machine – Learning Paradigms: Introduction, Machine learning Systems, Supervised and Unsupervised Learning, Inductive Learning, Learning Decision Trees (Learning Resources: 2) Deductive Learning, Clustering, Support Vector Machines.

Artificial Neural Networks : Introduction Artificial Neural Networks, Single – Layer Feed Forward Networks, Multi – Layer Feed Forward Networks, Radial – Basis Function Networks, Design Issues of Artificial Neural Networks, Recurrent Networks

UNIT-V

Fuzzy Sets and Fuzzy logic : Fuzzy sets, Fuzzy set operations, Types of membership Functions, Multi valued logic, Fuzzy Logic, Linguistic variables and Hedges, Fuzzy Propositions, Inference Rules for Fuzzy Propositions, Fuzzy Systems.

Advanced Knowledge representation Techniques: Case Grammars

Natural Language Processing : Introduction. Sentence Analysis Phases, Grammars and Parsers, Types of Parsers, Semantic Analysis, Universal Networking Knowledge

Learning Resources :

1. Saroj Kaushik, "Artificial Intelligence", Cengage Learning, 2011.
2. Russell, Norvig, "Artificial Intelligence, A Modern Approach ", Pearson Education, Second Edition, 2004.
3. Elaine Rich, Kevin Knight, Shivshankar B. Nair, "Artificial Intelligence", Tata McGraw Hill, Third Edition 2009.

With effect from Academic year 2016-17

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – I SEMESTER

OBJECT ORIENTED SOFTWARE ENGINEERING		
Instruction: 3 Hours/ week	Semester End Exam Marks: 70	Subject Reference Code: **CS5140**
Credits: 3	Sessional Marks: 30	Duration of Semester End Exam: 3 hrs.

COURSE OBJECTIVES	**COURSE OUTCOMES**
Students should be able to	Students will be able to
• construct an efficient information system using Object Oriented programming concepts.	• define the software systems ,discuss different problems in software system development and solve these problems using object oriented concepts • differentiate different fact finding techniques to capture the requirements and apply different methods for requirement analysis • analyze the different object oriented programming concepts and apply them in software system development • apply different design patterns in software system development to solve real world problems • explain different methods for database design and different reusable components for software system development

UNIT-I

Information System: Problems in Information System development, Project Life Cycles, Managing Information Systems Development, User Involvement and Methodological approaches, Basic Concepts and Origins of Object Orientation Modeling concepts.

UNIT-II :

Requirement Capture, Requirement Analysis, Refining the Requirement Models, Object Interaction.

UNIT-III :
Operations, Control, Design, System Design**.**

UNIT-IV
Object Design, Design patterns, Human Computer Interaction, Designing Boundary Classes.
Testing concepts: Fault and Erroneous states and failures, Test Cases.
Testing activities: Component Inspection, Usability Testing, Unit Testing, Integration Testing, system testing, Regression Testing, Model Based Testing.

UNIT-V :
Data Management Design, Implementation, Reusable Components, Managing Object Oriented Projects, System Development Methodologies.

Learning Resources :

1. Simon Benett, Steve Mc Robb & ray Farmer, "Object Oriented System Analysis and Design using UML", McGraw Hill, 2002
2. Bernd Bruegge and Allen H. Dutoit, "Object-Oriented Software Engineering: Using UML Patterns and Java", 2nd Edition, Pearson Education Asia
3. Grady Booch, James Rumbaugh, Ivor Jacobson, "The Unified Modeling Language-User Guide", Addison Wesley, 1999.
4. Ivor Jacobson, Grady Booch, James Rumbaugh, "The Unified Software Development Process", Addison Wesley, 1999 .

With effect from Academic year 2016-17

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – I SEMESTER

MOBILE COMPUTING		
Instruction: 3 Hours/ week	Semester End Exam Marks: 70	Subject Reference Code: **CS5001**
Credits: 3	Sessional Marks: 30	Duration of Semester End Exam: 3 hrs.

COURSE OBJECTIVES	**COURSE OUTCOMES**
Students should be able to	Students will be able to
• describe the functionalities and standards of mobile systems, design and develop mobile apps.	• describe the principles of cellular wireless networks. • explain GSM, GPRS, 3G technologies and broadcasting techniques • identify and choose wireless LAN protocols for different environments • compare file systems for mobility support and discuss ways to publish data on air • design and develop mobile app and compare models of mobile transactions

UNIT-I
Introduction: Wireless Transmission, Frequencies for Radio Transmission, Signals, Antennas, Signal Propagation, Multiplexing, Modulations, Spread Spectrum, MAC- SDMA, FDMA, TDMA, CDMA, Cellular Wireless Networks.

UNIT-II
Telecommunication Systems: GSM, GPRS, Satellite Systems - Basics, Routing, Localization, Handover, FAMA and DAMA, Broadcast Systems- DAB, DVB, CDMA and 3G.

UNIT-III
Wireless LAN: IEEE 802.11, Architecture, Services, MAC-Physical Layer, IEEE 802.11a-802.11b Standards, Bluetooth.

UNIT-IV

Mobile IP - Dynamic Host Configuration Protocol, Traditional TCP- Classical TCP Improvements-WAP, WAP 2.0

Publishing & Accessing Data in Air: Pull and Push Based Data Delivery Models, Data Dissemination by Broadcast, Broadcast Disks, Directory Service in Air

File System Support for Mobility: Distributed File Sharing for Mobility Support, CODA and other Storage Manager for Mobility Support.

UNIT-V

Mobile Platforms - Android, iOS, Windows Phone 8, Mobile App or Website, Android Development Tools, Application Development, Android development Practices.

Mobile Transaction and Commerce: Models for Mobile Transaction, Kangaroo and Joey Transactions, Team Transaction.

Recovery Model for Mobile Transactions, Electronic Payment and Protocols for Mobile Commerce.

Learning Resources:

1. Jochen, M Schiller, "Mobile Communications", 2nd Edition, Pearson Education, 2009.
2. Jeff McWherter, Scott Gowell, "Professional Mobile Application Development", Wiley Publishers, 2012
3. KumkumGarg, "Mobile Computing", Pearson Education, 2010.
4. Asoke K Talukder, Roopa R Yavagal, "Mobile Computing", TMH, 2008.
5. Raj Kamal, "Mobile Computing", Oxford, 2009.
6. A Survey of Mobile Transactions appeared in Distributed and Parallel Databases, pgs. 193-230, Kluwer Academic Publishers, 2004.
7. S.Acharya, M.Franklin and S.Zdonik, "Balancing Push and Pull for Data Broadcast", Proceedings of ACM SIGMOD, Tuscon, AZ, May 1997.
8. S.Acharya, R. Alonso, M.Franklin and S.Zdonik, "Broadcast Disks: Data Management for Asymmetric Communication Environments", Proceedings of ACM SIGMOD Conference, San Jose, CA, May 1995.

INFORMATION STORAGE & MANAGEMENT		
Instruction: 3 Hours/ week	Semester End Exam Marks: 70	Subject Reference Code: **CS5002**
Credits: 3	Sessional Marks: 30	Duration of Semester End Exam: 3 hrs.

COURSE OBJECTIVES	**COURSE OUTCOMES**
Students should be able to	Students will be able to
• apply the knowledge of different Storage techniques to practice scalable data universe generated by heterogeneous devices and devising a support system for a highly available self sustainable business solutions that are robust, secure & cloud enabled	• evaluate Storage architectures and key data center elements in classic, virtualized & cloud Environments, explain physical & logical components of storage infrastructure, RAID & Intelligent Storage Systems • describe storage networking technologies: FC-SAN, IP-SAN, FCoE, NAS, Object-based and unified storage • elaborate business continuity solutions, backup and recovery technologies, and local and remote replication solutions • detail the various enabling technologies, service models & Adoption considerations in the area of cloud • apply information security and storage security domains and identify parameters for managing and monitoring storage infrastructure

UNIT-I
Storage System
Introduction to information storage, virtualization and cloud computing, Key data center elements, Compute, application, and storage virtualization, Disk drive & flash drive components and performance, RAID, Intelligent storage system and storage provisioning (including virtual provisioning).

UNIT-II
Storage Networking
Fibre Channel SAN components, FC protocol and operations, Block level storage virtualization, iSCSI and FCIP as an IP-SAN solutions, Converged networking option – FCoE, Network Attached Storage (NAS) - components, protocol and operations, File level storage virtualization, Object based storage and unified storage platform.

UNIT-III
Backup, Replication, Archive
Business continuity terminologies, planning and solutions, Clustering and multipathing architecture to avoid single points of failure, Backup and recovery - methods, targets and topologies, Data deduplication and backup in virtualized environment, Fixed content and data archive, Local replication in classic and virtual environments, Remote replication in classic and virtual environments, Three-site remote replication and continuous data protection.

UNIT-IV
Cloud Infrastructure
Cloud Enabling Technologies, Characteristics of Cloud Computing, Benefits, Cloud Service Models, Deployment Models, Cloud Computing Infrastructure, Cloud Challenges, Cloud Adoption Considerations, Concepts in practice.

UNIT-V

Storage Security & Management
Security threats, and countermeasures in various domains, Security solutions for FC-SAN, IP-SAN and NAS environments, Security in virtualized and cloud environments, Monitoring and managing various information infrastructure components in classic and virtual environments, Information lifecycle management (ILM) and storage tiering.

Learning Resources :

1. Somasundaram G, Alok Shrivastava , "Information Storage and Management", Second Edition, Wiley Publishers, 2012
2. John W. Rittinghouse, James F. Ransome, "Implementation Management and Security", CRC Press, 2010
3. Robert Spalding, "Storage Networks: The Complete Reference", Tata McGraw Hill, Osborne, 2003.
4. Marc Farley, "Building Storage Networks", Tata McGraw Hill, Osborne. 2001.
5. Meeta Gupta, "Storage Area Network Fundamentals", Pearson Education Limited, 2002.

With effect from Academic year 2016-17

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – I SEMESTER

ADVANCED ALGORITHMS LAB		
Instruction: 2 Hours/ week	Semester End Exam Marks: 0	Subject Reference Code: **CS5111**
Credits: 1	Sessional Marks: 50	Duration of Semester End Exam: -

COURSE OBJECTIVES	**COURSE OUTCOMES**
Students should be able to	Students will be able to
• identify and apply various algorithm design strategies to solve engineering problems with efficient time and space utilization	• implement and use basic data structures like stack, queue, linked list, tree and graph to solve problems • apply divide-and-conquer, greedy design strategy, and dynamic programming approaches to solve problems • implement network flow algorithms • develop string and pattern matching algorithms. • implement geometric algorithms

Implement the following using JAVA :

1. Stacks, Queues.(Using both Arrays and Linked Lists)
2. Singly Linked List, Doubly Linked List and Circular Linked List.
3. Binary Search Tree (BST) and Graph Traversal-DFS , BFS algorithms.
4. Quick and Merge Sort Algorithms.
5. Single Source Shortest Path algorithms- Dijkstra's and Bellman-Ford.
6. Minimum Cost Spanning tree Algorithms- Prim's and Kruskal's.
7. Matrix Chain Multiplication Algorithm.
8. Optimal Binary Search Tree (OBST) Algorithm.
9. All-Pairs shortest paths Algorithm.
10. Network Flow- Ford-Fulkerson Algorithm.
11. Boyer –Moore Pattern Matching Algorithm.
12. KMP Pattern Matching Algorithm with failure function.
13. Longest Common Subsequence (LCS) algorithm.
14. Encryption algorithms-RSA and DES
15. Convex Hull –Graham Scan Algorithm, Gift Wrapping algorithms

Learning Resources :

1. M.T.Goodrich, R.Tomassia, "Algorithm design – Foundations, Analysis, and Internet Algorithms", John Wiley, 2002.
2. E Horrowitz, S salmi, S Rajasekaran, "Fundamentals of Computer Algorithms",Second Edition University Press, 2007.
3. Aho, A V craftHop Ullman JD,"The Design and Analysis of Computer Algorithms",Pearson Education, 2007.
4. Hari Mohan Pandy, " Design analysis and Algorithms", University Science Press, 2009.
5. Thomas H. Cormen, Charles E. Lieserson, Ronald L. Rivest, and Clifford Stein, "Introduction to Algorithms", Second Edition, PHI,MIT press,USA, 2003..

With effect from Academic year 2016-17

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – I SEMESTER

OBJECT ORIENTED SOFTWARE ENGINEERING LAB		
Instruction: 2 Hours/ week	Semester End Exam Marks: 0	Subject Reference Code: **CS5121**
Credits: 1	Sessional Marks: 50	Duration of Semester End Exam: -

COURSE OBJECTIVES	**COURSE OUTCOMES**
Student should be able to	Students will be able to
• apply software engineering principles for analyzing, visualizing, specifying, constructing and documenting the artifacts of software intensive system	• identify the functional and non-+functional requirements for a given s/w system • draw the structure chart for functional decomposition of the system • prepare project schedule using Gantt project and estimate the cost of the system using COCOMO-II • build design specifications for the s/w system using Rational Rose • prepare the test plan and use CVS tool to identify change management

Do the following for any five case studies.

1. Systems Software Requirement Specification (SRS)
2. ER Diagrams.
3. Functional module decomposition
4. Data flow diagrams at Level 0,1,2
5. project Schedule
6. product metrics
7. Cost estimation
8. Draw Usecase diagram
9. Draw Class diagram
10. Draw Interaction diagrams
11. Draw Activity diagram
12. Draw Component diagram
13. Test plan
14. Configuration management
15. Risk Management

Learning Resources :

1. Simon Benett, Steve Mc Robb & ray Farmer, "Object Oriented System Analysis and Design using UML", McGraw Hill, 2002.
2. Bernd Bruegge and Allen H. Dutoit, "Object-Oriented Software Engineering: Using UML Patterns and Java", 2nd Edition, Pearson Education Asia.
3. Grady Booch, James Rumbaugh, Ivor Jacobson, "The Unified Modeling Language-User Guide", Addison Wesley, 1999.
4. Ivor Jacobson, Grady Booch, James Rumbaugh, "The Unified Software Development Process", Addison Wesley, 1999.

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – I SEMESTER

SEMINAR-I		
Instruction: 2 Hours/ week	Semester End Exam Marks: 0	Subject Reference Code: **CS5112**
Credits: 1	Sessional Marks: 25	Duration of Semester End Exam: -

COURSE OBJECTIVES	**COURSE OUTCOMES**
Students should be able to	Students will be able to
• acquire knowledge on latest technologies and on-going research areas in Computer Science and Engineering .	• improve presentation and communication skills • acquire knowledge about recent advancements in industry and new research trends • collect information through literature survey, analyze and present them • acquire knowledge about new hardware and software needs of market • acquire technical document writing skills

Oral presentation is an important aspect of engineering education. The objective of the seminar is to prepare the student for systematic independent study of state of the art topics in broad area of his/her specialization.

Seminar topics can be chosen by the students with the advice from the faculty members.

Students are to be exposed to following aspects of seminar presentation:

Literature survey

Organization of material

Preparation of OHP slides / PC presentation

Technical writing.

Each student is required to:

1. Submit one page of synopsis of the seminar talk two days before for display on notice board.
2. Give 20 minutes presentation through OHP, PC and slide project followed by 10 minutes discussion.
3. Submit a report on the seminar topic with a list of references and slides used within a week.

Seminars are to scheduled from the 3rd week to the last week of the semester and any change in schedule should be discouraged.

The sessional marks will be awarded to the students by at least 2 faculty members on the basis of an oral and a written presentation as well as their involvement in the discussion. Average of two presentations is considered for award of sessional marks for each student.

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – II SEMESTER

DISTRIBUTED COMPUTING		
Instruction: 3+1 Hours/ week	Semester End Exam Marks: 70	Subject Reference Code: **CS5210**
Credits: 3	Sessional Marks: 30	Duration of Semester End Exam: 3 hrs.

COURSE OBJECTIVES	**COURSE OUTCOMES**
Students should be able to	Students will be able to
• describe the design issues of distributed systems and demonstrate component technologies.	• explain the goals and design issues of distributed systems • demonstrate remote procedural call and describe message and stream oriented communication • describe design issues of server and naming entities in a distributed system • distinguish between CORBA, EJB and GLOBE • describe quality of service parameters in distributed multimedia systems

UNIT-I

Introduction: Definition of Distributed Systems, Goals: Makin Resources Accessible, Distribution Transparency, Openness, Scalability, Types of Distributed Systems: Distributed Computing Systems, Distributed Information Systems, Distributed Pervasive Systems, Architectural Styles, System Architectures: Centralized Architectures, Distributed Architectures, Hybrid Architectures, Architectures Versus Middleware: Interceptors, General Approaches to Adaptive Software.

UNIT-II

Communication: Layered Protocols, Types of Communication, Remote Procedure Call: Basic RPC Operation, Parameter Passing, Asynchronous RPC, Message-Oriented Communication: Message-Oriented Transient Communication, Message-Oriented Persistent Communication, Stream Oriented Communication: Support for Continuous Media, Streams and Quality of Service, Stream Synchronization.

UNIT-III

Processes, Threads: Introduction to Threads, Threads in Distributed Systems, Clients: Networked User Interfaces, Client-Side Software for Distribution Transparency, Servers: General Design Issues, Server Clusters, Managing Server Clusters.

Naming: Names, Identifiers and Addresses, Flat Naming: Simple Solutions, Home-Based Approaches, Distributed Hash Tables, Hierarchical Approaches, Structured Naming: Name Spaces, Name Resolution, The Implementation of a Name Space, Example: DNS, Attribute-Based Naming: Directory Services, Hierarchical Implementations: LDAP, Decentralized Implementations.

UNIT-IV

Distributed Object Based Systems: Architecture: Distributed Objects, Example: Enterprise Java Beans (EJB), Example: Globe Distributed Shared Objects, Processes: Object Servers, Example: Ice Runtime System, Communication: Binding a Client to an Object, Static versus Dynamic Remote Method Invocations, Parameter Passing, Example: Java RMI, Object-Based Messaging, Naming: CORBA Object References, Globe Object References, Synchronization, Caching and Replication: Entry Consistency, Replicated Invocations, Fault Tolerance: Example: Fault-Tolerant CORBA, Java, Security: Example: Globe, Security for Remote Objects.

UNIT-V

Distributed Multimedia Systems: Introduction, Characteristics of Multimedia Data, Quality of Service Management: Quality of Service Negotiation, Admission Control, Resource Management: Resource Scheduling, Stream Adaptation.

Learning Resources:

1. Andrew S. Tanenbaum and Maarten Van Steen, "Distributed Systems: Principles and Paradigms", PHI, 2nd Edition, 2011.
2. Colouris G. Dollimore Jean, Kindberg Tim, "Distributed Systems Concepts and Design", 4th Edition, Pearson Education, 2012.

With effect from Academic year 2016-17

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – II SEMESTER

ADVANCED DATABASES		
Instruction: 3 Hours/ week	Semester End Exam Marks: 70	Subject Reference Code: **CS5220**
Credits: 3	Sessional Marks: 30	Duration of Semester End Exam: 3 hrs.

COURSE OBJECTIVES	**COURSE OUTCOMES**
Students should be able to	Students will be able to
• apply knowledge of advanced database management techniques to provide solution for a database intensive problem.	• create and query tables in object relational and object oriented databases • create, query and process data in XML files • describe query processing mechanisms and query optimization • explain inter query, intra query parallelism and distributed database processing techniques • apply performance tuning methods and describe data representation in spatial, geographical and temporal databases

UNIT-I

Object Based Databases: Overview, Complex Data Types, Structured Types and Inheritance in SQL, Table Inheritance, Array and Multiset Types in SQL, Object-Identity and Reference Types in SQL, Implementing O-R features, Persistent Programming Languages, Object-Relational Mapping, Object-Oriented versus Object-Relational.

UNIT-II

XML: Motivation, Structure of XML data, XML Document Schema, Querying and Transformation, Application program Interfaces to XML , Storage of XML Data, XML applications.

UNIT-III

Query Processing: Overview, Measures of Query Cost, Selection Operation, Sorting, Join Operation, Other Operations, Evaluation of Expressions.

Query Optimization: Overview, Transformation of Relational Expressions, Estimating Statistics of Expression Results, Choice of Evaluation Plans, Materialized Views.

UNIT-IV

Parallel Databases: Introduction, I/O Parallelism, Interquery Parallelism, Intraquery Parallelism, Intraoperation Parallelism, Interoperation Parallelism, Query Optimization, Design of Parallel Systems.

Distributed Databases : Homogeneous and Heterogeneous Databases, Distributed Data Storage, Distributed Transactions, Commit Protocols, Concurrency Control in Distributed Databases, Availability, Distributed Query Processing, Heterogeneous Distributed Databases, Cloud-Based Databases, Directory Systems.

UNIT-V

Advanced Application Development: Performance Tuning, Performance Benchmarks, Other Issues in Application Development, Standardization.

Spatial and Temporal Data and Mobility: Motivation, Time in Databases, Spatial and Geographic Data, Multimedia Databases, Mobility and Personal Databases.

Learning Resources :

1. Abraham Silberschatz, Henry F Korth, S Sudarshan, "Database System Concepts", McGrawHill international Edition, Sixth Edition, 2010.
2. Elmasri Navathe, Somayajulu, Gupta, "Fundamentals of Database Systems", Pearson Education, Fourth Edition, 2006.
3. C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", Pearson Education, Eighth Edition, 2006.
4. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems" McGraw-Hill International Edition, Third Edition, 2002.

With effect from Academic year 2016-17

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – II SEMESTER

IMAGE PROCESSING		
Instruction: 3 Hours/ week	Semester End Exam Marks: 70	Subject Reference Code: **CS5009**
Credits: 3	Sessional Marks: 30	Duration of Semester End Exam: 3 hrs.

COURSE OBJECTIVES	**COURSE OUTCOMES**
Students should be able to	Students will be able to
• store, enhance,segment, recognize, encode, and represent the images by spatial and frequency domain techniques.	• explain sampling and quantization processes in obtaining digital images from continuously sensed. data and describe the steps in image processing • apply Fourier transformation and enhance digital image • apply different techniques in spatial domain to enhance digital image • describe different methods to encode raw image data into standard compressed image format • explain most commonly applied color models and their use in basic color image processing

UNIT-I

Image formation & description: Digital Image Representation – Elements of visual Perception. Sampling and Quantization, Elements of Digital Image Processing Systems.

UNIT-II

Image transforms: Digital Image Transforms –Discrete Fourier Transform(DFT),1D-DFT,2D-DFT,1D-DCT,2D-DCT,Walsh- Hadamard Transform.

UNIT-III

Image Enhancement: Histogram Modification, Equalization, Matching , Image Smoothing, Image Sharpening.

Segmentation: Point, Line, and Edge detection, Thresholding , Region Growing, Region Splitting and Merging techniques.

UNIT-IV

Image encoding: Fundamentals-Fidelity Criteria, Image Compression Models, Run-length Coding, Huffman Coding, Contour Coding.
Transformations for Compression: KL, Fourier, DCT.

UNIT-V

Restroration: A model for Image Degradation/ Restoration Process**,** Restroration Models, Noise Models, Inverse Filtering, Minimum Mean Square Error(Wiener) Filter, Constrained Least Squares Filtering, Recursive Filtering.

Learning Resources :

1. Rafael C. Gonzalez, Richard E. Woods, "Digital Image Processing", Third Edition, Pearson,2012.
2. Rosenfeld A. Kak AC, "Digital Picture Processing", Vol. I & II, Acad. Press, 2nd ed.1982.
3. Milan Sonka, Vaclav Hlavac, Roger Boyle, "Image Processing and Analysis and Machine Vision", 2nd Edition, Thomson Learning, 1999.

With effect from Academic year 2016-17

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – II SEMESTER

DATA MINING		
Instruction: 3 Hours/ week	Semester End Exam Marks: 70	Subject Reference Code: **CS5010**
Credits: 3	Sessional Marks: 30	Duration of Semester End Exam: 3 hrs.

COURSE OBJECTIVES	**COURSE OUTCOMES**
Students should be able to	Students will be able to
• analyze various data mining tasks to find relevant patterns from large databases	• explain the steps in KDD , Identify various pre-processing techniques and Compute similarity among objects and differentiate relational & multidimensional data models • build a classification model to classify unknown data objects based on different classification techniques • illustrate the use of advanced classification models for prediction • find associations and correlations among items by mining frequent patterns from transactional databases • evaluate clusters formed based on various clustering techniques

UNIT-I

Introduction: Challenges, The Origins of Data Mining, Data Mining Tasks
Data: Types of Data, Data Quality, Data Preprocessing, Measures of Similarity and Dissimilarity, OLAP and Multidimensional Data Analysis.

UNIT-II

Classification: Preliminaries, General Approach to Solving a Classification Problem, Decision Tree Induction, Model Overfitting, Evaluating the Performance of a Classifier, Methods for Comparing Classifiers, Rule-Based Classifier.

UNIT-III

Classification: Nearest-Neighbor classifiers, Bayesian Classifiers, Artificial Neural Networks (ANN), Support Vector Machine (SVM), Ensemble Methods, Class Imbalance Problem, Multiclass Problem.

UNIT-IV

Association Analysis: Problem Definition, Frequent Itemset Generation, Rule Generation, Compact Representation of Frequent Itemsets, Alternative Methods for Generating Frequent Itemsets, FP-Growth Algorithm, Evaluation of Association Patterns, Effect of Skewed Support Distribution, Handling Categorical Attributes, Handling Continuous Attributes, Handling a Concept Hierarchy.

UNIT-V

Cluster Analysis: Overview, K-means, Agglomerative Hierarchical Clustering, DBSCAN, Cluster Evaluation, Characteristics of Data, Clusters and Clustering Algorithms.

Learning Resources :

1. Pang-Ning Tan, Vipin Kumar, Michael Steinbach, "Introduction to Data Mining", Pearson Education, 2008.
2. K.P.Soman, Shyam Diwakar, V.Ajay, "Insight into Data Mining: Theory and Practice, PHI Learning,2010.
3. Arun K Pujari, "Data Mining Techniques", Universities Press,2nd Edition,2009.
4. Vikram Pudi, P.Radha Krishna, "Data Mining", Oxford University Press, 1st Edition, 2009.
5. S Sumathi, S.N.Sivanandam, "Introduction to Data Mining and its Applications", Springer, 2006.

With effect from Academic year 2016-17

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – II SEMESTER

CLOUD COMPUTING		
Instruction: 3 Hours/ week	Semester End Exam Marks: 70	Subject Reference Code: **CS5019**
Credits: 3	Sessional Marks: 30	Duration of Semester End Exam: 3 hrs.

COURSE OBJECTIVES	**COURSE OUTCOMES**
Students should be able to	Students will be able to
• comprehend the deployment and service models, evaluate fundamental issues, security standards and apply the concepts in practise to develop a cloud application.	• correlate the evolution of hardware & software technologies that substantiated the rise of cloud computing • identify the benefits of cloud computing service and deployment models and visualize the need for building cloud networks • elaborate cloud migration strategy by adopting cloud implementation standards leverage the role of virtualization • analyze the need for federation, threats associated with identity, privacy & security in cloud & recommend risk management policies & measurements • explain the standards in cloud computing & showcase the end user examples that embrace cloud computing

UNIT-I

The Evolution of Cloud Computing: Hardware Evolution, Internet Software Evolution, Establishing a common Protocol for the Internet, Evolution of Ipv6, Finding a Common Method to Communicate Using the Internet Protocol, Building a Common Interface to the Internet, Cloud Formation- From One Computer to a Grid of Many, Server Virtualization, parallel Processing, Vector Processing, Symmetric

Multiprocessing Systems, Massively Parallel Processing Systems.

UNIT-II

Web Services and the Cloud: Communication-as-a Service (CaaS), Infrastructure-as-a-Service (laaS), Monitoring-as-a-Service (MaaS), Platform-as-a-Service (PaaS), Software-NIS-a-Service(SaaS)

Building Cloud Networks: The Evolution from the MSP Model to Cloud, Computing and Software- as-a-Service, The Cloud Data Centre, Collaboration, Service-Oriented Architectures as a Step Towards Cloud Computing, Basic Approach to a Data Centre-Based SOA The Role of Open Source Software in Data Centres, Where Open Source Software is Used Case studies: Amazon web services, Google App Engine.

UNIT-III

Virtualization: Introduction, Types and Technologies, Accomplishing virtualization, importance of virtualization in Cloud computing. Case studies: Xen Virtual machine monitor – Xen API, VMware – VMware product – VMware Features, Microsoft Virtual Server – Features of Microsoft Virtual Server

UNIT-IV

Federation in the Cloud, Presence in the Cloud, Privacy and Its Relation to Cloud-Based Information System. Cloud Security Challenges, Software-as-a-Service Security, Security-as-a-Service the New MSSP.

UNIT-V

Common Standards in cloud Computing: The Open Cloud Consortium, The Distributed Management Task Force, Standards for Application Developers, Standards for Messaging, Internet Messaging Access Protocol (IMAP), Standard for Security

Examples of End-Use Access to Cloud Computing Mobile Internet Devices and the Cloud: Mobile Operating Systems for Smartphones Mobile Platform Virtualization, Collaboration Applications for Mobile Platforms.

Learning Resources :

1. John W. Rittinghouse, James F. Ransome "Cloud Computing: Implementation, Management and Security", CRC Press 2009.
2. Virtualization Specialist level complete certification kit – Study guide from www.theartofservice.org.
3. William Von Hagen, "Professional Xen Virtualization", Wrox Publications, January, 2008.
4. Chris Wolf, Erick M. Halter, "Virtualization: From the Desktop to the Enterprise", APress 2005.
5. David Marshall, Wade A. Reynolds, "Advanced Server Virtualization: VMware and Microsoft Platform in the virtual Data Center", Auerbach Publications. 2006

Web resources:

1. https://aws.amazon.com/ec2/
2. https://cloud.google.com/appengine/

With effect from Academic year 2016-17

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – II SEMESTER

NETWORK SECURITY		
Instruction: 3 Hours/ week	Semester End Exam Marks: 70	Subject Reference Code: **CS5018**
Credits: 3	Sessional Marks: 30	Duration of Semester End Exam: 3 hrs.

COURSE OBJECTIVES	**COURSE OUTCOMES**
Students should be able to	Students will be able to
• student should be able to apply different algorithms to achieve various security services	• discuss different security attacks and threats • differentiate secrete Key cryptography and public key cryptography and discuss DES, AES and RSA algorithms for information security • discuss and differentiate different methods for message integrity and authentication • discuss PKI Interface and differentiate different methods for smart card security • discuss Kerberos and web security protocols

UNIT-I
Introduction: Attributes of Security, Integrity, Authenticity, Non-repudiation, Confidentiality, Authorization, Anonymity, Types of Attacks, DoS, IP Spoofing, Replay, Man-in-the-Middle W attacks., General Threats to Computer Network, Worms, Viruses, Trojans

UNIT-II
Secret Key Cryptography: DES, Triple DES, AES, Key distribution, Attacks
Public Key Cryptography: RSA, ECC, Key Exchange (Diffie-Hellman), Java Cryptography Extensions, Attacks.

UNIT-III
Integrity, Authentication and Non-Repudiation: Hash Function (MD5, SHA5), Message Authentication Code (MAC), Digital Signature (RSA, DSA Signatures), Biometric Authentication.

UNIT-IV
PKI Interface: Digital Certificates, Certifying Authorities, POP Key Interface, System Security using Firewalls and VPN's.
Smart Cards: Application Security using Smart Cards, Zero Knowledge Protocols and their use in Smart Cards, Attacks on Smart Cards

UNIT-V
Applications: Kerberos, Web Security Protocols (SSL), IPSec, Electronic Payments, E-cash, Secure Electronic Transaction (SET), Micro Payments, Case Studies of Enterprise Security (.NET and J2EE)

With effect from Academic year 2016-17

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – II SEMESTER

DISTRIBUTED COMPUTING LAB		
Instruction: 2 Hours/ week	Semester End Exam Marks: 0	Subject Reference Code: **CS5211**
Credits: 1	Sessional Marks: 50	Duration of Semester End Exam: -

COURSE OBJECTIVES	**COURSE OUTCOMES**
Students should be able to	Students will be able to
• implement distributed applications	• develop, test and debug RPC and RMI based client-server programs in Linux • create client and server using socket programming • develop an application using EJB and Web services • implement programs using message passing interface • develop an application on Hadoop framework

List of Experiments :

1. Design a distributed application which consists of a state-full server using socket primitives
2. Design a distributed application which consists of a stateless server using socket primitives
3. Design a distributed application which consists of a server and client using Threads
4. Design a distributed application using Remote Procedural Call (RPC) for remote computation
5. Design a distributed application using Remote Method Invocation (RMI) for remote computation in which client submits two strings to the server and server returns the concatenation of the given strings
6. Design a distributed application using RMI in which client submits a string to the server and server returns the reverse of it
7. Design a distributed application using Stateless Session Bean in Enterprise Java Bean (EJB)
8. Design a distributed application using State-full Session Bean in EJB
9. Implement Message Passing Interface (MPI) program using Point-to-Point Communication Library Calls
10. Design a distributed application using MPI for remote computation
11. Design a Web service using Simple Object Access Protocol (SOAP)
12. Installation and configuration of Hadoop
13. Implement a distributed application on Hadoop framework to count word frequency with Map Reduce
14. Implement a distributed application on Hadoop framework to process a log file of a system

Note: The students have to submit a report at the end of the semester.

Learning Resources :

1. W. Richard Stevens , "Unix Network Programming, Volume 1: The Sockets Networking API", PHI, 2013
2. Nirva Morisseau-Leroy, Martin K. Solomon, Julie Basu, "Oracle8i Java Component Programming With EJB, CORBA AND JSP", Tata McGraw Hill, 2000.
3. http://www.hpjava.org/mpiJava.html
4. http://hadoop.apache.org/

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – II SEMESTER

ADVANCED DATABASES LAB		
Instruction: 2 Hours/ week	Semester End Exam Marks: 0	Subject Reference Code: **CS5221**
Credits: 1	Sessional Marks: 50	Duration of Semester End Exam: --

Course Objective	**Course Outcomes**
Students should be able to	Students will be able to
• apply database management techniques to provide solution for a data intensive problem	• create and query the tables in object relational and object oriented databases • create, query and process data in XML files • implement sort and join operations on tables • access remote data in distributed database system • apply tuning methods to optimize the performance of a database

List of Experiments:

1. Creating tables and Inserting values for Retail Banking Database
2. Grouping Data, Sub Queries
3. Joins, Set operations
4. Aggregation operations.
5. Creating indexes on a table
6. Views, Clusters
7. Sequences, Object Types
8. Object views, Nested tables
9. Variable Arrays, Referencing Objects
10. Creating XML File for university database
11. Implementing External Sort-Merge algorithm
12. Implementing Nested-loop join algorithm
13. Implementing Block Nested-loop join algorithm
14. Accessing remote data

Learning Resources:

1. Ivan Bayross, SQL, PL/SQL, "The Programming Language of Oracle", 4th Edition, PBP Publications.
2. Abraham Silberschatz, Henry F Korth, S Sudarshan, "Database System Concepts", McGraw Hill International Edition, 6th Edition, 2009.

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – II SEMESTER

SEMINAR-II		
Instruction: 2 Hours/ week	Semester End Exam Marks: 0	Subject Reference Code: **CS5212**
Credits: 1	Sessional Marks: 25	Duration of Semester End Exam: -

COURSE OBJECTIVES	**COURSE OUTCOMES**
Students should be able to	Students will be able to
• acquire knowledge on latest technologies and on-going research areas in Computer Science and Engineering .	• improve presentation and communication skills. • aware of recent advancements in industry and new research trends • collect information through literature survey, analyze and present them • acquire knowledge about new hardware and software needs of market • acquire technical document writing skills

Oral presentation is an important aspect of engineering education. The objective of the seminar is to prepare the student for systematic independent study of state of the art topics in broad area of his/her specialization.
Seminar topics can be chosen by the students with the advice from the faculty members.
Students are to be exposed to following aspects of seminar presentation.
Literature survey
Organization of material
Preparation of OHP slides / PC presentation
Technical writing.

Each student is required to

1. Submit one page of synopsis of the seminar talk two days before for display on notice board.
2. Give 20 minutes presentation through OHP, PC and slide project followed by 10 minutes discussion.
3. Submit a report on the seminar topic with a list of references and slides used within a week.

Seminars are to scheduled from the 3rd week to the last week of the semester and any change in schedule should be discouraged.
The sessional marks will be awarded to the students by at least 2 faculty members on the basis of an oral and a written presentation as well as their involvement in the discussion. Average of two presentations is considered for award of sessional marks for each student.

ADVANCED COMPUTER GRAPHICS		
Instruction: 3 Hours/ week	Semester End Exam Marks: 70	Subject Reference Code: **CS5004**
Credits: 3	Sessional Marks: 30	Duration of Semester End Exam: 3 hrs.

COURSE OBJECTIVES	**COURSE OUTCOMES**
Students should be able to	Students will be able to
• create 2D and 3D designs and use animation techniques	• design line drawing & polygon filling algorithms and 2D transformations. • perform 3D geometrical transformation and choose appropriate methods to detect surface • describe the structure elements and hierarchical modeling with structures • explain the salient features of GKS and PHIGS and implement graphics algorithms using OpenGL • apply fractal geometry for 3D

UNIT-I

Raster Graphics System and its Working: Line-Drawing Algorithms (DDA and Bresenham's algorithms), Polygon Filling, 2-D Transformations.

UNIT-II

Fundamentals of 3-D Graphics: Projections (Parallel projection and Perspective projection), 3- D Transformations, Bezier curves and B-spline curves, Visible-Surface Detection Methods (Painter's algorithm and Z-buffer method).

UNIT-III

Structures and Hierarchical Modeling: Structure Concepts, Editing Structures, Basic Modeling Concepts, Hierarchical Modeling with Structures.

UNIT -IV

Graphics Standards: GKS, PHIGS-their salient features.

OpenGL-the new graphics standard, important OpenGL functions, advantages of OpenGL, Sample graphics programs showing the use of OpenGL functions.

UNIT-V

Fractals: Fractal-Geometry Methods, Fractal-Generation Procedures, Classification of Fractals, Fractal Dimension, Geometric Construction of Deterministic Self-Similar Fractals, Geometric Construction of Statistically Self-Similar Fractals. Affine Fractal**-**Construction methods, Random Midpoint-Displacement Methods, Controlling Terrain Topography, Self-squaring Fractals, Self- inverse Fractals.

Learning Resources:

1. Hearn Donald, Pauline Baker M., "Computer Graphics", Pearson Education, 2nd Edition, 1997.

2. Foley, Vandam, Feiner, Hughes, "Computer Graphics - Principles & Practice", Addison- Wesley, 2nd Edition, 1996.

3. David F Rogers, "Procedural Elements for Computer Graphics", McGraw-Hill, 2nd Edition, 2001.

4. Hill, Jr. & Kelley by F. S.,Hill Jr,Kelley Jr,Stephen M**,** **"**Computer Graphics Using OpenGL", PHI, 3rd Edition,
2009.

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – I SEMESTER

EMBEDDED SYSTEMS		
Instruction: 3 Hours/ week	Semester End Exam Marks: 70	Subject Reference Code: **CS5007**
Credits: 3	Sessional Marks: 30	Duration of Semester End Exam: 3 hrs.

COURSE OBJECTIVES	**COURSE OUTCOMES**
Students should be able to	Students will be able to
• design methods and techniques specific to the creation of an embedded system that integrates both software and hardware to fulfill a set of requirements	• describe the Embedded System design process • compare CISC and RISC instruction set architecture • design and develop embedded hardware and firmware • identify real-time constraints associated with Embedded System and relate them with RTOS principles • describe the techniques and tools to debug the Embedded System software

UNIT-I

Introduction to Embedded Systems: Characteristics and quality attributes of Embedded Systems Challenges in Embedded System Design, Application and Domain specific Embedded Systems.

UNIT –II

Embedded System Architecture: Instruction Set Architecture, CISC and RISC instruction set architecture, Basic Embedded Processor/Microcontroller Architecture, C1SC Examples-Motorola (68HCI1), RISC Example- ARM, DSP Processors, Harvard Architecture Microcontroller Example - PIC.

UNIT -III

Embedded Hardware Design and Development: VLSI and Integrated Circuit Design, EDA tools, usage of EDA tools and PCB layout.

Embedded firmware and Design and Development: Embedded Firmware Design Approaches and Development languages and Programming in Embedded in C.

UNIT -IV

Introduction to Real Time Operating System: Tasks and Task States, Tasks and Data, Semaphores, and Shared Data; Message Queues, Mailboxes and Pipes, Timer functions, Events, Memory Management, Interrupt Routines in an RTOS Environment, OS Security Issues and Mobile OS.

UNIT-V

Embedded Systems Development Environment: IDE, Cross Compilation, Disassembler, Simulators, Emulators and Debugging, Target Hardware Debugging, Boundary Scan. Product Enclosure Design and Development Tools, Embedded Product Development Life Cycle- Different phases and Approaches' of EDLC. Trends in Embedded Industry.

Learning Resources:

1. Shibu K V, Introduction to Embedded Systems, Tata McGraw HilI,2010.
2. Raj Kamal, Embedded Systems Architecture, Programming & Design, Tata McGraw Hill, 2010.
3. Dr K.V.K.K. Prasad, Embedded/Real Time Systems: Concepts, Design and Programming, Dreamtech Press, 2004

NEURAL NETWORKS		
Instruction: 3 Hours/ week	Semester End Exam Marks: 70	Subject Reference Code: **CS5013**
Credits: 3	Sessional Marks: 30	Duration of Semester End Exam: 3 hrs.

COURSE OBJECTIVES	**COURSE OUTCOMES**
Students should be able to	Students will be able to
• apply neural network learning algorithms for solving problems by using appropriate neural network architecture	• compare different types of neuron models and architecture in knowledge representation using neural network • apply various learning algorithms in solving specific problems • solve simple classification problems using single layer neural networks • apply multilayer feed forward network in solving complex classification problems which are not linearly separable • describe various techniques to find the association among the patterns

UNIT -I

Introduction: Concept of a Neural Network. Human Brain. Models of a Neuron. Neural Networks Viewed as Directed Graphs. Feedback. Neural Network Architectures. Knowledge Representation. Artificial Intelligence and Neural Networks. History of Neural Networks.

UNIT-II

Learning processes: Introduction. Error-Correction Learning. Memory-Based Learning. Hebbian Learning, Competitive Learning. Boltzmann Learning. Credit Assignment Problem. Learning with a Teacher. Learning without a Teacher.

UNIT-III

Single Layer Perceptrons: Introduction. Least-Mean-Square Algorithm. Learning Curves. Learning Rate Annealing Schedules Perceptron. Perceptron Convergence Theorem.

UNIT-IV

Multilayer Perceptrons: Introduction. Some Preliminaries. Back-Propagation Algorithm. Summary of the. Back-Propagation Algorithm. XOR Problem. Virtues and limitations of Back- Propagation learning.

UNIT -V

Neuro dynamics' Introduction. Dynamical Systems. Stability of equilibrium States. Attractors Neurodynamical Models. Manipulation of Attractors as a Recurrent Network Paradigm. Hopfield Models. Cohen-Grossberg Theorem.

Learning Resources :

1. Simon Haykin, "Networks Networks - A Comprehensive Foundation", Pearson Education, 2nd Edition, 2001.
2. Jacek M. Zurada, "Introduction to Artificial Neural Systems", PWS Publishing Company, 1992

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR M.TECH. (CSE) – II SEMESTER

SOFT COMPUTING		
Instruction: 3 Hours/ week	Semester End Exam Marks: 70	Subject Reference Code: **CS5014**
Credits: 3	Sessional Marks: 30	Duration of Semester End Exam: 3 hrs.

COURSE OBJECTIVES	**COURSE OUTCOMES**
Students should be able to	Students will be able to
• apply soft computing techniques to solve problems which are tolerant of imprecision, uncertainty, partial truth, and approximation.	• describe the evolution of computing • explain knowledge acquisition and use of Genetic Algorithms in machine learning. • apply neural network techniques to solve problems • explain various operations on fuzzy sets, fuzzy membership functions and components of fuzzy expert systems. • combine neural networks and fuzzy logic to build AI systems

UNIT-I

Introduction to Soft Computing and Neural Networks: Evolution of Computing , Soft Computing Constituents From Conventional AI to Computational Intelligence-Machine Learning Basics.

UNIT II

Genetic Algorithms: Introduction to Genetic Algorithms (GA) –Applications of GA in Machine Learning-Machine Learning Approach to Knowledge Acquisition.

UNIT III

Neural networks: Machine Learning Using Neural Network, Adaptive Networks –Feed forward Networks–Supervised Learning Neural Networks–Radial Basis Function Networks-Reinforcement Learning–Unsupervised Learning Neural Networks–Adaptive Resonance architectures – Advances in Neural networks.

UNIT IV

Fuzzy Logic: Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions, Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems ,Fuzzy Expert Systems, Fuzzy Decision Making.

UNIT V

Neuro-Fuzzy Modeling: Adaptive Neuro, Fuzzy Inference Systems, Coactive Neuro, Fuzzy Modeling, Classification and Regression Trees, Data Clustering Algorithms, Rule base Structure Identification, Neuro-Fuzzy Control, Case studies.

Learning Resources :

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, "Neuro-Fuzzy and Soft Computing", Prentice-Hall of India, 2003.
2. George J. Klir and Bo Yuan, "Fuzzy Sets and Fuzzy Logic-Theory and Applications", Prentice Hall,1995.
3. James A. Freeman and David M. Skapura, "Neural Networks Algorithms, Applications and Programming Techniques", Pearson Edn., 2003.
4. Mitchell Melanie, "An Introduction to Genetic Algorithm", Prentice Hall, 1998.
5. David E. Goldberg, "Genetic Algorithms in Search, Optimization and Machine Learning", AddisonWesley, 1997.

With effect from Academic year 2016-17

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

SYLLABUS FOR M.TECH. (CSE) – II SEMESTER

WEB MINING		
Instruction: 3 Hours/ week	Semester End Exam Marks: 70	Subject Reference Code: **CS5016**
Credits: 3	Sessional Marks: 30	Duration of Semester End Exam: 3 hrs.

COURSE OBJECTIVES	**COURSE OUTCOMES**
Students should be able to	Students will be able to
• describe the techniques to perform data mining functionalities on Web Data and understand the relationship of web search with information retrieval .	• explain various types of web data mining techniques to perform association rule mining and classification on web data • describe various clustering techniques used in Web Mining and working of a search engine • apply different techniques to find the rank of a web page • describe the functionality of a web Crawler and the methods for structured data extraction and Information integration • explain the applications of web usage mining such as Sentiment analysis and Opinion mining

UNIT-I

Introduction: The World Wide Web, History of the Web and the Internet, Web Data Mining

Association Rules and Sequential Patterns: Basic Concepts, Apriori Algorithm, Data Formats for Association Rule Mining, Mining with Multiple Minimum Supports, Mining Class Association Rules

Supervised Learning: Basic Concepts, Decision Tree Induction, Classifier Evaluation, Naïve Bayesian Classification, Naïve Bayesian Text Classification, K-Nearest Neighbor Learning, Ensemble of Classifiers

UNIT-II

Unsupervised Learning: Basic Concepts. K-means Clustering, Representation of Clusters, Hierarchical Clustering, Distance Functions, Data Standardization, Handling of Mixed Attributes, Which Clustering Algorithm to Use? Cluster Evaluation

Information Retrieval and Web Search: Basic Concepts, Relevance Feedback, Evaluation Measures, Text and Web Page Pre-Processing, Inverted Index and Its Compression

UNIT-III

Information Retrieval and Web Search: Web Search, Meta-Search: Combining Multiple Rankings, Web Spamming

Link Analysis: Social Network Analysis, Co-Citation and Bibliographic Coupling, PageRank , HITS, Community Discovery

UNIT-IV

Web Crawling: A Basic Crawler Algorithm, Implementation Issues, Evaluation, Crawler Ethics and Conflicts

Structured Data Extraction: Wrapper Generation**,** Preliminaries, Wrapper Induction, Instance- Based Wrapper Learning, Automatic Wrapper Generation, String Matching and Tree Matching, Building DOM Trees.

Information Integration: Introduction to Schema Matching, Pre-Processing for Schema Matching, Schema-Level Match, Domain and Instance-Level Matching, Combining Similarities, 1: Match.

UNIT-V

Opinion Mining and Sentiment Analysis: Sentiment Classification, Feature-Based Opinion Mining and Summarization, Comparative Sentence and Relation Mining, Opinion Search, Opinion Spam.

Web Usage Mining: Data Collection and Pre-Processing, Data Modeling for Web Usage Mining.

Learning Resources:

1. Bing Liu , "Web Data Mining", Springer India, 2010
2. Soumen Chakrabarti, "Mining the Web", Morgan-Kaufmann Publishers, Elseiver, 2002
3. Manu Konchady, "Text Mining Application Programming", Cengage Learning, 2006

MULTIMEDIA TECHNOLOGIES		
Instruction: 3 Hours/ week	Semester End Exam Marks: 70	Subject Reference Code: **CS5024**
Credits: 3	Sessional Marks: 30	Duration of Semester End Exam: 3 hrs.

COURSE OBJECTIVES	**COURSE OUTCOMES**
Students should be able to	Students will be able to
• explain the different techniques for storing multimedia data and synchronization of the them	• explain the properties of Mulitimedia systems and characteristics of data streams • describe the transmission of digital image &video and techniques for animation • work with different compression standards and storage for multimedia data • perform the synchronization of the multimedia data • illustrate the application of multimedia systems

UNIT-I

Media and Data Streams: Properties of multimedia systems, Data streams characteristics: Digital representation of audio, numeric instruments digital interface Bark concepts, Devices, Messages, Timing Standards Speech generation, analysis and transmission.

UNIT-II

Digital Image: Analysis, recognition, transmission, **Video**: Representation, Digitalization transmission **Animations**: Basic concepts, animation languages, animations control transmission

UNIT-III

Data Compression Standards: JPEG, H-261, MPEG DVI

Optical storage devices and Standards: WORHS, CDDA, CDROM, CDWO, CDMO.
Real Time Multimedia, Multimedia file System.

UNIT-IV

Multimedia Communication System: Collaborative computing session management, transport subsystem, QOS, resource management.

Multimedia Databases: Characteristics, data structures, operation, integration in a database model. **Synchronization**: Issues, presentation requirements, reference to multimedia synchronization, MHEG

UNIT-V

Multimedia Application: Media preparation, Composition, integration communication, consumption, entertainment.

Learning Resources:

1. Ralf Steninmetz, Klara Hahrstedt, "Multimedia: Computing, Communication and Applications", PHI PTR Innovative Technology Series.
2. John F.Koegel Bufford, "Multimedia System", Addison Wesley, 1994.
3. Mark Elsom – Cook, "Principles of Interactive Multimedia", Tata Mc-Graw Hill, 2001.
4. Judith Jefcoate, "Multimedia in Practice: Technology and Application", PHI 1998.

With effect from Academic year 2016-17

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

SYLLABUS FOR M.TECH. (CSE) – II SEMESTER

REAL TIME OPERATING SYSTEMS		
Instruction: 3 Hours/ week	Semester End Exam Marks: 70	Subject Reference Code: **CS5025**
Credits: 3	Sessional Marks: 30	Duration of Semester End Exam: 3 hrs.

COURSE OBJECTIVES	**COURSE OUTCOMES**
Students should be able to	Students will be able to
• analyze different methods to perform Operating Systems services to work in real time	• illustrate the functionalities of Unix operating systems • compare Hard and Soft Real-time systems and illustrate the scheduling algorithms. • explain the techniques for task management in Real time operating systems • design process synchronization solutions in RTOS • explain the techniques and tools to debug and compare various Real Time operating systems

UNIT I

Brief Review of Unix Operating Systems (Unix Kernel – File system, Concepts of – Process, Concurrent Execution & Interrupts. Process Management – forks & execution. Programming with system calls, Process Scheduling. Shell programming and filters).

Portable Operating System Interface (POSIX) – IEEE Standard 1003.13 & POSIX real time profile. POSIX versus traditional Unix signals, overheads and timing predictability.

UNIT II

Hard versus Soft Real-time systems – examples, Jobs & Processors, Hard and Soft timing constraints, Hard Real-time systems, Soft Real-time systems. Classical Uniprocessor Scheduling Algorithms – RMS, Preemptive EDF, Allowing for Preemptive and Exclusion Condition.

UNIT III

Concept of Embedded Operating Systems, Differences between Traditional OS and RTOS. Real- time System Concepts, RTOS Kernel & Issues in Multitasking – Task Assignment, Task Priorities, Scheduling, Intertask Communication & Synchronization – Definition of Context Switching, Foreground ISRs and Background Tasks. Critical Section – Reentrant Functions, Interprocess Communication (IPC) – IPC through Semaphores, Mutex, Mailboxes, Message Queues or Pipes and Event Flags.

UNIT IV

VxWorks – POSIX Real Time Extensions, timeout features, Task Creation, Semaphores (Binary, Counting), Mutex, Mailbox, Message Queues, Memory Management – Virtual to Physical Address Mapping.

UNIT V

Debugging Tools and Cross Development Environment – Software Logic Analyzers, ICEs. Comparison of RTOS – VxWorks, µC/OS-II and RT Linux for Embedded Applications.

Learning Resources:

1. Jane W.S.Liu , "Real Time Systems" , Pearson Education, Asia, 2001.
2. Betcnhof, D.R., "Programming with POSIX threads", Addison - Wesley Longman, 1997.
3. "VxWorks Programmers Guide", Windriver, 1999.
4. Jean.J.Labrosse, "MicroC/OS-II", Taylor & Francis, 2002.
5. C.M.Krishna and G.Shin, "Real Time Systems", McGraw-Hill International Edition, 1997.