(14CS551)ADVANCED DATA STRUCTURES AND ALGORITHMS

Program: M.Tech
Year: I
Sem : I
Int. Max Marks: 40
Ext. Max Marks: 60

Lecture : 3/Week
Tutorial : -
Drawing : -
Credits : 3

COURES OBJECTIVES:

1. The fundamental design, analysis, and implementation of basic data structures.
2. Basic concepts in the specification and analysis of programs.
3. Principles for good program design, especially the uses of data abstraction.
4. Significance of algorithms in the computer field
5. Various aspects of algorithm development
6. Qualities of a good solution

COURSE OUTCOMES:

1. Basic ability to analyze algorithms and to determine algorithm correctness and time efficiency class.
2. Master a variety of advanced abstract data type (ADT) and data structures and their imple mentations.
3. Master different algorithm design techniques (brute-force, divide and conquer, greedy, etc
4. Ability to apply and implement learned algorithm design techniques and data structures to solve problems.

UNIT I

Algorithms, Performance analysis- time complexity and space complexity, Asymptotic Notation-Big Oh, Omega and Theta notations, Complexity Analysis Examples. Data structures-Linear and non linear data structures, ADT concept, Linear List ADT, Array representation, Linked representation, Vector representation, singly linked lists -insertion, deletion, search operations, doubly linked lists-insertion, deletion operations, circular lists. Representation of single, two dimensional arrays, Sparse matrices and their representation.

UNIT II

Stack and Queue ADTs, array and linked list representations, infix to postfix conversion using stack,implementation of recursion, Circular queue-insertion and deletion, Dequeue ADT, array and linked list representations, Priority queue ADT, implementation using Heaps, Insertion into a Max Heap, Deletion from a Max Heap, java.util package-ArrayList, Linked List, Vector classes, Stacks and Queues in java.util, Iterators in java.util.

UNIT III

Searching–Linear and binary search methods, Hashing-Hash functions, Collision Resolution methods-Open Addressing, Chaining, Hashing in java.util-HashMap, HashSet, Hashtable. Sorting –Bubble sort, Insertion sort, Quick sort, Merge sort, Heap sort, Radix sort, comparison of sorting methods.

UNIT IV

Trees- Ordinary and Binary trees terminology, Properties of Binary trees, Binary tree ADT, representations, recursive and non recursive traversals, Java code for traversals, Threaded binary trees.Graphs- Graphs terminology, Graph ADT, representations, graph traversals/search methods-dfs and bfs, Java code for graph traversals, Applications of Graphs-Minimum cost spanning tree using Kruskal's algorithm, Dijkstra's algorithm for Single Source Shortest Path Problem.

UNIT V

Search trees- Binary search tree-Binary search tree ADT, insertion, deletion and searching operations, Balanced search trees, AVL trees-Definition and examples only, Red Black trees – Definition and examples only, B-Trees-definition, insertion and searching operations, Trees in java.util- TreeSet, Tree Map Classes, Tries(examples only),Comparison of Search trees. Text compression-Huffman coding and decoding, Pattern matching-KMP algorithm.

TEXT BOOKS:

1. S. Sahni, "Data structures, Algorithms and Applications in Java", Universities Press. [ISBN:0-07-109217-x]
2. Adam Drozdek, "Data structures and Algorithms in Java", 3rd edition, Cengage Learning. [ISBN:978-9814239233]

REFERENCE BOOKS:

1. R.Lafore "Data structures and Algorithms in Java", Pearson education. ISBN: 9788 131718124.
2. J.P.Tremblay and G.A.Cheston "Data structures and Software Development in an Object-Oriented Domain", Java edition, Pearson Education.

(14CS552) COMPUTER SYSTEM DESIGN

Program: M.Tech
Year: I
Sem : I
Int. Max Marks: 40
Ext. Max Marks: 60

Lecture : 3/Week
Tutorial : -
Drawing : -
Credits : 3

COURSE OBJECTIVES:

1. To understabnd the fundamentals of Computer Systems Design and IT in devising IT solutions.
2. To know the Design, simulate, and analyze digital hardware.
3. To learn the Interface between basic hardware and software computing systems.
4. To Simulate and evaluate different computing architectures.
5. To understand the file management systems
6. To aware of security concepts

COURSE OUTCOMES:

The student will be able to

1. Master the binary and hexadecimal number systems including computer arithmetic.
2. Familiarize with the cache subsystem.
3. Familiarize with the representation of data, addressing modes, instructions sets.
4. Describe Analyze differing structures for operating systems.

UNIT I

Computer Structure: hardware, software, system software, Von-Neumann architecture – case study. IA -32 Pentium: registers and addressing, instructions, assembly language, program flow control, logic and shift/rotate instructions, multiply, divide MMX, SIMD instructions, I/O operations, subroutines. Input/output organization, interrupts, DMA, Buses, Interface circuits, I/O interfaces, device drivers in
Windows interrupt handlers.

UNIT II

Processing Unit: Execution of a complete instruction, multiple bus organization, hardwired control, micro programmed control.

Pipelining: data hazards, instruction hazards, influence on instruction sets, data path & control consideration, and RISC architecture introduction.

UNIT – III

Memory: types and hierarchy, model level organization, cache memory, performance considerations, mapping, virtual memory, swapping, paging, segmentation, replacement policies.

UNIT – IV

Processes and Threads: processes, threads, inter process communication, classical IPC problems, Deadlocks.

UNIT – V

File system: Files, directories, Implementation, UNIX file system

Security: Threats, intruders, accident data loss, basics of cryptography, user authentication.

TEXT BOOKS:

1. Carl Hamacher, Zvonks Vranesic, SafeaZaky "Computer Organization ", Vth Edition, McGraw Hill. [ISBN:0071412379]
2. Andrew S Tanenbaum "Modern Operating Systems", 2nd edition Pearson/PHI[ISBN:0-13-031358-0]

REFERENCE BOOKS:

1. Morris Mano "Computer System Architecture " 3rd Edition-Pearson Education. [ISBN:0131755633]
2. Abraham Silberchatz, Peter B. Galvin, Greg Gagne "Operating System Principles", 7th Edition, John Wiley

(14CS553) ADVANCED OPERATING SYSTEMS

Program: M.Tech
Year: I
Sem : I
Int. Max Marks: 40
Ext. Max Marks: 60

Lecture : 3/Week
Tutorial : -
Drawing : -
Credits : 3

CORSE OBJECTIVES:

1. To understand main components of Real time Operating system and their working
2. To study the operations performed by OS as a resource manager
3. To understand the scheduling policies of DOS
4. To implement the working principles of OS
5. To study different OS and compare their features
6. Uderstand and analyse theory and implementation of: processes,resource control (Concurrency etc.), physical and virtual memory, scheduling, I/O and files

COURSE OUTCOMES:

The student will be able to

1. Describe the general architecture of computers
2. Describe, contrast and compare differing structures for operating systems
3. analyze the high-level structure of the Linux kernel both in concept and source code
4. Acquire a detailed understanding of one aspect (the scheduler) of the Linux kernel

UNIT I

Real-time Operating Systems: Design issues, principles and case study.

UNIT II

Distributed Operating System: Design issues, features and principles of working, case study.

UNIT III

Network Operating System: Design issues, working principles and characteristic features, case study.

UNIT IV

Kernel Development: Issues and development principles, case study.

UNIT V

Protection, privacy, access control and security issues, solutions.

TEXT BOOKS:

1. A.Silberschatz,"Applied Operating System Concepts" Wiley, 2000. ISBN:0-471-36508-4
2. Lubemirs F Bic and Alan C. Shaw "Operating System Principles", Pearson Education, 2003.ISBN:0-13-026611-6

REFERENCE BOOKS:

1. Stallings", Operating Systems " Internal and Design Principles " 6th ed., PE.[ISBN:0-13-147954-7]
2. Andrew S Tanenbaum," Modern Operating Systems", 3rd ed., PE.[ISBN:013-031358-0]

(14CS554) DISTRIBUTED SYSTEMS

Program: M.Tech
Year: I
Sem : I
Int. Max Marks: 40
Ext. Max Marks: 60

Lecture : 3/Week
Tutorial : -
Drawing : -
Credits : 3

COURSE OBJECTIVES:

1. To explain what a distributed system is, why you would design a system as a distributedsystem, and what the desired properties of such systems are;
2. To list the principles underlying the functioning of distributed systems, describe the problems and challenges associated with these principles, and evaluate the effectiveness and shortcomings of their solutions;
3. To recognize how the principles are applied in contemporary distributed systems, explain how they affect the software design, and be able to identify features and design decisions that may cause problems;
4. To design a distributed system that fulfills requirements with regards to key distributed systems properties (such as scalability, transparency, etc.), be able to recognize when this is not possible, and explain why;
5. To build distributed system software using basic OS mechanisms as well as higher-level middleware and languages.
6. To understand the middleware technologies

COURSE OUTCOMES:

The student will be able to

1. To specify the properties of distributed algorithms, so called liveness and safety Properties.
2. Models of distributed systems, including failure and timing model.
3. Master basic algorithms for failure detection, leader elections, broadcast and multicast, basic shared memory in distributed systems, agreement protocols, and group communication.
4. Practice in design and implementation of selected distributed algorithms in middleware designed for group communication.

UNIT I

Characterization of Distributed Systems- Introduction, Examples of Distributed systems, Resource sharing and web, challenges, System models- Introduction, Architectural and Fundamental models, Networking and Internetworking, Interprocess Communication. Distributed objects and Remote Invocation-Introduction, Communication between distributed objects, RPC, Events and notifications, Case study-Java RMI.

UNIT II

Operating System Support- Introduction, OS layer, Protection, Processes and Threads, Communication and Invocation, Operating system architecture, Distributed File Systems-Introduction, File Service architecture, case study- SUN network file systems. Name Services-Introduction, Name Services and the Domain Name System, Case study of the Global Name Service, Case study of the X.500 Directory Service.

UNIT III

Peer to Peer Systems-Introduction, Napster and its legacy, Peer to Peer middleware, Routing overlays, Overlay case studies-Pastry, Tapestry, Application case studies-Squirrel, OceanStore. Time and Global States-Introduction, Clocks, events and Process states, Synchronizing physical clocks, logical time and logical clocks, global states, distributed debugging. Coordination and Agreement - Introduction, Distributed mutual exclusion, Elections, Multicast communication, consensus and related problems.

UNIT IV

Transactions and Concurrency control - Introduction, Transactions, Nested Transactions, Locks, Optimistic concurrency control, Timestamp ordering, Comparison of methods for concurrency Controls. Distributed Transactions - Introduction, Flat and Nested Distributed Transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery, Replication-Introduction, System model and group communication, Fault tolerant services, Transactions with replicated data.

UNIT V

Security - Introduction, Overview of Security techniques, Cryptographic algorithms, Digital signatures, Case studies-Kerberos, TLS, 802.11 WiFi. Distributed shared memory, Design and Implementation issues, Sequential consistency and Ivy case study, Release consistency and Munin case study, other consistency models, CORBA case study- Introduction, CORBA RMI, CORBA Services.

TEXT BOOKS:

1. G Coulouris, J Dollimore and T Kindberg “Distributed Systems Concepts and Design”, Fourth Edition, Pearson Education.[ISBN:0-13-101621-0]
2. S. Ghosh, Chapman & Hall/CRC, Taylor & Francis Group “Distributed Systems, 2010. [ISBN-13:978-1-58488-564-1]

REFERENCE BOOKS:

1. S.Mahajan and S.Shah, “Distributed Computing”,Oxford University Press.[ISBN-13:978-0198061861]
2. Pradeep K.Sinha,” Distributed Operating Systems Concepts and Design”,PHI.[ISBN:7-302-02411-1]

(14CS555) SOFTWARE PROCESS AND PROJECT MANAGEMENT
(ELECTIVE – I)

Program: M.Tech
Year: I
Sem : I
Int. Max Marks: 40
Ext. Max Marks: 60

Lecture : 3/Week
Tutorial : -
Drawing : -
Credits : 3

COURSE OBJECTIVES:

1. Describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project.
2. Compare and differentiate organization structures and project structures.
3. Implement a project to manage project schedule, expenses and resources with the application of suitable project management tools.
4. To understand the future software project management practices
5. To learn the different process models
6. To understand workflows, check points of process

COURSE OUTCOMES:

The student will be able to

1. Appreciate the importance of software process and management;
2. Apply project management techniques for information systems development;
3. Apply the management skills to monitor and control a software project;
4. Work together as a team in preparing a report

UNIT I

Software Process Maturity: Software maturity Framework**,** Principles of Software Process Change, Software Process Assessment, The Initial Process, The Repeatable Process, The Defined Process, The Managed Process, The ptimizing Process.

Process Reference Models: Capability Maturity Model (CMM)**,** CMMI, PCMM, PSP, TSP.

UNIT II

Software Project Management Renaissance: Conventional Software Management, Evolution of Software Economics, Improving Software Economics, The old way and the new way.

Life-Cycle Phases and Process artifacts: Engineering and Production stages, inception phase, elaboration phase, construction phase,transition phase, artifact sets, management artifacts, engineering artifacts and pragmatic artifacts,model based software architectures.

UNIT III

Workflows and Checkpoints of process: Software process workflows, Iteration workflows, Major milestones, Minor milestones, Periodic status assessments.

Process Planning: Work breakdown structures, Planning guidelines, cost and schedule estimating process, iteration planning process, Pragmatic planning.

UNIT IV

Project Organizations: Line-of- business organizations, project organizations, evolution of organizations, process automation.

Project Control and process instrumentation: The seven core metrics, management indicators, quality indicators, life-cycle expectations, Pragmatic
Software metrics and metrics automation.

UNIT V

CCPDS-R Case Study and Future Software Project Management Practices

Modern Project Profiles, Next-Generation software Economics, Modern Process Transitions.

TEXT BOOKS:

1. Watts S.Humphrey,"Managing the Software Process" , Pearson Education.[ISBN-13:978-0201180954]
2. Walker Royce"Software Project Management", Pearson Education. [ISBN: 9788177583786]

REFERENCE BOOKS:

1. Agile, Extreme, Robert Wysocki, "Effective Project Management: Traditional", Sixth edition, Wiley India, rp2011.[ISBN:978-1-118-01619-0]
2. Bob Hughes & Mike Cotterell ,"Software Project Management", fourth edition, TMH, 2006

(14CS556) NATURAL LANGUAGE PROCESSING (ELECTIVE-I)

Program: M.Tech
Year: I
Sem : I
Int. Max Marks: 40
Ext. Max Marks: 60

Lecture : 3/Week
Tutorial : -
Drawing : -
Credits : 3

COURSE OBJECTIVES:

1. To acquire basic understanding of linguistic concepts and natural language complexity, variability.
2. To acquire basic understanding of machine learning techniques as applied to language.
3. To implement N-grams Models.
4. to understand language modeling
5. to learn about the CFG
6. to information extraction and retrieval

COURSE OUTCOMES:

1. Given an appropriate NLP problem, students should be able to select a corpus and an annotation scheme for the problem and justify the choice over other candidates.
2. Given one of the main linguistic issues relevant to NLP (including the representation and induction of syntactic knowledge, and the modelling of lexical and semantic information, and the syntax-semantics interface), students should be able to construct an example of the issue and provide an explanation of how their example illustrates the issue in general.
3. Given an example of one of the main linguistic issues identified above, students should be able to classify it as belonging to that issue and relate the example to the issue in general.
4. Given an NLP problem, students should be able to analyse, assess and justify which algorithms are most appropriate for solving the problem, based on an understanding of fundamental algorithms such as Viterbi algorithm, inside-outside, chart-based parsing and generation.

UNIT I

Introduction and Overview: What is Natural Language Processing, hands-on demonstrations. Ambiguity and uncertainty in language.The Turing test. **Regular Expressions:** Chomsky hierarchy, regular languages, and their limitations. Finite-state automata. Practical regular expressions for finding and counting language phenomena. A little morphology. Exploring a large corpus with regextools. **Programming in Python:** An introduction to programming in Python. Variables, numbers, strings, arrays, dictionaries, conditionals, iteration. The NLTK (Natural Language Toolkit). **String Edit Distance and Alignment:** Key algorithmic tool: dynamic programming, a simple example, use in optimal alignment of sequences. String edit operations, edit distance, and examples of use in spelling correction, and machine translation.

UNIT II

Context Free Grammars: Constituency, CFG definition, use and limitations. Chomsky Normal Form. Top-down parsing, bottom-up parsing, and the problems with each. The desirability of combining evidence from both directions **Non-probabilistic Parsing** Efficient CFG parsing with CYK, another dynamic programming algorithms. Early parser. Designing a little grammar, and parsing with it on some test data. **Probability** Introduction to probability

theory Joint and conditional probability,marginals, independence, Bayes rule, combining evidence. Examples of applications in natural language. **Information Theory** The "Shannon game"--motivated by language! Entropy, crossentropy,information gain. Its application to some language phenomena.

UNIT III

Language modeling and Naive Bayes: Probabilistic language modeling and its applications. Markov models. N-grams. Estimating the probability of a word, and smoothing. Generative models of language. Part of Speech Tagging and Hidden Markov Models**,** Viterbi Algorithm for Finding Most Likely HMM Path Dynamic programming with Hidden Markov Models, and its use for part-of-speech tagging, Chinese word segmentation, prosody, information extraction, etc.

UNIT IV

Probabilistic Context Free Grammars: Weighted context free grammars. Weighted CYK. Pruning and beam search. **Parsing with PCFGs** A tree bank and what it takes to create one. The probabilistic version of CYK. Also: How do humans parse? Experiments with eye-tracking. Modern parsers. **Maximum Entropy Classifiers** The maximum entropy principle and its relation to maximum likelihood. Maximum entropy classifiers and their application to document classification, sentence segmentation, and other language tasks

UNIT V

Maximum Entropy Markov Models and Conditional Random Fields Part-of-speech tagging, noun-phrase segmentation and information extraction models that combine maximum entropy and finite-state machines. State-of-the-art models for NLP. **Lexical Semantics** Mathematics of Multinomial and Dirichlet distributions, Dirichlet as a smoothing for multinomial's. **Information Extraction** and deference Resolution- Various methods, including HMMs. Models of anaphora resolution. Machine learning methods for co reference.

TEXT BOOKS:

1. Jurafsky and Martin, "Speech and Language Processing", Prentice Hall[ISBN-13:978-0131873216]
2. Manning and Schutze, "Statistical Natural Language Processing" ,MIT Press[ISBN:0-262-13360-1]

REFERENCES BOOKS:

1. Cover,T.M. and J.A.Thomas "Elements of Information Theory",Wiley.[ISBN-13:978-0-471-24195-9]
2. James Allen,"Natural Language Understanding", The Benajmins/Cummings Publishing Company

(14CS557) PATTERN RECOGNITION
(ELECTIVE – I)

Program: M.Tech
Year: I
Sem : I
Int. Max Marks: 40
Ext. Max Marks: 60

Lecture : 3/Week
Tutorial : -
Drawing : -
Credits : 3

COURSE OBJECTIVES:

1. To implement pattern recognition and machine learning theories
2. To design and implement certain important pattern recognition techniques
3. To apply the pattern recognition theories to applications of interest
4. To implement the entropy minimization, clustering transformation and feature ordering
5. Understand and analyse methods for automatic training of classification systems
6. to underastand the applications of pattern recognition

COURSE OUTCOMES:

1. Design systems and algorithms for pattern recognition (signal classification), with focus on sequences of patterns that are analyzed using, e.g., hidden Markov models (HMM),
2. Analyse classification problems probabilistically and estimate classifier performance,
3. Apply Maximum-likelihood parameter estimation in relatively complex probabilistic models, such as mixture density models and hidden Markov models.
4. Understand the principles of Bayesian parameter estimation and apply them in relatively simple probabilistic models.

UNIT I

Introduction: Basic concepts, Applications, Fundamental problems in pattern Recognition system design, Design concepts and methodologies, Examples of Automatic Pattern recognition systems, Simple pattern recognition model. **Decision And Distance Functions:** Linear and generalized decision functions, Pattern space and weight space, Geometrical properties, implementations of decision functions, Minimum-distance pattern classifications.

UNIT II

Probability: Probability of events: Random variables, Joint distributions and densities, Movements of random variables, Estimation of parameter from samples. **Statistical Decision Making-** Introduction, Baye's theorem, Multiple features, Conditionally independent features, ecision boundaries, Unequal cost of error, estimation of error rates, the leaving-one-out-techniques,characteristic curves, estimating the composition of populations. Baye's classifier for normal patterns.

UNIT III

Non Parametric Decision Making: Introduction, histogram, kernel and window estimation, Nearest neighbour classification techniques. Adaptive decision boundaries, adaptive discriminate functions, Minimum squared error discriminate functions, choosing a decision making techniques. **Clustering and Partitioning -** Hierarchical Clustering: Introduction, agglomerative clustering algorithm, the single-linkage, complete-linkage and average-linkage algorithm.Ward's method Partition clustering-Forg's algorithm, K-means's algorithm, Isodata algorithm.

UNIT IV

Pattern Preprocessing and Feature Selection: Introduction, distance measures, clustering transformation and feature ordering, clustering in feature selection through entropy minimization, features selection through orthogonal expansion, binary feature selection.

UNIT V

Syntactic Pattern Recognition and Application of Pattern Recognition: Introduction, concepts from formal language theory, formulation of syntactic pattern recognition problem, syntactic pattern description, recognition grammars, automata as pattern recognizers, Application of pattern recognition techniques in bio-metric, facial recognition, IRIS scon, Finger prints, etc.,

TEXT BOOKS:

1. Gose. Johnsonbaugh. Jost. “Pattern recognition and Image Analysis”, PHI. [ISBN-10:8120314840]
2. Tou. Rafael. Gonzalez. “Pattern Recognition Principle”, Pearson Education [ISBN:9788436814897]

REFERENCE BOOK:

1. Richard duda, Hart, David Strok, “Pattern Classification”, John Wiley.[ISBN:0-471-05669-3]
2. M.Anji Reddy,Y.Hari Shankar“Digital Image Processing”, BS Publications.[ISBN-13:9788178001227]

(14CS558) MACHINE LEARNING
(ELECTIVE –II)

Program: M.Tech
Year: I
Sem : I
Int. Max Marks: 40
Ext. Max Marks: 60

Lecture : 3/Week
Tutorial : -
Drawing : -
Credits : 3

COURSE OBJECTIVES:

1. To be able to formulate machine learning problems corresponding to different applications.
2. To understand a range of machine learning algorithms along with their strengths and weaknesses.
3. To understand the basic theory underlying machine learning.
4. To be able to apply machine learning algorithms to solve problems of moderate complexity.
5. To be able to read current research papers and understands the issues raised by current research.
6. to understand inductive and analytical learning

COURSE OUTCOMES:

1. Apply machine learning: data, model selection, model complexity, etc.
2. Apply desidn and analyze the popular machine learning approaches.
3. Appreciate the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning.
4. Be able to design and implement various machine learning algorithms in a range of real-world applications.

UNIT I

Introduction: Well-posed learning problems, Designing a learning system, Perspectives and issues in machine learning **Concept learning and the general to specific ordering –** Introduction, A concept learning task, Concept learning as search, Find-S: finding a maximally specific hypothesis, Version spaces and the candidate elimination algorithm, Remarks on version spaces and candidate elimination, Inductive bias

UNIT II

Decision Tree learning: Introduction, Decision tree representation, Appropriate problems for decision tree learning, The basic decision tree learning algorithm, Hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning **Artificial Neural Networks –** Introduction, Neural network representation, Appropriate problems for neural network learning, Perceptions, Multilayer networks and the back propagation algorithm, Remarks on the back propagation algorithm, An illustrative example face recognition Advanced topics in artificial neural networks. **Evaluation Hypotheses –** Motivation, Estimation hypothesis accuracy, Basics of sampling theory, A general approach for deriving confidence intervals, Difference in error of two hypotheses, Comparing learning algorithms.

UNIT III

Bayesian learning: Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum likelihood and least squared error hypotheses, Maximum likelihood hypotheses for predicting probabilities, Minimum description length principle, Bayes optimal classifier, Gibs algorithm, Naïve Bayes classifier, An example learning to classify text, Bayesian belief networks The EM algorithm **Computational learning theory –** Introduction, Probability learning an approximately correct hypothesis, Sample complexity for Finite Hypothesis Space, Sample Complexity for infinite Hypothesis Spaces, The mistake bound model of learning **Instance-Based Learning**- Introduction, k -Nearest Neighbour Learning, Locally Weighted Regression, Radial Basis Functions, Case-Based Reasoning, Remarks on Lazy and Eager Learning **Genetic Algorithms** – Motivation, Genetic Algorithms, An illustrative Example, Hypothesis Space Search, Genetic Programming, Models of Evolution and Learning, Parallelizing Genetic Algorithms.

UNIT IV

Learning Sets of Rules: Introduction, Sequential Covering Algorithms, Learning Rule Sets: Summary, Learning First Order Rules, Learning Sets of First Order Rules: FOIL, Induction as Inverted Deduction, Inverting Resolution. **Analytical Learning** - Introduction, Learning with Perfect Domain Theories: Prolog-EBG Remarks on Explanation-Based Learning, Explanation-Based Learning of Search Control Knowledge

UNIT V

Combining Inductive and Analytical Learning: Motivation, Inductive-Analytical Approaches to Learning, Using Prior Knowledge to Initialize the Hypothesis, Using Prior Knowledge to Alter the Search Objective, Using Prior Knowledge to Augment Search Operators, **Reinforcement Learning** – Introduction, The Learning Task, Q Learning, Non-Deterministic, Rewards and Actions, Temporal Difference Learning, Generalizing from Examples, Relationship to Dynamic Programming.

TEXT BOOKS:

1. Tom M. Mitchell,“Machine Learning”,MGH,ISBN-13:9780071154673,978-1449303716
2. Stephen Marsland, Taylor & Francis (CRC),”Machine Learning: An Algorithmic Perspective”.[ISBN-13:978-1-4200-6718-7]

REFERENCE BOOKS:

1. William W Hsieh, “Machine Learning Methods in the Environmental Sciences, Neural Networks”, Cambridge Univ Press.[ISBN:9780521181914]
2. Richard o. Duda, Peter E. Hart and David G. Stork, “pattern classification”, John Wiley & Sons Inc.,2001.[ISBN:978-0-471-05669-0]

(14CS559) PARALLEL AND DISTRIBUTED ALGORITHMS (ELECTIVE –II)

Program: M.Tech
Year: I
Sem : I
Int. Max Marks: 40
Ext. Max Marks: 60

Lecture : 3/Week
Tutorial : -
Drawing : -
Credits : 3

COURSE OBJECTIVES:

1. To learn parallel and distributed algorithms development techniques for shared memory and message passing models.
2. To study the main classes of parallel algorithms.
3. To study the complexity and correctness models for parallel algorithms.
4. to learn about the synchronous computations
5. to understand distributive shared memory sustems
6. to leran about the algorithms

COURSCE OUTCOMES:

1. Analyze the evolution of high performance computing (HPC) with respect to laws and the contemporary notion that involves mobility for data, hardware devices and software agents;
2. Understand, appreciate and apply parallel and distributed algorithms in problem solving;
3. Evaluate the impact of network topology on parallel/distributed algorithm formulations and traffic their performance;
4. Gain hand-on experience with the agent-based and Internet-based parallel and distributed programming techniques;

UNIT-I

Basic Techniques, Parallel Computers for increase Computation speed, Parallel & Cluster Computing.

UNIT-II

Message Passing Technique- Evaluating Parallel programs and debugging, Portioning and Divide and Conquer strategies examples.

UNIT-III

Pipelining- Techniques computing platform, pipeline programs examples.

UNIT-IV

Synchronous Computations, load balancing, distributed termination examples, programming with shared memory, shared memory multiprocessor constructs for specifying parallelist sharing data parallel programming languages and constructs, open MP.

UNIT-V

Distributed shared memory systems and programming achieving constant memory distributed shared memory programming primitives, algorithms – sorting and numerical algorithms.

TEXT BOOK:

1. Barry Wilkinson, Michael Allen," Parallel Programming", Pearson Education, 2nd Edition. [ISBN-13:9780131405639]

REFERENCE BOOK:

1. Jaja ,"Introduction to Parallel algorithms "Pearson, 1992.[ISBN:0201548569]

(14CS560) SOFTWARE ARCHITECTURE AND DESIGN PATTERNS
(ELECTIVE –II)

Program: M.Tech
Year: I
Sem : I
Int. Max Marks: 40
Ext. Max Marks: 60

Lecture : 3/Week
Tutorial : -
Drawing : -
Credits : 3

COURSE OBJECTIVES:

1. To understand the concept of patterns and the Catalog.
2. To discuss the Presentation tier design patterns and their affect on: sessions, client access, validation and consistency.
3. To understand the variety of implemented bad practices related to the Business and Integration tiers.
4. To highlight the evolution of patterns.
5. To how to add functionality to designs while minimizing complexity
6. To understand what design patterns really are, and are not

COURSE OUTCOMES:

The student will be able to

1. Argue the importance and role of software architecture in large scale software systems
2. Design and motivate software architecture for large scale software systems
3. Recognise major software architectural styles, design patterns, and frameworks
4. Discuss and evaluate the current trends and technologies such as model-driven, service-oriented, and aspect-oriented architectures and Evaluate the coming attractions in software architecture research and practice

UNIT I

Envisioning Architecture: The Architecture Business Cycle, What is Software Architecture, Architectural patterns, reference models, reference architectures, architectural structures and views.**Creating an Architecture** Quality Attributes, Achieving qualities, Architectural styles and patterns, designing the Architecture, Documenting software architectures, Reconstructing Software Architecture.

UNIT II

Analyzing Architectures Architecture Evaluation, Architecture design decision making, ATAM, CBAM. **Moving from one system to many** Software Product Lines, Building systems from off the shelf components, Software architecture in future.

UNIT III

Patterns Pattern Description, Organizing catalogs, role in solving design problems, Selection and usage.

Creational and Structural patterns: Abstract factory, builder, factory method, prototype, singleton, adapter, bridge, composite, façade, flyweight.

UNIT IV

Behavioral patterns: Chain of responsibility, command, Interpreter, iterator, mediator, memento, observer, state, strategy, template method, visitor.

UNIT V

Case Studies: A-7E – A case study in utilizing architectural structures, The World Wide Web - a case study in interoperability, Air Traffic Control – a case study in designing for high availability, Celsius Tech – a case study in product line development,

TEXT BOOKS:

1. Len Bass, Paul Clements & Rick Kazman, "Software Architecture in Practice", second edition, Pearson Education, 2003.
2. Erich Gamma, "Design Patterns", Pearson Education, 1995.

REFERENCE BOOKS:

1. David M. Dikel, David Kane and James R. Wilson, "Software architecture", Prentice Hall PTR, 2001.
2. F.Buschmann & others, "Pattern Oriented Software Architecture", John Wiley & Sons.

(14CS584) ADVANCED DATA STRUCTURES AND ALGORITHMS LAB

Program: M.Tech
Year: I
Sem : I
Int. Max Marks: 40
Ext. Max Marks: 60

Lecture : -
Tutorial : -
Practical : 3/Week
Credits : 2

COURSE OBJECTIVES:

1. The fundamental design, analysis, and implementation of basic data structures.
2. Basic concepts in the specification and analysis of programs.
3. Principles for good program design, especially the uses of data abstraction.
4. to understand the sorting techniques
5. to understand the non linear data structures
6. to learn bout the pattern matching

COURSE OUTCOMES:

1. Basic ability to analyze algorithms and to determine algorithm correctness and time Efficiency class.
2. Master a variety of advanced abstract data type (ADT) and data structures and their Implementations.
3. Master different algorithm design techniques (brute-force, divide and conquer, greedy, etc.)
4. Ability to apply and implement learned algorithm design techniques and data structures to solve problems

Sample Problems on Data structures:

1. Write Java programs that use both recursive and non-recursive functions for implementing the following searching methods:
   a) Linear search b) Binary search
2. Write Java programs to implement the following using arrays and linked lists
   a) List ADT
3. Write Java programs to implement the following using an array.
   a) Stack ADT b) Queue ADT
4. Write a Java program that reads an infix expression and converts the expression to postfix form. (Use stack ADT).
5. Write a Java program to implement circular queue ADT using an array.
6. Write a Java program that uses both a stack and a queue to test whether the given string is a palindrome or not.
7. Write Java programs to implement the following using a singly linked list.
   a) Stack ADT b) Queue ADT
8. Write Java programs to implement the deque (double ended queue) ADT using
   a) Array b) Singly linked list c) Doubly linked list.
9. Write a Java program to implement priority queue ADT.
10. Write a Java program to perform the following operations:
    a) Construct a binary search tree of elements.
    b) Search for a key element in the above binary search tree.

c) Delete an element from the above binary search tree.

11. Write a Java program to implement all the functions of a dictionary (ADT) using Hashing.
12. Write a Java program to implement Dijkstra's algorithm for Single source shortest path problem.
13. Write Java programs that use recursive and non-recursive functions to traverse the given binary tree in
    a) Preorder b) Inorder c) Postorder.
14. Write Java programs for the implementation of bfs and dfs for a given graph.
15. Write Java programs for implementing the following sorting methods:
    a) Bubble sort d) Merge sort g) Binary tree sort
    b) Insertion sort e) Heap sort
    c) Quick sort f) Radix sort
16. Write a Java program to perform the following operations:
    a) Insertion into a B-tree b) Searching in a B-tree
17. Write a Java program that implements Kruskal's algorithm to generate minimum cost spanning tree.
18. Write a Java program that implements KMP algorithm for pattern matching.

REFERENCE BOOKS:

1. A.Drozdek "Data Structures and Algorithms in java", 3rd edition, Cengage Learning.
2. J.R.Hubbard, "Data Structures with Java", 2nd edition, Schaum's Outlines, TMH.

(Note: Use packages like java.io, java.util, etc)

(14CS561)ADVANCED NETWORK PROGRAMMING

Program: M.Tech
Year: I
Sem : II
Int. Max Marks: 40
Ext. Max Marks: 60

Lecture : 3/Week
Tutorial : -
Drawing : -
Credits : 3

COURSE OBJECTIVES:

1. Computer network programming involves writing computer programs that enable processes to communicate with each other across a computer network
2. Network programming to build effective client–server systems
3. To know about the Interprocess communication
4. To learn about peer-to-peer communication, the program can act both as a client and a server.
5. to learn about the networking programming
6. to understand about client - server applications

COURSE OUTCOMES:

1. To use Java Application Programming Interface and windowing toolkits (AWT, Swing)
2. To design GUI clients for network servers
3. To develop concurrent programs with threads, in particular, multithreaded servers
4. To develop and design distributed applications with sockets, JSF, EJB.

UNIT – I

Linux Utilities- File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking utilities, Filters, Text processing utilities and Backup utilities. Bourne again shell(bash) - Introduction, pipes and redirection, here documents, running a shell script, the shell as a programming language, shell meta characters, file name substitution, shell variables, command substitution, shell commands, the environment, quoting, test command, control structures, arithmetic in shell, shell script examples. Review of C programming concepts-arrays, strings (library functions), pointers, function pointers, structures, unions, libraries in C.

UNIT - II

Files- File Concept, File types File System Structure, Inodes, File Attributes, file I/O in C using system calls, kernel support for files, file status information-stat family, file and record locking-lockf and fcntl functions, file permissions- chmod, fchmod, file ownership-chown, lchown , fchown, linkssoft links and hard links – symlink, link, unlink. File and Directory management – Directory contents, Scanning Directories- Directory file APIs. Process- Process concept, Kernel support for process, process attributes, process control – process creation, replacing a process image, waiting for a process, process termination, zombie process, orphan process.

UNIT - III

Signals- Introduction to signals, Signal generation and handling, Kernel support for signals, Signal function, unreliable signals, reliable signals, kill, raise , alarm, pause, abort, sleep functions. Interprocess Communication - Introduction to IPC mechanisms, Pipes- creation,

IPC between related processes using unnamed pipes, FIFOs-creation, IPC between unrelated processes using FIFOs(Named pipes), differences between unnamed and named pipes, popen and pclose library functions, Introduction to message queues, semaphores and shared memory.Message Queues- Kernel support for messages, UNIX system V APIs for messages, client/server example. Semaphores-Kernel support for semaphores, UNIX system V APIs for semaphores.

UNIT – IV

Shared Memory- Kernel support for shared memory, UNIX system V APIs for shared memory, client/server example. Network IPC - Introduction to Unix Sockets, IPC over a network, Client-Server model ,Address formats(Unix domain and Internet domain), Socket system calls for Connection Oriented -Communication, Socket system calls for Connectionless-Communication, Example-Client/Server Programs- Single Server-Client connection, Multiple simultaneous clients, Socket options – setsockopt, getsockopt, fcntl.

UNIT-V

Network Programming in Java-Network basics, TCP sockets, UDP sockets (datagram sockets), Server programs that can handle one connection at a time and multiple connections (using multithreaded server), Remote Method Invocation (Java RMI)-Basic RMI Process, Implementation details-Client-Server Application.

TEXT BOOKS:

1. T.Chan, “Unix System Programming using C++”, PHI.
2. Sumitabha Das, “Unix Concepts and Applications”, 4th Edition, TMH.

REFERENCE BOOKS:

1. Robert Love, “Linux System Programming”, O’Reilly, SPD.
2. Jan Graba, “An Introduction to Network Programming with Java”, Springer, rp 2010.

(14CS562) ADVANCED DATABASES

Program: M.Tech
Year: I
Sem : II
Int. Max Marks: 40
Ext. Max Marks: 60

Lecture : 3/Week
Tutorial : -
Drawing : -
Credits : 3

COURSE OBJECTIVES:

1. History and Structure of databases
2. How to design a database
3. How to convert the design into the appropriate tables
4. Handling Keys appropriately
5. Enforcing Integrity Constraints to keep the database consistent
6. Normalizing the tables to eliminate redundancies

COURSE OUTCOMES:

1. Demonstrate an understanding of how to use the more advanced filtering SQL commands.
2. Illustrate how subqueries can be used to compare the results in separate groups.
3. Describe the properties of set-theoretic operators.
4. Master the basics of query evaluation techniques and and query optimization.
5. Be familiar with the basic issues of transaction processing and concurrency control

UNIT I

Database System Applications, Purpose of Database Systems, View of Data – Data Abstraction, Instances and Schemas, Data Models – the ER Model, Relational Model, Other Models – Database Languages – DDL,DML, Database Access from Applications Programs, Transaction Management, Data Storage and Querying, Database Architecture, Database Users and Administrators, ER diagrams,. Relational Model: Introduction to the Relational Model – Integrity Constraints Over Relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design, Introduction to Views –Altering Tables and Views, Relational Algebra, Basic SQL Queries, Nested Queries, Complex Integrity Constraints in SQL, Triggers

UNIT II

Introduction to Schema Refinement – Problems Caused by redundancy, Decompositions – Problem related to decomposition, Functional Dependencies - Reasoning about FDS, Normal Forms – FIRST, SECOND, THIRD Normal forms – BCNF –Properties of Decompositions- Loss less- join ecomposition, Dependency preserving Decomposition, Schema Refinement in Data base Design – Multi valued Dependencies – FOURTH Normal Form, Join Dependencies, FIFTH Normal form.

UNIT III

Transaction Management: The ACID Properties, Transactions and Schedules, Concurrent Execution of Transactions – Lock Based Concurrency Control, Deadlocks – Performance of Locking – Transaction Support in SQL. Concurrency Control: Serializability, and

recoverability – Introduction to Lock Management – Lock Conversions, Dealing with Dead Locks, Specialized Locking Techniques – Concurrency Control without Locking. Crash recovery: Introduction to Crash recovery, Introduction to ARIES, the Log, and Other Recovery related Structures, the Write-Ahead Log Protocol, Check pointing, recovering from a System Crash, Media recovery

UNIT IV

Overview of Storage and Indexing: Data on External Storage, File Organization and Indexing – Clustered Indexes, Primary and Secondary Indexes, Index data Structures – Hash Based Indexing, Tree based Indexing Storing data: Disks and Files: -The Memory Hierarchy – Redundant Arrays of Independent Disks. Tree Structured Indexing: Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM) B+ Trees: A Dynamic Index Structure, Search, Insert, Delete. Hash Based Indexing: Static Hashing, Extendable hashing, Linear Hashing, Extendable vs. Linear Hashing.

UNIT V

Distributed databases: Introduction to distributed databases, Distributed DBMS architectures, Storing data in a distributed DBMS, Distributed catalog management, Distributed query processing Updating distributed data, Distributed transactions, Distributed concurrency control, Distributed recovery.

TEXT BOOKS:

1. Raghu Ramakrishnan, Johannes Gehrke, “Data base Management Systems”, TMH, 3rd Edition, 2003.
2. A.Silberschatz, H.F. Korth, S.Sudarshan, “Data base System Concepts”, McGraw hill, VI edition, 2006.

REFERENCE BOOKS:

1. C.J.Date, “Introduction to Database Systems”, Pearson Education.
2. P.K.Das Gupta,” Database Management System Oracle SQL and PL/SQL”, PHI.

(14CS563) WEB SERVICES AND SERVICE ORIENTED ARCHITECTURE

Program: M.Tech
Year: I
Sem : II
Int. Max Marks: 40
Ext. Max Marks: 60

Lecture : 3/Week
Tutorial : -
Drawing : -
Credits : 3

COURSE OBJECTIVES:

1. To Understand Web Services and implementation model for SOA
2. To Understand the SOA, its Principles and Benefits, XML concepts
3. To Understand paradigms needed for testing Web Services
4. To explore different Test Strategies for SOA-based applications
5. To implement functional testing, compliance testing and load testing of Web Services
6. To Identify bug-finding ideas in testing Web Services

COURSE OUTCOMES:

1. Understand and describe the principles of service oriented architecture
2. Understand and describe the standards and technologies of modern web services implementations
3. Effectively use market-leading development tools to create and consume web services
4. Analyze the requirements of a medium-difficulty programming task, and create software that meets the requirements

UNIT I

Evolution and Emergence of Web Services – Evolution of distributed computing. Core distributed computing technologies – client/server, CORBA, JAVA RMI, Micro Soft DCOM, MOM, Challenges in Distributed Computing, role of J2EE and XML in distributed computing, emergence of Web Services and Service Oriented Architecture (SOA). Introduction to Web Services – The definition of web services, basic operational model of web services, tools and technologies enabling web services, benefits and challenges of using web services.

UNIT II

Web Service Architecture – Web services Architecture and its characteristics, core building blocks of web services, standards and technologies available for implementing web services, web services communication, basic steps of implementing web services. Describing Web Services – WSDL introduction, non functional service description, WSDL1.1 Vs WSDL 2.0, WSDL document, WSDL elements, WSDL binding, WSDL tools, WSDL port type, limitations of WSDL.

UNIT III

Brief Over View of XML – XML Document structure, XML namespaces, Defining structure in XML documents, Reuse of XML schemes, Document navigation and transformation. SOAP : Simple bject Access Protocol, Inter-application communication and wire protocols, SOAP as a messaging protocol,Structure of a SOAP message, SOAP envelope, Encoding,

Service Oriented Architectures, SOA revisited, Service roles in a SOA, Reliable messaging, The enterprise Service Bus, SOA Development Lifecycle, SOAP HTTP binding, SOAP communication model, Error handling in SOAP.

UNIT IV

Registering and Discovering Services : The role of service registries, Service discovery, Universal Description, Discovery, and Integration, UDDI Architecture, UDDI Data Model, Interfaces, UDDI Implementation, UDDI with WSDL, UDDI specification, Service Addressing and Notification, Referencing and addressing Web Services, Web Services Notification.

UNIT V

SOA and web services security considerations, Network-level security mechanisms, Application-level security topologies, XML security standards, Semantics and Web Services, The semantic interoperability problem, The role of metadata, Service metadata, Overview of .NET and J2EE, SOA and Web Service Management, Managing Distributed System, Enterprise management Framework, Standard distributed management frameworks, Web service management, Richer schema languages, WS-Metadata Exchange.

TEXT BOOKS:

1. Michael P. Papazoglou,"Web Services & SOA Principles and Technology", Second Edition.
2. R. Nagappan, R. Skoczylas, R.P. Sriganesh "Developing Java Web Services", Wiley India.

REFERENCE BOOKS:

1. S. Chatterjee, J. Webber, "Developing Enterprise Web Services", Pearson Education.
2. S. Graham and others, "Building web Services with Java", 2nd Edition, Pearson Education.

(14CS564)GRID AND CLOUD COMPUTING

Program: M.Tech
Year: I
Sem : II
Int. Max Marks: 40
Ext. Max Marks: 60

Lecture : 3/Week
Tutorial : -
Drawing : -
Credits : 3

COURSE OBJECTIVES:

1. To know the Basics, techniques and tools for Grid & Cloud Computing
2. To understand any kind of heterogeneous resources over a network using open standards
3. To learn the Service models
4. To know about the virtualization
5. To know about the grid architecture
6. to know about the cloud architecture

COURSE OUTCOMES:

1. Be able to evaluate enabling technologies such as high-speed links and storage area networks for building computer grids;
2. Be able to utilise grid computing and clustering middleware, such as parallel virtual machine (pvm), message passing interface (mpi), hpc portals, and peer-to-peer networks for implementing virtual super computing resources;
3. Be able to design a grid computing application in one of the key application areas e.g. Computer animation, e-research;
4. Describe the hardware and software concepts and architecture of cloud computing.

UNIT-I

System models for advanced computing –clusters of cooperative computing, grid computing and Cloud computing; software systems for advanced computing-service oriented software and parallel And distributed programming models with introductory details, Features of grid and cloud platform.

UNIT-II

Cloud Computing services models and features in Saas, Paas and Iaas. Service oriented architecture and web services; Features of cloud computing architectures and simple case studies.

UNIT-III

Virtualization- Characteristic features, Taxonomy Hypervisor, Virtualization and Cloud Computing, Pros and Cons of Cloud Computing, Technology Examples/Case Studies.

UNIT-IV

Cloud programming Environmental- Map Reduce Hadoop Library from Apache, Open Source Cloud Software Systems –Eucalyptus.

UNIT-V

Grid Architecture and Service modeling, Grid resource management, Grid Application trends.

TEXT BOOKS:

1. Kaittwang Geoffrey C.Fox and Jack J Dongrra,"Distributed and Cloud Computing", Elsevier India, 2012.
2. Raj Kumar Buyya, Christian Vecchiola and S.Tanurai Selvi, "Mastering Cloud Computing", TMH, 2012.

REFERENCE BOOKS:

1. John W. Ritting House and James F Ramsome, "Cloud Computing", CRC Press, 2012.
1. 2. Gautam Shroff, "Enterprise Cloud Computing", Cambridge University Press, 2012

(14CS565) ADVANCED DATA MINING
ELECTIVE-III

Program: M.Tech
Year: I
Sem : II
Int. Max Marks: 40
Ext. Max Marks: 60

Lecture : 3/Week
Tutorial : -
Drawing : -
Credits : 3

COURSE OBJECTIVES:

1. To develop the abilities of critical analysis to data mining systems and applications.
2. practical and theoretical understanding of the technologies for data mining
3. To understand the strengths and limitations of various data mining models
4. To know about the advanced clustering
5. To learn about the web and text mining
6. To understand temporal and spatial data mining

COURSE OUTCOMES:

1. Display a comprehensive understanding of different data mining tasks and the algorithms most appropriate for addressing these tasks enabling the student to independently carry out data mining projects
2. Creatively deal with data related issues that need to be addressed for successful data mining to be carried out
3. Systematically evaluate models/algorithms with respect to their accuracy
4. Critique emerging standards for data mining and apply them to practical scenarios

UNIT-I

Data mining Overview and Advanced Pattern Mining: Data mining tasks – mining frequent patterns, associations and correlations, classification and regression for predictive analysis, cluster analysis, outlier analysis; advanced pattern mining in multilevel, multidimensional space– mining multilevel associations, mining multidimensional associations, mining quantitative association rules, mining rare patterns and negative patterns.

UNIT-II

Advance Classification: Classification by back propagation, support vector machines, classification using frequent patterns, other classification methods – genetic algorithms, roughest approach, fuzz>set approach;

UNIT-III

Advance Clustering: Density - based methods –DBSCAN, OPTICS, DENCLUE; Grid-Based methods – STING, CLIQUE; Exception – maximization algorithm; clustering High-Dimensional Data; Clustering Graph and Network Data.

UNIT-IV

Web and Text Mining: Introduction, web mining, web content mining, web structure mining, we usage mining, Text mining – unstructured text, episode rule discovery for texts, hierarchy of categories, text clustering.

UNIT-V

Temporal and Spatial Data Mining: Introduction; Temporal Data Mining – Temporal Association Rules, Sequence Mining, GSP algorithm,
SPADE, SPIRIT Episode Discovery, Time Series Analysis, Spatial Mining – Spatial Mining Tasks, Spatial Clustering. Data Mining Applications.

TEXT BOOKS:

1. Jiawei Hang Micheline Kamber, Jian pei, Morgan Kaufmannn, "Data Mining Concepts and Techniques"
2. Arun K pujari, "Data Mining Techniques", Universities Press.

REFERENCE BOOKS:

1. Pang-Ning Tan,Vipin kumar, Michael Steinbach,"Introduction to Data Mining", Pearson.
2. T.V Sveresh Kumar, B.Esware Reddy, Jagadish S Kalimani, "Data Mining Principles & Applications" Elsevier.

(14CS566)STORAGE AREA NETWORKS
ELECTIVE-III

Program: M.Tech
Year: I
Sem : II
Int. Max Marks: 40
Ext. Max Marks: 60

Lecture : 3/Week
Tutorial : -
Drawing : -
Credits : 3

COURSE OBJECTIVES:

1. To understand Storage Area Networks characteristics and components.
2. To become familiar with the SAN vendors and their products
3. To learn Fibre Channel protocols and how SAN components use them to communicate with each other
4. To become familiar with Cisco MDS 9000 Multilayer Directors and Fabric Switches
5. Thoroughly learn Cisco SAN-OS features.
6. To understand the use of all SAN-OS commands. Practice variations of SANOS features

COURSE OUTCOMES:

1. Describe storage technology solutions such as SAN, NAS, DAS and CAS.
2. Analyze the technologies and articulate available solutions to support an IT infrastructure including Business Continuity, Information Availability, Local and Remote Replication, Backup and Recovery and Disaster Recovery needs of an organization.
3. Apply the key tasks in successfully planning, deploying, managing, and monitoring a modern large data storage infrastructure,
4. Work in a team and quickly get up to speed with various proprietary technologies.

UNIT I

Introduction to Storage Technology: Review data creation and the amount of data being created and understand the value of data to a business, challenges in data storage and data management, Solutions available for data storage, Core elements of a data center infrastructure, role of each element in supporting business activities.

UNIT II

Storage Systems Architecture: Hardware and software components of the host environment, Key protocols and concepts used by each component ,Physical and logical components of a connectivity environment ,Major physical components of a disk drive and their function, logical constructs of a physical disk, access characteristics, and performance Implications, Concept of RAID and its components , Different RAID levels and their suitability for different application environments: RAID 0, RAID 1, RAID 3, RAID 4, RAID 5, RAID 0+1, RAID 1+0, RAID 6, Compare and contrast integrated and modular storage systems ,High-level architecture and working of an intelligent storage system.

UNIT III

Introduction to Networked Storage: Evolution of networked storage, Architecture, components, and topologies of FC-SAN, NAS, and IPSAN,Benefits of the different networked storage options, understand the need for long-term archiving solutions and

describe how CAS fulfills the need, understand the appropriateness of the different networked storage options for different application environments

UNIT IV

Information Availability & Monitoring & Managing Datacenter: List reasons for planned/unplanned outages and the impact of downtime, Impact of downtime, Differentiate between business continuity (BC) and disaster recovery (DR) ,RTO and RPO, Identify single points of failure in a storage infrastructure and list solutions to mitigate these failures, Architecture of backup/recovery and the different backup/recovery topologies, replication technologies and their role in ensuring information availability and business continuity, Remote replication technologies and their role in providing disaster recovery and business continuity capabilities Identify key areas to monitor in a data center, Industry standards for data center monitoring and management, Key metrics to monitor for different components in a storage infrastructure, Key management tasks in a data center.

UNIT V

Securing Storage and Storage Virtualization: Information security, Critical security attributes for information systems, Storage security domains, List and analyzes the common threats in each domain, Virtualization technologies, block-level and filelevel virtualization technologies and processes **Case Studies** The technologies described in the course are reinforced with EMC examples of actual solutions. Realistic case studies enable the participant to design the most appropriate solution for given sets of criteria.

TEXT BOOK:

1. EMC Corporation, “Information Storage and Management”, Wiley.
2. Robert Spalding, “Storage Networks: The Complete Reference“, Tata McGraw Hill, Osborne, 2003.

REFERENCE BOOKS:

1. Marc Farley, “Building Storage Networks”, Tata McGraw Hill, Osborne, 2001.
2. Meeta Gupta, “Storage Area Network Fundamentals”, Pearson Education Limited, 2002.

(14CS567) DATABASE SECURITY
ELECTIVE-III

Program: M.Tech
Year: I
Sem : II
Int. Max Marks: 40
Ext. Max Marks: 60

Lecture : 3/Week
Tutorial : -
Drawing : -
Credits : 3

COURSE OBJECTIVES:
1. To learn the security of databases
2. To learn the design techniques of database security
3. To learn the secure software design
4. To know about stastical DB Protection
5. To understand the IDS
6. To know about the models and protection of new generation DBs

COURSE OUTCOMES:
1. Carry out a risk analysis for a large database.
2. Implement identification and authentication procedures, fine-grained access control and data encryption techniques.
3. Set up accounts with privileges and roles.
4. Audit accounts and the database system.
5. Back-up and Restore a database.

UNIT I
Introduction: Introduction to Databases Security Problems in Databases Security Controls Conclusions **Security Models -1** Introduction Access Matrix Model Take-Grant Model Acten Model PN Model Hartson and Hsiao's Model Fernandez's Model Bussolati and Martella's Model for Distributed databases

UNIT II
Security Models -2: Bell and LaPadula's Model Biba's Model Dion's Model Sea View Model Jajodia and Sandhu's Model The Lattice Model for the Flow Control conclusion. **Security Mechanisms** Introduction User Identification/Authentication Memory Protection Resource Protection Control Flow Mechanisms Isolation Security Functionalities in Some Operating Systems Trusted Computer System Evaluation Criteria

UNIT III
Security Software Design: Introduction A Methodological Approach to Security Software Design Secure Operating System Design Secure DBMS Design Security Packages Database Security Design

UNIT IV
Statistical Database Protection & **Intrusion Detection Systems:** Introduction Statistics Concepts and Definitions Types of Attacks Inference Controls evaluation Criteria for Control Comparison .Introduction IDES System RETISS System ASES System Discovery

UNIT V

Models for The Protection Of New Generation Database Systems -1: Introduction A Model for the Protection of Frame Based Systems A Model for the Protection of Object-Oriented Systems SORION Model for the Protection of Object-Oriented Databases **Models For The Protection Of New Generation Database Systems -2** A Model for the Protection of New Generation Database Systems: the Orion Model Jajodia and Kogan's Model A Model for the Protection of Active Databases Conclusions.

TEXT BOOKS:

1. Hassan A. Afyouni "Database Security and Auditing", India Edition, CENGAGE Learning, 2009.
2. Castano, "Database Security", Second edition, Pearson Education.

REFERENCE BOOK:

1. Alfred basta, melissa zgola, "Database security" CENGAGE learning.

(14CS568)SEMANTIC WEB AND SOCIAL NETWORKS ELECTIVE-IV

Program: M.Tech
Year: I
Sem : II
Int. Max Marks: 40
Ext. Max Marks: 60

Lecture : 3/Week
Tutorial : -
Drawing : -
Credits : 3

COURSE OBJECTIVES:

1. To learn Web Intelligence
2. To learn Knowledge Representation for the Semantic Web
3. To learn Ontology Engineering
4. To learn Semantic Web Applications, Services and Technology
5. To learn Social Network Analysis and semantic web
6. To know about the different social networking technologies

COURSE OUTCOMES:

1. Describe the web intelligence and Knowledge Representation for the Semantic Web.
2. Discuss the principles of Social Network Analysis and semantic web.
3. Ability to work on Ontology Engineering.
4. Explain the problems and solutions introduced by Social Network Analysis and semantic web.

UNIT –I

Web IntelligenceThinking and Intelligent Web Applications, The Information Age ,The World Wide Web, Limitations of Today's Web, The Next Generation Web, Machine Intelligence, Artificial Intelligence, Ontology, Inference engines, Software Agents, Berners-Lee www, Semantic Road Map, Logic on the semantic Web.

UNIT -II

Knowledge Representation for the Semantic Web Ontologies and their role in the semantic web, Ontologies Languages for the Semantic Web –Resource Description Framework(RDF) / RDF Schema, Ontology Web Language(OWL), UML,XML/XML Schema.

UNIT-III

Ontology Engineering Ontology Engineering, Constructing Ontology, Ontology Development Tools, Ontology Methods, Ontology Sharing and Merging, Ontology Libraries and Ontology Mapping, Logic, Rule and Inference Engines.

UNIT-IV

Semantic Web Applications, Services and Technology Semantic Web applications and services, Semantic Search, e-learning, Semantic Bioinformatics, Knowledge Base ,XML Based Web Services, Creating an OWL-S Ontology for Web Services, Semantic Search Technology, Web Search Agents and Semantic Methods

UNIT-V

Social Network Analysis and semantic web What is social Networks analysis, development of the social networks analysis, Electronic Sources for Network Analysis – Electronic Discussion networks, Blogs and Online Communities, Web Based Networks. Building Semantic Web Applications with social network features.

TEXT BOOKS:

1. Berners Lee, Godel and Turing, "Thinking on the Web" ,Wiley inter science, 2008.
2. Peter Mika, "Social Networks and the Semantic Web", Springer, 2007.

REFERENCE BOOKS:

1. "J.Davies, R.Studer, P.Warren, Semantic Web Technologies, Trends and Research in Ontology Based Systems", John Wiley & Sons.
2. Liyang Lu Chapman and Hall/CRC Publishers, (Taylor & Francis Group), "Semantic Web and Semantic Web Services".

(14CS569) WIRELESS NETWORKS AND MOBILE COMPUTING
ELECTIVE-IV

Program: M.Tech
Year: I
Sem : II
Int. Max Marks: 40
Ext. Max Marks: 60

Lecture : 3/Week
Tutorial : -
Drawing : -
Credits : 3

COURSE OBJECTIVES:

1. To provide the students with the competences required for understanding and using the communications component of an universal communications environment.
2. emerging communications networks,
3. Their computational demands,
4. The classes of distributed services and applications enabled by these networks, and
5. The computational means required to create the new networks and the new applications.
6. To understand the wireless networks

COURSE OUTCOMES:

1. Describe the lower layer issues in wireless communication systems.
2. Discuss the principles of Mobile Computing and its enabling technologies,
3. Provide a foundation to critically analyze state of the art wireless communication systems.
4. Explain the problems and solutions introduced by wireless networks and mobile computing to traditional networking, operating systems, human-computer interface, architecture, and security.

UNIT I

Wireless Networks: Wireless Network, Wireless Network Architecture, Wireless Switching Technology, Wireless Communication problem, Wireless Network Reference Model, Wireless Networking Issues & Standards. **Mobile Computing:** Mobile communication, Mobile computing, Mobile Computing Architecture, Mobile Devices, Mobile System Networks, Mobility Management

UNIT II

Wireless Lan: Infra red Vs radio transmission, Infrastructure and Ad-hoc Network, IEEE 802.11: System Architecture, Protocol Architecture, 802.11b, 802.11a, Newer Developments, HIPERLAN 1,HIPERLAN 2, Bluetooth : User Scenarios, Architecture.

UNIT III

Global System for Mobile Communications (GSM): Mobile Services, System Architecture, Protocols, Localization & Calling, Handover, Security. **GPRS:** GPRS System Architecture, **UMTS**: UMTS System Architecture. **LTE**: Long Term Evolution.

UNIT IV

Mobile Network Layer: Mobile IP: Goals, Assumptions, Entities and Terminology, IP Packet Delivery, Agent Discovery, Registration, Tunneling and Encapsulation, Optimizations, Dynamic Host Configuration Protocol (DHCP)

UNIT V

Mobile Transport Layer: Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast Retransmit /fast recovery, Transmission /time-out freezing, Selective retransmission, Transaction oriented TCP, TCP over 2.5G/3G Wireless Networks.

TEXT BOOKS:

1. Jochen Schiller, "Mobile Communications", Pearson Education, Second Edition, 2008.
2. Dr. Sunilkumar, et al "Wireless and Mobile Networks: Concepts and Protocols", Wiley India.

REFERENCE BOOKS:

1. Asoke K Talukder, et al, "Mobile Computing", Tata McGraw Hill, 2008.
2. Raj Kamal, "Mobile Computing", OXFORD UNIVERSITY PRESS. 2011.

(14CS570)INFORMATION RETRIEVAL SYSTEMS
ELECTIVE-IV

Program: M.Tech
Year: I
Sem : II
Int. Max Marks: 40
Ext. Max Marks: 60

Lecture : 3/Week
Tutorial : -
Drawing : -
Credits : 3

COURSE OBJECTIVES:

1. To gain a good understanding of the foundation concepts of information retrieval techniques and be able to apply these concepts into practice.
2. To use different information retrieval techniques in various application areas
3. To apply IR principles to locate relevant information large collections of data
4. To analyze performance of retrieval systems when dealing with unmanaged data sources
5. To understand the retrieval systems for web search tasks.
6. To learn about the web crawling and analysis

COURSE OUTCOMES:

1. Use different information retrieval techniques in various application areas
2. Apply IR principles to locate relevant information large collections of data
3. Analyse performance of retrieval systems when dealing with unmanaged data sources
4. Implement retrieval systems for web search tasks.

UNIT I

Boolean retrieval. The term vocabulary and postings lists. Dictionaries and tolerant retrieval. Index construction. Index compression.

UNIT II

Scoring, term weighting and the vector space model. Computing scores in a complete search system. Evaluation in information retrieval. Relevance feedback and query expansion.

UNIT III

XML retrieval. Probabilistic information retrieval. Language models for information retrieval. Text classification. Vector space classification.

UNIT IV

Support vector machines and machine learning on documents, Flat clustering, Hierarchical clustering, Matrix decompositions and latent semantic indexing.

UNIT V

Web search basics. Web crawling and indexes, Link analysis.

TEXT BOOK:

1. Christopher D. Manning and Prabhakar Raghavan and Hinrich Schütze," Introduction to Information Retrieval", Cambridge University Press, 2008.
2. Kowalski, Gerald, Mark T Maybury, "Information Storage and Retrieval Systems: Theory and Implementation", Springer.

REFERENCE BOOKS:

1. Ricardo Baeza-Yates, "Modern Information Retrieval", Pearson Education, 2007.
2. David A Grossman and Ophir Frieder, "Information Retrieval: Algorithms and Heuristics", 2nd Edition, Springer, 2004.

(14CS587) WEB SERVICES LAB

Program: M.Tech
Year: I
Sem : II
Int. Max Marks: 40
Ext. Max Marks: 60

Lecture : -
Tutorial : -
Practical : 3/Week
Credits : 2

COURSE OBJECTIVES:

1. To implement the technologies like WSDL, UDDI.
2. To learn how to implement and deploy web service client and server
3. To understand the communication technology
4. to understand the web services at client side and server side
5. to learn about the UDDI Registry
6. to understand windows web based applications

COURSE OUTCOMES:

1. Understand and describe the standards and technologies of modern web services implementations
2. Effectively use market-leading development tools to create and consume web services
3. Analyze the requirements of a medium-difficulty programming task, and create software that meets the requirements
4. For a given specification, determine the appropriate web services style and design

List of Programs:

1. Write a program to implement WSDL Service (Hello Service. WSDL File)
2. Write a program the service provider can be implement a single get price (), static bind ( ) and get product operation.
3. Write a program to implement the operation can receive request and will return a response intwo ways.
   a) One-Way operation b) Request – Response
4. Write a program to implement to create a simple web service that converts the temperature from Fahrenheit to Celsius (using HTTP Post Protocol)
5. Write a program to implement business UDDI Registry entry
6. Write a program to implement
   a) Web based service consumer
   b) Windows application based web service consumer

REFERENCE BOOKS

1. Alonso**, G.,** Casati**, F.,** Kuno**, H.,** Machiraju**, V.** "Web Services: Concepts, Architecture and Applications" 2004 XX.
2. Sanjiva Weerawarana, Francisco Curbera, Frank Leymann, Tony Storey,Donald F. Ferguson,"Web Services Platform Architecture": SOAP, WSDL, WS-Policy, WS-Addressing, WS-BPEL, WS-Reliable Messaging, and More ISBN:9780131488748 / 0131488740.

SEMINAR-II (14CS588)

I M.Tech. II Sem.	L	T / P / D	C
	-	- / - / -	2

COMPREHENSIVE VIVA-VOCE (14CS591)

II M.Tech. I Sem.	L	T / P / D	C
	-	- / - / -	2

PROJECT SEMINAR (14CS592)

II M.Tech. I Sem.	L	T / P / D	C
	-	- / 3 / -	2

PROJECT WORK (14CS593)

II M.Tech. I Sem.	L	T / P / D	C
	-	- / - / -	18

PROJECT WORK AND SEMINAR (14CS594)

II M.Tech. II Sem.	L	T / P / D	C
	-	- / - / -	22