UNIVERSITY DEPARTMENTS
ANNA UNIVERSITY, CHENNAI 600 025
REGULATIONS - 2013
M.E. COMPUTER SCIENCE AND ENGINEERING
I – IV SEMESTER CURRICULUM AND SYLLABUS

PROGRAM OBJECTIVES:

1. Prepare students to review and understand foundational Concepts in Computer Science and Engineering
2. Enable students to critically analyze current trends and learn future issues from a system perspective at multiple levels of detail and abstraction
3. Enable students to apply the interplay between theory and practice for problem solving using case studies
4. Enable students to continue to pursue lifelong multidisciplinary learning as professional engineers and scientists and effectively communicate technical information, function effectively on teams, and develop and apply computer engineering solutions within a global, societal, and environmental context
5. Prepare students to critically analyze existing literature in an area of specialization and develop innovative and research oriented methodologies to tackle gaps identified.

PROGRAM OUTCOMES

Students will be able to:

a. Apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer based systems of varying complexity
b. Critically analyze a problem, identify, formulate and solve problems in the field of computer science and Engineering considering current and future trends
a. Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, ethical, health and safety, and sustainability in the field of computer engineering
b. Function effectively on teams to accomplish a common goal
c. Communicate effectively with a range of audiences and prepare technical documents and make effective oral presentations
d. Analyze the local and global impact of computing on individuals, organizations, and society
e. Recognize the need for and possess an ability to engage in lifelong learning continuing professional development
f. Use current techniques, skills, and tools necessary for computing practice
g. Demonstrate advanced knowledge of a selected area within the computer science discipline
h. Critically analyze existing literature in an area of specialization and develop innovative and research oriented methodologies to tackle gaps identified.
# UNIVERSITY DEPARTMENTS
ANNA UNIVERSITY, CHENNAI 600 025
REGULATIONS - 2013
M.E. COMPUTER SCIENCE AND ENGINEERING (FT & PT)
I - IV SEMESTER CURRICULUM AND SYLLABUS

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**UNIVERSITY DEPARTMENTS**

**ANNA UNIVERSITY, CHENNAI 600 025**

**REGULATIONS - 2013**

M.E. COMPUTER SCIENCE AND ENGINEERING (PART TIME)

I – VI SEMESTER CURRICULUM AND SYLLABUS

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OBJECTIVES:

- To understand the recent trends in the field of Computer Architecture and identify performance related parameters
- To appreciate the need for parallel processing
- To expose the students to the problems related to multiprocessing
- To understand the different types of multicore architectures
- To understand the design of the memory hierarchy
- To expose the students to multicore programming

UNIT I       NEED FOR MULTICORE ARCHITECTURES


UNIT II   MULTIPROCESSOR ISSUES

Symmetric and Distributed Shared Memory Architectures – Cache Coherence Issues - Performance Issues – Synchronization Issues – Models of Memory Consistency - Interconnection Networks – Buses, Crossbar and Multi-stage Interconnection Networks.

UNIT III   MULTICORE ARCHITECTURES


UNIT IV   MEMORY HIERARCHY DESIGN

Introduction - Optimizations of Cache Performance - Memory Technology and Optimizations - Protection: Virtual Memory and Virtual Machines - Design of Memory Hierarchies - Case Studies.

UNIT V   MULTICORE PROGRAMMING

Parallel Programming models – Shared Memory Programming – Message Passing Interface – Open MP Program Development and Performance Tuning.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to

- Identify the limitations of ILP and the need for multicore architectures
- Discuss the issues related to multiprocessing and suggest solutions
- Point out the salient features of different multicore architectures and how they exploit parallelism
- Critically analyze the different types of interconnection networks
- Design a memory hierarchy and optimize it
- Explain the different parallel programming models
- Develop programs using Open MP and optimize them
REFERENCES:

CP8151 ADVANCED DATA STRUCTURES AND ALGORITHMS L T P C
3 0 2 4

OBJECTIVES:
- To extend the students' knowledge of algorithms and data structures, and to enhance their expertise in algorithmic analysis and algorithm design techniques.
- Expected to learn a variety of useful algorithms and techniques and extrapolate from them in order to then apply those algorithms and techniques to solve problems.

UNIT I FUNDAMENTALS

UNIT II HEAP STRUCTURES

UNIT III SEARCH STRUCTURES

UNIT IV GEOMETRIC ALGORITHMS

UNIT V PARALLEL ALGORITHMS

TOTAL : 45 +30 : 75 PERIODS

OUTCOMES:
- Basic ability to analyze algorithms and to determine algorithm correctness and time efficiency class.
- Master a variety of advanced data structures and their implementations.
- Master different algorithm design techniques in computational geometry and in parallel algorithms.
- Ability to apply and implement learned algorithm design techniques and data structures to solve problems.
REFERENCES:
5. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein
   Introduction to AI, 2009.

CP8152 OBJECT ORIENTED SYSTEMS ENGINEERING L T P C
3 0 2 4

OBJECTIVE:

- To understand the importance of object oriented software engineering.
- To study the various lifecycle models for developing software’s.
- To analyze and design software using tools.
- To develop efficient software, deploy and maintain after production.

UNIT I CLASSICAL PARADIGM
System Concepts – Project Organization – Communication – Project Management
9+6

UNIT II PROCESS MODELS
9+6

UNIT III ANALYSIS
Requirements Elicitation – Use Cases – Unified Modeling Language, Tools – Analysis Object Model (Domain Model) – Analysis Dynamic Models – Non-functional requirements – Analysis Patterns
9+6

UNIT IV DESIGN
9+6

UNIT V IMPLEMENTATION, DEPLOYMENT AND MAINTENANCE
9+6

TOTAL: 45 + 30 = 75 PERIODS

OUTCOMES:

- To prepare object oriented design for small/ medium scale problem.
- To evaluate the appropriate life cycle model for the system under consideration.
- To apply the various tools and patterns while developing software
- Testing the software against usability, deployment, maintenance.

REFERENCES:
OBJECTIVES:

- To understand the basic issues in open source kernels
- To appreciate the different aspects of processes
- To understand the role played by files and devices
- To understand the basic issues in open source networking
- To appreciate the different aspects of internetworking

UNIT I  FOUNDATION  9

UNIT II  PROCESSES  9
Process scheduling: policy, algorithm, system calls – Memory management: page frame management, memory area management, slab allocator, aligning objects in memory, noncontiguous memory area management, addresses of noncontiguous memory areas – Process address space: process's address space, foundational aspects of memory regions, page fault exception handler, creation and deletion – System calls – Signals: foundational aspects of the role of signals, generating a signal, delivering a signal and system calls – Implementation aspects of processes.

UNIT III  FILES AND DEVICES  9
Virtual File System – I/O architecture and device drivers, block devices handling, the generic block layer, block device drivers – Implementation aspects of files and devices.

UNIT IV  NETWORKING  9
Introduction, data structures overview, user space to kernel interface – System initialization: reasons for notification chains, system initialization overview, device registration and initialization, goals of NIC initialization, interaction between devices and kernel, examples of virtual devices, boot time kernel options, when a device is registered and unregistered – Transmission and reception: decisions and traffic direction, notifying drivers, interrupt handlers, reasons for bottom half handlers, bottom halves solutions, concurrency and locking, preemption, overview of network stack – Bridging: concepts, spanning tree protocol – Implementation aspects of networking.

UNIT V  INTERNETWORKING  9

OUTCOMES:
Upon completion of the course, the students will be able to
- Identify the different features of open source kernels
- Install and use available open source kernel
- Modify existing open source kernels in terms of functionality or features used
- Identify different features of open source networking
- Modify and use existing open source networking modules

REFERENCES:
OBJECTIVES:

- To understand the basics of random variables and standard distributions
- To understand the arrival process and various queueing and server models
- To appreciate the use of simulation techniques
- To apply testing of hypothesis to infer outcome of experiments
- To apply mathematical linear programming techniques to solve constrained problems.

UNIT I  RANDOM VARIABLES

UNIT II  QUEUING MODELS

UNIT III  SIMULATION
Discrete Event Simulation – Monte Carlo Simulation – Stochastic Simulation – Applications to Queuing systems.

UNIT IV  TESTING OF HYPOTHESIS
Sampling distributions – Estimation of parameters - Statistical hypothesis – Tests based on Normal, t, Chi-square and F distributions for mean, variance and proportion.

UNIT V  LINEAR PROGRAMMING

TOTAL : 60 PERIODS

OUTCOMES:
Upon completion of the course, the student will be able to

- Identify the type of random variable and distribution for a given operational conditions/scene
- Study and Design appropriate queuing model for a given problem/system situation
- To understand and simulate appropriate application/distribution problems
- Differentiate/infer the merit of sampling tests.
- Formulate and find optimal solution in the real life optimizing/allocation/assignment problems involving conditions and resource constraints.

REFERENCES:

CP8111 PROFESSIONAL PRACTICE
L T P C
0 0 2 1

THE OBJECTIVES OF PROFESSIONAL PRACTICE:
To Facilitate Research, Analysis, and Problem Solving.
To Interview people who know the context of the Problem and the Solution
To Explore various possible alternative solutions
To Estimate Risk

THE OUTCOMES OF PROFESSIONAL PRACTICE:
Formulating a Problem
Describing the Background of the Problem
Assessing the needs of the People
Framing a Policy
Predicting Business Opportunity
Understanding System Implications

TOTAL: 30 PERIODS

CP8201 ADVANCES IN COMPILER DESIGN
L T P C
3 0 0 3

OBJECTIVES:
• To understand the various optimization techniques
• To understand about compiler’s instruction selection and scheduling techniques
• To explore how parallelism is handled by compilers
• To understand how compilers deal with pipelining architecture
• To appreciate the just-in-time compilations

UNIT I COMPILER PHASE
Compiler phases - Compiler techniques review - lexical & syntax analysis, intermediate representation (AST), etc. Introduction to compiler analysis & optimization – basic blocks – DAG – control flow analysis - Data flow analysis – Dependency analysis – dependency graphs – alias analysis

UNIT II OPTIMIZATION TECHNIQUES
Optimization Techniques – Early optimization – redundancy elimination – loop optimization – Procedure optimization – Procedural analysis

UNIT III REGISTER ALLOCATION

UNIT IV INSTRUCTION LEVEL PARALLELISM PROCESSOR ARCHITECTURES
UNIT V  INTERPROCEDURAL ANALYSIS BASIC CONCEPTS

Interprocedural analysis Basic concepts — need for inter-procedural analysis — logic representation of data flow — pointer-analysis algorithm — context insensitive and sensitive inter-procedural analysis - binary decision diagrams — Case study — HOT Compilation — Just-in-time compilation.

TOTAL: 45 PERIODS

OUTCOMES:
Upon Completion of the course, the students will be able to
• Identify the different optimization techniques that are possible for a sequence of code
• Design Compilers for a programming language
• Map the process of Compilation for a programming paradigm and design compiler for the same
• Design a system that uses just-in-time compilation or HOT compilation

REFERENCES:

CP8202  MACHINE LEARNING TECHNIQUES  L T P C
3 0 2 4

OBJECTIVES:
• To understand the concepts of machine learning
• To appreciate supervised and unsupervised learning and their applications
• To understand the theoretical and practical aspects of Probabilistic Graphical Models
• To appreciate the concepts and algorithms of reinforcement learning
• To learn aspects of computational learning theory

UNIT I  INTRODUCTION  9+6

UNIT II  SUPERVISED LEARNING  9+6
UNIT III  UNSUPERVISED LEARNING  9+6

UNIT IV  PROBABILISTIC GRAPHICAL MODELS  9+6

UNIT V  ADVANCED LEARNING  9+6

OUTCOMES:
Upon Completion of the course, the students will be able to
- To implement a neural network for an application of your choice using an available tool
- To implement probabilistic discriminative and generative algorithms for an application of your choice and analyze the results
- To use a tool to implement typical clustering algorithms for different types of applications
- To design and implement an HMM for a sequence model type of application
- To identify applications suitable for different types of machine learning with suitable justification

REFERENCES:

CP8251  VIRTUALIZATION TECHNIQUES  L T P C
3 0 2 4

OBJECTIVES:
- To understand the need of virtualization
- To explore the types of virtualization
- To understand the concepts of virtualization and virtual machines
- To understand the practical virtualization solutions and enterprise solutions
- To understand the concepts of cloud computing
- To have an introduction to cloud programming giving emphasis to Hadoop MapReduce
- To understand the security issues in cloud computing
UNIT I OVERVIEW OF VIRTUALIZATION 9+6
Basics of Virtualization – Types of Virtualization Techniques – Merits and demerits of Virtualization –
Full Vs Para-irtualization – Virtual Machine Monitor/Hypervisor - Virtual Machine Basics – Taxonomy
of Virtual machines – Process Vs System Virtual Machines – Emulation: Interpretation and Binary
Translation - HLL Virtual Machines

UNIT II SERVER AND NETWORK VIRTUALIZATION 9+6
Server Virtualization: Virtual Hardware Overview - Server Consolidation – Partitioning Techniques -
Uses of Virtual server Consolidation – Server Virtualization Platforms, Network Virtualization:
Design of Scalable Enterprise Networks – Layer2 Virtualization – VLAN - VFI - Layer 3 Virtualization –
VRF - Virtual Firewall Contexts - Network Device Virtualization - Data- Path Virtualization - Routing
Protocols

UNIT III STORAGE, DESKTOP AND APPLICATION VIRTUALIZATION 9+6
Storage Virtualization: Hardware Devices – SAN backup and recovery techniques – RAID –
Classical Storage Model – SNIA Shared Storage Model – Virtual Storage: File System Level and
Block Level, Desktop Virtualization: Concepts - Desktop Management Issues - Potential Desktop
Virtualization Scenarios - Desktop Virtualization Infrastructures, Application Virtualization: Concepts -
Application Management Issues - Redesign Application Management – Application Migration

UNIT IV APPLYING VIRTUALIZATION 9+6
Practical Virtualization Solutions: Comparison of Virtualization Technologies: Guest OS/ Host OS –
Hypervisor – Emulation – Kernel Level – Shared Kernel, Enterprise Solutions: VMWare Server –
VMWare ESXi – Citrix Xen Server – Microsoft Virtual PC – Microsoft Hyper-V – Virtual Box, Server
Virtualization: Configuring Servers with Virtualization – Adjusting and Tuning Virtual servers – VM
Backup – VM Migration, Desktop Virtualization: Terminal services – Hosted Desktop – Web-based
Solutions – Localized Virtual Desktops, Network and Storage Virtualization: Virtual Private
Networks – Virtual LAN – SAN and VSAN – NAS

UNIT V CLOUD COMPUTING 9+6
Environments – Cloud Services – Service Providers – Google – Amazon – Microsoft – IBM – EMC –
security challenges, Cloud Programming: Hadoop – Map Reduce – HDFS – Hadoop I/O –
Developing a MapReduce Application

TOTAL: 45 + 30 = 75 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to
• Deploy legacy OSs on virtual machines
• Understand the intricacies of server, storage, network, desktop and application virtualizations
• Design new models for virtualization
• Design and develop cloud applications on virtual machine platforms
• Design new models for Bigdata processing in cloud

REFERENCES:

IF8254 MOBILE AND PERVERSIVE COMPUTING

OBJECTIVES:
- To understand the basics of Mobile computing and Personal computing.
- To learn the role of wireless networks in Mobile Computing and Pervasive Computing.
- To study about the underlying wireless networks.
- To understand the architectures of mobile and pervasive applications.
- To become familiar with the pervasive devices and mobile computing platforms.

UNIT I INTRODUCTION

UNIT II 3G AND 4G CELLULAR NETWORKS

UNIT III SENSOR AND MESH NETWORKS

UNIT IV CONTEXT AWARE COMPUTING
OUTCOMES:
At the end of the course the student should be able to,
- To deploy 3G networks.
- To develop suitable algorithms for 4G networks.
- To use sensor and mesh networks to develop mobile computing environment.
- To develop mobile computing applications based on the paradigm of context aware computing.

REFERENCES:

CP8211 CASE STUDY

The case study approach is to engage students in critical thinking for real world situations. As Students, they turn basic knowledge into principles that can be applied across cases. By placing them in real situations, and requiring them to make decisions, students learn to connect their knowledge with analytical skills.

A Case Study includes Research, Analysis, and Problem Solving.
Interviewing people who know the place or the situation is a vital step. There is no single solution. A case study includes.

Introduction
Background
People
Policy
Business Opportunity
System Implications

TOTAL: 30 PERIODS
THE OBJECTIVES OF TECHNICAL SEMINAR ARE:
1. To elicit pro-active participation of the students through
2. To entrust assignment to present
3. To inculcate presentation and leadership skills among students
4. To involving students to learn actively
5. To offer opportunities of interaction with peer students and staff.

THE OUTCOMES OF THE TECHNICAL SEMINAR ARE:
1. Good Communications Skills.
2. Knowing the Audience.
3. Choosing the Topic.
4. Setting the Goals for the Talk.
5. Talking to the Audience.
6. Knowing the Content of the Talk.
7. Preparation of the Slides.
8. Answering Questions.

TOTAL: 30 PERIODS

OBJECTIVES:
- To understand the mathematical foundations of security principles
- To appreciate the different aspects of encryption techniques
- To understand the role played by authentication in security
- To appreciate the current trends security practices

UNIT I INTRODUCTION AND MATHEMATICAL FOUNDATION  
An illustrative communication game – safeguard versus attack – Probability and Information Theory - Algebraic foundations – Number theory.

UNIT II ENCRYPTION – SYMMETRIC TECHNIQUES  

UNIT III ENCRYPTION – ASYMMETRIC TECHNIQUES AND DATA TECHNIQUES  
UNIT IV AUTHENTICATION
Authentication Protocols Principles – Authentication protocols for Internet Security – SSH
Remote logic protocol – Kerberos Protocol – SSL & TLS – Authentication frame for public key
Cryptography – Directory Based Authentication framework – Non - Directory Based Public-Key
Authentication framework.

UNIT V SECURITY PRACTICES
Protecting Programs and Data – Information and the Law – Rights of Employees and Employers

TOTAL: 45 PERIODS

OUTCOMES:
Upon Completion of the course, the students will be able to

- Use the mathematical foundations in security principles
- Identify the features of encryption and authentication
- Use available security practices

REFERENCES:

CP8001 ADVANCED COMPUTING

OBJECTIVES:
- To understand the basics of quantum computing, membrane computing, molecular computing, DNA computing and nano computing
- To understand the models and the theory involved in the biologically inspired computing techniques
- To explore the applications of these computing models

UNIT I INTRODUCTION
UNIT II       DNA COMPUTING
Structure of DNA – Operation on DNA molecules – Adleman’s experiments – Other DNA solutions to NP problems – Two dimensional generalization – Computing by carving – Sticker systems – Extended H systems – Controlled H systems – distributed H systems

UNIT III      MEMBRANE COMPUTING

UNIT IV      QUANTUM COMPUTING

UNIT V        NANO AND MOLECULAR COMPUTING
Defect tolerant nano computing – error detection – Non-traditional computing models – Reliability trade off for nano architecture – Molecular recognition – storage and processing of molecular information

TOTAL:45 PERIODS

OUTCOMES:
Upon Completion of the course, the students will be able to
- Comprehend the different computing paradigms
- Write Grammar rules for the different models of computing
- Design applications to incorporate one or more computing models
- Try to solve problems and prove the application of the computing models.

REFERENCES:

CP8002       COMPUTATIONAL GAME THEORY
L T P C
3 0 0 3

OBJECTIVES:
- To introduce the student to the notion of a game, its solutions concepts, and other basic notions and tools of game theory, and the main applications for which they are appropriate, including electronic trading markets;
- To formalize the notion of strategic thinking and rational choice by using the tools of game theory, and to provide insights into using game theory in modeling applications;
- To draw the connections between game theory, computer science, and economics, especially emphasizing the computational issues;
- To introduce contemporary topics in the intersection of game theory, computer science, and economics;
UNIT I  INTRODUCTION  8

UNIT II  GAMES WITH PERFECT INFORMATION  10
Games with Perfect Information - Strategic games - prisoner's dilemma, matching pennies- Nash equilibria- theory and illustrations - Cournot's and Bertrand's models of oligopoly- auctions- mixed strategy equilibrium- zero-sum games- Extensive Games with Perfect Information-repeated games (prisoner's dilemma)- subgame perfect Nash equilibrium; computational issues.

UNIT III  GAMES WITH IMPERFECT INFORMATION  9
Games with Imperfect Information - Bayesian Games – Motivational Examples – General Definitions –Information aspects – Illustrations - Extensive Games with Imperfect -Information - Strategies- Nash Equilibrium – Beliefs and sequential equilibrium – Illustrations - Repeated Games - The Prisoner's Dilemma - Bargaining

UNIT IV  NON-COOPERATIVE GAME THEORY  9

UNIT V  MECHANISM DESIGN  9
Aggregating Preferences-Social Choice – Formal Model- Voting - Existence of social functions - Ranking systems - Protocols for Strategic Agents: Mechanism Design - Mechanism design with unrestricted preferences- Efficient mechanisms - Vickrey and VCG mechanisms (shortest paths) - Combinatorial auctions - profit maximization Computational applications of mechanism design - applications in Computer Science - Google's sponsored search - eBay auctions

TOTAL: 45 PERIODS

OUTCOMES:
Upon Completion of the course, the students will be able to
- Discuss the notion of a strategic game and equilibria, and identify the characteristics of main applications of these concepts
- Do a literature survey on applications of Game Theory in Computer Science and Engineering
- Discuss the use of Nash Equilibrium for other problems
- Identify key strategic aspects and based on these be able to connect them to appropriate game theoretic concepts given a real world situation
- Identify some applications that need aspects of Bayesian Games
- Implement a typical Virtual Business scenario using Game theory

REFERENCES:
OBJECTIVES:
- To understand geometric problems.
- To learn the algorithmic solutions for geometric problems.
- To map problems in various application domains to a geometric problem.
- To learn to solve problems in various application domains

UNIT I INTRODUCTION
Introduction – Application Domains – Line Segment Intersection – Intersection of Convex Polygons – Polygon Triangulation

UNIT II GEOMETRIC SEARCHING

UNIT III CONVEX HULL PROBLEM

UNIT IV PROXIMITY PROBLEMS
Proximity Problems – Fundamental Algorithms (Closest Pair – All Nearest Neighbours – Euclidean Minimum Spanning Tree – Nearest Neighbour Search) – Lower bounds – Closest Pair Problem: A Divide-and-Conquer Approach

UNIT V VORONOI DIAGRAM
Voronoi Diagram – Proximity Problems Solved by the Voronoi Diagram – Planar Applications

OUTCOMES:
Upon completion of the course the students will be able to
- Identify problems that can be mapped to geometric problems
- Transform problems in different applications to geometric problems
- Use the algorithms learnt for solving the transformed problems
- Find solution for the problems

REFERENCES:

TOTAL: 45 PERIODS
OBJECTIVES:

- To learn parallel algorithms development techniques for shared memory and DCM models.
- To study the main classes of fundamental parallel algorithms.
- To study the complexity and correctness models for parallel algorithms.

UNIT I  INTRODUCTION

UNIT II  SORTING & SEARCHING
Sorting Networks – Sorting on a Linear Array – Sorting on CRCW, CREW, EREW – Searching a sorted sequence – Searching a random sequence – Bitonic Sort.

UNIT III  ALGEBRAIC PROBLEMS
Permutations and Combinations – Matrix Transpositions – Matrix by Matrix multiplications – Matrix by vector multiplication.

UNIT IV  GRAPH & GEOMETRY

UNIT V  OPTIMIZATION & BIT COMPUTATIONS
Prefix Sums – Job Sequencing – Knapsack - Adding two integers – Adding n integers – Multiplying two integers – Selection.

TOTAL: 45 PERIODS

OUTCOMES:

- Familiar with design of parallel algorithms in various models of parallel computation.
- Familiar with the efficient parallel algorithms related to many areas of computer science: expression computation, sorting, graph-theoretic problems, computational geometry, etc.
- Familiar with the basic issues of implementing parallel algorithms.

REFERENCES:
OBJECTIVES:
- To understand the concepts of parallel computing and parallel systems’ architecture
- To understand the two popular parallel programming paradigms (message passing and shared memory)
- To understand major performance issues for parallel systems and programs;
- To reiterate hot topics in research on parallel computing;

UNIT I ARCHITECTURES 5
The changing role of parallelism - Basic Principles - Sources of inefficiency - Metrics: Execution time, speedup, etc. – Throughput vs. latency – Scalability: massive parallelism, Amdahl’s Law, Gustafson’s Law - Parallel architectures – Trends in architectures, CMPs, GPUs, and Grids, Multiprocessors, Multicomputers, Multithreading, Pipelining, VLIWs, Superscaling, Vectors, SIMDs, paradigm of shared-memory, distributed-memory, interconnection networks, optical computing, systolic arrays, cache coherence — Models of parallelism: PRAM, CTA

UNIT II PROGRAMMING MODELS 5

UNIT III OPTIMIZATION 15

UNIT IV LOOP PARALLELIZATIONS 12
Loop transformations, loop parallelizations, Data-Parallel and Data-Flow Systems Connection MachineCM5 - Data-Flow Models -Parallel Programming Concept dependence and loop parallelization - parallelism profiling Data-Path Design Parallel and Pipelined Design - Scheduling Parallel Programs-Optimal Scheduling Algorithms - Scheduling Heuristics -Loop Transformation and Scheduling -Parallelizing Serial Programs -Data Dependency Test -Parallelization Techniques - Instruction-Level Parallelism

UNIT V SCHEDULING 8

TOTAL : 45 PERIODS

OUTCOMES:
- To understand the concepts of parallel computing and parallel systems’ architecture
- To understand the two popular parallel programming paradigms (message passing and shared memory)
- To understand major performance issues for parallel systems and programs;
- To reiterate hot topics in research on parallel computing;
REFERENCES:
5. Ian Foster, Designing and Building Parallel Programs, Addison-Wesley, 1994.

CP8006 FAULT TOLERANT SYSTEMS

OBJECTIVES:
- To provide a comprehensive view of fault tolerant systems
- To appreciate the need for fault tolerance
- To expose the students to the methods of hardware fault tolerance
- To understand the different ways of providing information redundancy
- To understand the need for and the different ways of providing software fault tolerance
- To expose the students to concept of checkpointing and their role in providing fault tolerance
- To understand how to handle security attacks

UNIT I INTRODUCTION:
Fault Classification, Types of Redundancy, Basic Measures of Fault Tolerance, Hardware Fault Tolerance, The Rate of Hardware Failures, Failure Rate, Reliability, and Mean Time to Failure, Canonical and Resilient Structures, Other Reliability Evaluation Techniques, Processor level Techniques.

UNIT II INFORMATION REDUNDANCY

UNIT III SOFTWARE FAULT TOLERANCE:

UNIT IV CHECKPOINTING:
Introduction, Checkpoint Level, Optimal Checkpointing-An Analytical Model, Cache-Aided Rollback Error Recovery (CARER), Checkpointing in Distributed Systems, Checkpointing in Shared-Memory
UNIT V  FAULT DETECTION IN CRYPTOGRAPHIC SYSTEMS


OUTCOMES:
Upon completion of the course, the students will be able to:

- Define the traditional measures of fault tolerance
- Discuss the various hardware fault tolerance techniques used
- Point out the processor level fault tolerance techniques
- Discuss error detecting and correcting codes
- Critically analyze the different types of RAID levels
- Discuss the different network topologies and their resilience
- Discuss techniques like recovery blocks and N-version programming
- Define check pointing and models for optimal check pointing
- Identify techniques for check pointing in distributed and shared memory systems
- Distinguish between symmetric key ciphers and public key ciphers
- Provide techniques to detect injected faults in ciphers

REFERENCES:

CP8007 NETWORK PROTOCOLS

OBJECTIVES:

- To understand how routing is done in telephone networks
- To learn about the different internet routing protocols
- To appreciate the different aspects routing in optical and mobile networks
- To understand the issues in ad hoc networks the protocols used for the working of ad hoc networks

UNIT I  INTRODUCTION
UNIT II  INTERNET ROUTING PROTOCOLS

UNIT III  ROUTING IN OPTICAL WDM NETWORKS

UNIT IV  MOBILE - IP NETWORKS

UNIT V  MOBILE AD HOC NETWORKS

TOTAL: 45 PERIODS

OUTCOMES:
Upon Completion of the course, the students will be able to
- Identify challenges in routing in different kinds of networks
- Identify the features of the protocols used in different kinds of networks
- Compare the issues in designing protocols for different kinds of networks

REFERENCES:
OBJECTIVE:

- To learn real time operating system concepts and the associated issues & techniques

UNIT I  REAL TIME SPECIFICATION AND DESIGN TECHNIQUES


UNIT II  REAL TIME SPECIFICATION AND DESIGN TECHNIQUES


UNIT III  INTERTASK COMMUNICATION AND SYNCHRONIZATION


UNIT IV  REAL TIME DATABASES

Real time Databases – Basic Definition, Real time Vs General Purpose Databases, Main Memory Databases, Transaction priorities, Transaction Aborts, Concurrency control issues, Disk Scheduling Algorithms, Two – phase Approach to improve Predictability – Maintaining Serialization Consistency – Databases for Hard Real Time Systems.

UNIT V  EVALUATION TECHNIQUES


TOTAL : 45 PERIODS

OUTCOME:

- Understanding principles of real time systems design; be aware of architectures and behaviors of real time operating systems, database and applications.

REFERENCES:

OBJECTIVES:
- To understand the design of the UNIX operating system.
- To become familiar with the various data structures used.
- To learn the various low-level algorithms used in UNIX.

UNIT I  OVERVIEW  9

UNIT II  FILE SUBSYSTEM  9
Internal Representation of Files: Inodes – Structure of a Regular File – Directories – Conversion of a Path Name to an Inode – Super Block – Inode Assignment to a New File – Allocation of Disk Blocks.

UNIT III  SYSTEM CALLS FOR THE FILE SYSTEM  9

UNIT IV  PROCESSES  9

UNIT V  MEMORY MANAGEMENT AND I/O  9

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to
- To understand the design of the UNIX operating system.
- To become familiar with the various data structures used.
- To learn the various low-level algorithms used in UNIX.

REFERENCES:
OBJECTIVE:
- To understand the basic concepts.
- To search information, visualize it.
- To learn various bioinformatics algorithms.
- To understand data mining techniques.
- To study various pattern matching techniques.

UNIT I  INTRODUCTORY CONCEPTS

UNIT II  SEARCH ENGINES, VISUALIZATION AND ALGORITHMS

UNIT III  STATISTICS AND DATA MINING

UNIT IV  PATTERN MATCHING

UNIT V  MODELING AND SIMULATION

TOTAL : 45 PERIODS

OUTCOMES:
- Will able to have basic idea of BioInformatics.
- Will able to retrieve information’s using various algorithms and techniques.
- Will able to sequence the databases.
- Will able to do modeling and simulation.
REFERENCES:

CP8009  BIO-INSPRIRED ARTIFICIAL INTELLIGENCE  L T P C
3 0 0 3

OBJECTIVES:
- To appreciate the use of biological aspects in building intelligent systems
- To understand the algorithms, programming and applications of Evolutionary and genetic algorithms and neural and fuzzy systems
- To appreciate the adaptation of cellular and developmental systems
- To focus on the understanding of artificial immune systems and its applications
- To understand issues in developing collective and behavioral systems

UNIT I  EVOLUTIONARY SYSTEMS

UNIT II  NEURAL AND FUZZY SYSTEMS

UNIT III  CELLULAR AND DEVELOPMENT SYSTEMS

UNIT IV  IMMUNE SYSTEMS AND COLLECTIVE SYSTEMS
UNIT V BEHAVIORAL SYSTEMS


TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to
- Use existing open source tools to build an application using genetic approaches
- Identify different applications suitable for different types of neural networks giving justifications
- Critically analyze the use of cellular systems
- Differentiate the different models of immune systems
- Do a literature survey on applications of artificial immune systems
- Implement the Particle swarm and Ant colony algorithms within a framework and build applications

REFERENCES:

CP8010 COGNITIVE SCIENCE L T P C
3 0 0 3

OBJECTIVES:
- To learn the basics of Cognitive Science with focus on acquisition, representation, and use of knowledge by individual minds, brains, and machines, as well as groups, institutions, and other social entities
- To study the mind and intelligence, embracing psychology, artificial intelligence, neuroscience and linguistics
- To appreciate the basics of cognitive Psychology
- To understand the role of Neuro science in Cognitive field

UNIT I INTRODUCTION TO COGNITIVE SCIENCE

UNIT II COGNITIVE PSYCHOLOGY
UNIT III COGNITIVE NEUROSCIENCE
Brain and Cognition Introduction to the Study of the Nervous System – Neural Representation – Neuropsychology- Computational Neuroscience - The Organization of the mind - Organization of Cognitive systems - Strategies for Brain mapping – A Case study: Exploring mindreading

UNIT IV LANGUAGE ACQUISITION, SEMANTICS AND PROCESSING MODELS

UNIT V HIGHER-LEVEL COGNITION

TOTAL: 45 PERIODS

OUTCOMES:
Upon Completion of the course, the students will be able to
• Explain, and analyze the major concepts, philosophical and theoretical perspectives, empirical findings, and historical trends in cognitive science, related to cultural diversity and living in a global community.
• Use cognitive science knowledge base to create their own methods for answering novel questions of either a theoretical or applied nature, and to critically evaluate the work of others in the same domain
• Proficient with basic cognitive science research methods, including both theory-driven and applied research design, data collection, data analysis, and data interpretation.

REFERENCES:
5. How the mind works,Steven Pinker,2009

CP8011 INFORMATION RETRIEVAL TECHNIQUES

OBJECTIVES:
• To understand the basics of Information Retrieval with pertinence to modeling, query operations and indexing
• To get an understanding of machine learning techniques for text classification and clustering
• To understand the various applications of Information Retrieval giving emphasis to Multimedia IR, Web Search
• To understand the concepts of digital libraries
UNIT I  INTRODUCTION: MOTIVATION  8

UNIT II  MODELING  10

UNIT III  INDEXING  9
Static and Dynamic Inverted Indices – Index Construction and Index Compression. Searching - Sequential Searching and Pattern Matching. Query Operations - Query Languages – Query Processing - Relevance Feedback and Query Expansion - Automatic Local and Global Analysis – Measuring Effectiveness and Efficiency

UNIT IV  TEXT CLASSIFICATION AND NAÏVE BAYES  9
Text Classification and Naïve Bayes – Vector Space Classification – Support vector machines and Machine learning on documents. Flat Clustering – Hierarchical Clustering – Matrix decompositions and latent semantic indexing – Fusion and Meta learning

UNIT V  SEARCHING THE WEB  8

TOTAL : 45 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to
- Build an Information Retrieval system using the available tools
- Identify and design the various components of an Information Retrieval system
- Apply machine learning techniques to text classification and clustering which is used for efficient Information Retrieval
- Analyze the Web content structure
- Design an efficient search engine

REFERENCES:
OBJECTIVES:
- To understand the basics of Internet of Things
- To get an idea of some of the application areas where Internet of Things can be applied
- To understand the middleware for Internet of Things
- To understand the concepts of Web of Things
- To understand the concepts of Cloud of Things with emphasis on Mobile cloud computing
- To understand the IOT protocols

UNIT I INTRODUCTION

UNIT II IOT PROTOCOLS

UNIT III WEB OF THINGS

UNIT IV INTEGRATED

UNIT V APPLICATIONS
The Role of the Internet of Things for Increased Autonomy and Agility in Collaborative Production Environments - Resource Management in the Internet of Things: Clustering, Synchronisation and Software Agents. Applications - Smart Grid – Electrical Vehicle Charging

OUTCOMES:
Upon completion of the course, the students will be able to
- Identify and design the new models for market strategic interaction
- Design business intelligence and information security for WoB
- Analyze various protocols for IoT
- Design a middleware for IoT
- Analyze and design different models for network dynamics

TOTAL: 45 PERIODS
REFERENCES:
2. Architecting the Internet of Things - Dieter Uckelmann; Mark Harrison; Florian Michahelles-(Eds.) – Springer – 2011
3. Networks, Crowds, and Markets: Reasoning About a Highly Connected World - David Easley and Jon Kleinberg, Cambridge University Press - 2010
4. The Internet of Things: Applications to the Smart Grid and Building Automation by - Olivier Hersent, Omar Elloumi and David Boswarthick - Wiley -2012

CP8013 NETWORK ON CHIP

OBJECTIVES:
- To understand the various classes of Interconnection networks.
- To learn about different routing techniques for on-chip network.
- To know the importance of flow control in on-chip network.
- To learn the building blocks of routers.
- To provide an overview of the current state-of-the-art research.

UNIT I ICN ARCHITECTURES
Introduction - Classification of ICNs - Topologies - Direct networks - Indirect networks-Performance analysis.

UNIT II SWITCHING TECHNIQUES
Basic switching techniques - Virtual channels - Hybrid switching techniques Optimizing switching techniques - Comparison of switching techniques - Deadlock, livelock and Starvation.

UNIT III ROUTING ALGORITHMS

UNIT IV NETWORK-ON-CHIP
NoC Architectures - Router architecture - Area, energy and reliability constraints - NoC design lternatives - Quality-of Service (QoS) issues in NoC architectures

UNIT V EMERGING TRENDS
Fault-tolerance issues - Emerging on-chip interconnection technologies- 3D NoC- Simulation.

OUTCOMES:
Upon Completion of the course, the students will be able to
- Identify the major components required to design an on-chip network.
- Compare different switching techniques.
- Evaluate the performance and the cost of the given on-chip network.
- Demonstrate deadlock-free and livelock free routing protocols.
- Simulate and assess the performance of a given on-chip network.
REFERENCES:

CP8014 SECURE NETWORK SYSTEM DESIGN L T P C
3 0 0 3

OBJECTIVES:
- Understand security best practices and how to take advantage of the networking gear that is already available
- Learn design considerations for device hardening, Layer 2 and Layer 3 security issues, denial of service, IPSec VPNs, and network identity
- Understand security design considerations for common applications such as DNS, mail, and web
- Identify the key security roles and placement issues for network security elements such as firewalls, intrusion detection systems, VPN gateways, content filtering, as well as for traditional network infrastructure devices such as routers and switches.
- Understand the various testing and optimizations strategies to select the technologies and devices for secure network design.

UNIT I NETWORK SECURITY FOUNDATIONS
Secure network design through modeling and simulation, A fundamental framework for network security, need for user level security on demand, Network Security Axioms, security policies and operations life cycle, security networking threats, network security technologies, general and identity design considerations, network security platform options and best deployment practices, secure network management and network security management.

UNIT II IDENTIFYING SYSTEM DESIGNER’S NEEDS AND GOALS
Evolution of network security and lessons learned from history, Analyzing top-down network design methodologies, technical goals and tradeoffs – scalability, reliability, availability, Network performance, security, Characterizing the existing internetwork, characterizing network traffic, developing network security strategies.

UNIT III PHYSICAL SECURITY ISSUES AND LAYER 2 SECURITY CONSIDERATIONS
Control physical access to facilities, Control physical access to data centers, Separate identity mechanisms for insecure locations, Prevent password-recovery mechanisms in insecure locations, awareness about cable plant issues, electromagnetic radiation and physical PC security threats, L2 control protocols, MAC flooding considerations, attack mitigations, VLAN hopping attacks, ARP, DHCP, PVLAN security considerations, L2 best practice policies.
UNIT IV  IP ADDRESSING AND ROUTING DESIGN CONSIDERATIONS
Route summarizations, ingress and egress filtering, Non routable networks, ICMP traffic management, Routing protocol security, Routing protocol authentication, transport protocol management policies, Network DoS/flooding attacks.

UNIT V  TESTING AND OPTIMIZING SYSTEM DESIGN
Selecting technologies and devices for network design, testing network design – using industry tests, building a prototype network system, writing and implementing test plan, tools for testing, optimizing network design – network performance to meet quality of service (QoS), Modeling, simulation and behavior analysis of security attacks, future issues in information system security.

OUTCOMES:
Follows the best practices to understand the basic needs to design secure network.
- Satisfy the need for user and physical level security on demand for various types of network attacks.
- Uses best practice policies for different network layers protocols.
- Understand the network analysis, simulation, testing and optimizing of security attacks to provide Quality of Service.

REFERENCES:

CP8015  TEXT DATA MINING  L T P C
OBJECTIVES:
- To understand the basic issues and types of text mining
- To appreciate the different aspects of text categorization and clustering
- To understand the role played by text mining in Information retrieval and extraction
- To appreciate the use of probabilistic models for text mining
- To appreciate the current trends in text mining

UNIT I  INTRODUCTION
Overview of text mining- Definition- General Architecture– Algorithms– Core Operations – Pre-processing– Types of Problems- basics of document classification- information retrieval- clustering and organizing documents- information extraction- prediction and evaluation-Textual information to numerical vectors -Collecting documents- document standardization- tokenization- lemmatization- vector generation for prediction- sentence boundary determination -evaluation performance
UNIT II TEXT CATEGORIZATION AND CLUSTERING

UNIT III TEXT MINING FOR INFORMATION RETRIEVAL AND INFORMATION EXTRACTION

UNIT IV PROBABILISTIC MODELS

UNIT V RECENT TRENDS
Visualization Approaches - Architectural Considerations - Visualization Techniques in Link Analysis - Example - Mining Text Streams - Text Mining in Multimedia - Text Analytics in Social Media - Opinion Mining and Sentiment Analysis - Document Sentiment Classification - Opinion Lexicon Expansion - Aspect-Based Sentiment Analysis - Opinion Spam Detection – Text Mining Applications and Case studies

OUTCOMES:
Upon Completion of the course, the students will be able to
• Identify the different features that can be mined from text and web documents
• Use available open source classification and clustering tools on some standard text data sets
• Modify existing classification/clustering algorithms in terms of functionality or features used
• Design a system that uses text mining to improve the functions of an existing open source search engine
• Implement a text mining system that can be used for an application of your choice

REFERENCES:
3. Charu C. Aggarwal ,ChengXiang Zhai, Mining Text Data, Springer; 2012
OBJECTIVES:

- To focus on a detailed overview of the data mining process and techniques, specifically those that are relevant to Web mining
- To understand the basics of Information retrieval and Web search with special emphasis on web crawling
- To appreciate the use of machine learning approaches for Web Content Mining
- To understand the role of hyper links in web structure mining
- To appreciate the various aspects of web usage mining

UNIT I  INTRODUCTION

UNIT II  WEB CONTENT MINING

UNIT III  WEB LINK MINING
Web Link Mining – Hyperlink based Ranking – Introduction - Social Networks Analysis- Co-Citation and Bibliographic Coupling - Page Rank - Authorities and Hubs - Link-Based Similarity Search - Enhanced Techniques for Page Ranking - Community Discovery – Web Crawling - A Basic Crawler Algorithm- Implementation Issues- Universal Crawlers- Focused Crawlers- Topical Crawlers- Evaluation - Crawler Ethics and Conflicts - New Developments

UNIT IV  STRUCTURED DATA EXTRACTION

UNIT V  WEB USAGE MINING

TOTAL: 45 PERIODS
OUTCOMES:
Upon Completion of the course, the students will be able to
• Build a sample search engine using available open source tools
• Identify the different components of a web page that can be used for mining
• Apply machine learning concepts to web content mining
• Implement Page Ranking algorithm and modify the algorithm for mining information
• Process data using the Map Reduce paradigm
• Design a system to harvest information available on the web to build recommender systems
• Analyze social media data using appropriate data/web mining techniques
• Modify an existing search engine to make it personalized

REFERENCES:
4. Soumen Chakrabarti, “Mining the Web: Discovering Knowledge from Hypertext Data”, Morgan Kaufmann; edition 2002
5. Adam Schenker, “Graph-Theoretic Techniques for Web Content Mining”, World Scientific Pub Co Inc, 2005

CP8073 DATAMINING TECHNIQUES

OBJECTIVES:
• To Understand Data mining principles and techniques and Introduce DM as a cutting edge business intelligence
• To expose the students to the concepts of Datawarehousing Architecture and Implementation
• To study the overview of developing areas – Web mining, Text mining and ethical aspects of Data mining
• To identify Business applications and Trends of Data mining

UNIT I INTRODUCTION TO DATA WAREHOUSING
Evolution of Decision Support Systems- Data warehousing Components – Building a Data warehouse, Data Warehouse and DBMS, Data marts, Metadata, Multidimensional data model, OLAP vs OLTP, OLAP operations, Data cubes, Schemas for Multidimensional Database: Stars, Snowflakes and Fact constellations

UNIT II DATA WAREHOUSE PROCESS AND ARCHITECTURE
Types of OLAP servers, 3–Tier data warehouse architecture, distributed and virtual data warehouses.Data warehouse implementatio, tuning and testing of data warehouse. Data Staging (ETL) Design and Development, data warehouse visualization, Data Warehouse Deployment, Maintenance, Growth, Business Intelligence Overview- Data Warehousing and Business Intelligence Trends - Business Applications- tools-SAS
UNIT III  INTRODUCTION TO DATA MINING  9
Data mining-KDD versus datamining, Stages of the Data Mining Process-task premitives, Data Mining Techniques -Data mining knowledge representation – Data mining query languages, Integration of a Data Mining System with a Data Warehouse – Issues, Data preprocessing – Data cleaning, Data transformation, Feature selection, Dimensionality reduction, Discretization and generating concept hierarchies-Mining frequent patterns- association-correlation

UNIT IV  CLASSIFICATION AND CLUSTERING  10
Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Clustering techniques – , Partitioning methods- k-means- Hierarchical Methods – distance based agglomerative and divisible clustering, Density-Based Methods – expectation maximization -Grid Based Methods – Model-Based Clustering Methods – Constraint – Based Cluster Analysis – Outlier Analysis

UNIT V  PREDICTIVE MODELING OF BIG DATA AND TRENDS IN DATAMINING  9

OUTCOMES:
Upon Completion of the course, the students will be able to
- Evolve Multidimensional Intelligent model from typical system
- Discover the knowledge imbibed in the high dimensional system
- Evaluate various mining techniques on complex data objects

TEXT BOOKS:
5. Statistical and Machine learning –Learning Data Mining, techniques for better Predictive Modeling and Analysis to Big Data

REFERENCES:
OBJECTIVES:
- To gain knowledge about the current Web development and emergence of Social Web.
- To study about the modeling, aggregating and knowledge representation of Semantic Web.
- To learn about the extraction and mining tools for Social networks.
- To gain knowledge on Web personalization and Web Visualization of Social networks.

UNIT I INTRODUCTION TO SOCIAL NETWORK ANALYSIS

UNIT II MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION

UNIT III EXTRACTION AND MINING COMMUNITIES IN WEB SOCIAL NETWORKS
Extracting evolution of Web Community from a Series of Web Archive - Detecting Communities in Social Networks - Definition of Community - Evaluating Communities - Methods for Community Detection & Mining - Applications of Community Mining Algorithms - Tools for Detecting Communities - Social Network Infrastructures and Communities - Decentralized Online Social Networks - Multi-Relational Characterization of Dynamic Social Network Communities.

UNIT IV PREDICTING HUMAN BEHAVIOR AND PRIVACY ISSUES

UNIT V VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS
Graph Theory- Centrality- Clustering - Node-Edge Diagrams, Matrix representation, Visualizing Online Social Networks, Visualizing Social Networks with Matrix-Based Representations- Matrix + Node-Link Diagrams, Hybrid Representations - Applications - Covert Networks - Community Welfare - Collaboration Networks - Co-Citation Networks.

OUTCOMES:
- To apply knowledge for current Web development in the era of Social Web.
- To model, aggregate and represent knowledge for Semantic Web.
- To design extraction and mining tools for Social networks.
- To develop personalized web sites and visualization for Social networks.
REFERENCES:

IF8078 IMAGE PROCESSING

OBJECTIVES:
- To understand the basic concepts of digital image processing and various image transforms.
- To familiarize the student with the image processing facilities in Matlab.
- To expose the student to a broad range of image processing techniques and their applications, and to provide the student with practical experience using them.
- To appreciate the use of current technologies those are specific to image processing systems.
- To expose the students to real-world applications of image processing.

UNIT I FUNDAMENTALS OF IMAGE PROCESSING AND IMAGE TRANSFORMS

UNIT II IMAGE ENHANCEMENT AND IMAGE RESTORATION

UNIT III MULTI RESOLUTION ANALYSIS AND IMAGE COMPRESSION

UNIT IV IMAGE SEGMENTATION AND DESCRIPTION
Image Segmentation: Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region Based Segmentation, Basic Morphological Algorithms, Morphological Water Sheds - Description: Boundary Descriptors, Regional Descriptors.
UNIT V  CURRENT TRENDS AND APPLICATIONS OF IMAGE PROCESSING


TOTAL: 45 PERIODS

OUTCOMES:
Upon Completion of the course, the students

• Should have a clear impression of the breadth and practical scope of digital image processing and have arrived at a level of understanding that is the foundation for most of the work currently underway in this field.
• Implement basic image processing algorithms using MATLAB tools
• Explore advanced topics of Digital Image Processing.
• Ability to Apply and develop new techniques in the areas of image enhancement- restoration- segmentation- compression-wavelet processing and image morphology.
• Make a positive professional contribution in the field of Digital Image Processing.

REFERENCES:

CP8017  AD HOC AND WIRELESS SENSOR NETWORKS

OBJECTIVES:

• To learn about the issues in the design of wireless ad hoc networks
• To understand the working of protocols in different layers of mobile ad hoc and sensor networks
• To expose the students to different aspects in sensor networks
• To understand various security issues in ad hoc and sensor networks and solutions to the issues

UNIT I  MAC & ROUTING IN AD HOC NETWORKS


UNIT II  TRANSPORT & QOS IN AD HOC NETWORKS

UNIT III MAC & ROUTING IN WIRELESS SENSOR NETWORKS

UNIT IV TRANSPORT & QOS IN WIRELESS SENSOR NETWORKS

UNIT V SECURITY IN AD HOC AND SENSOR NETWORKS

OUTCOMES:
Upon completion of this course students should be able to
- Identify different issues in wireless ad hoc and sensor networks
- To analyze protocols developed for ad hoc and sensor networks
- To identify and understand security issues in ad hoc and sensor networks

REFERENCES:

CP8018 BIG DATA ANALYTICS

OBJECTIVES:
- To understand big data analytics as the next wave for businesses looking for competitive advantage
- To understand the financial value of big data analytics
- To explore tools and practices for working with big data
- To understand how big data analytics can leverage into a key component
- To understand how to mine the data
- To learn about stream computing
- To know about the research that requires the integration of large amounts of data
UNIT I INTRODUCTION TO BIG DATA 9

UNIT II DATA ANALYSIS 9

UNIT III STREAM COMPUTING 9

UNIT IV PREDICTIVE ANALYTICS AND VISUALIZATION 9

UNIT V FRAMEWORKS AND APPLICATIONS 9

TOTAL : 45 PERIODS

OUTCOMES:
Upon Completion of the course, the students will be able to
• Identify the need for big data analytics for a domain
• Use Hadoop, Map Reduce Framework
• Apply big data analytics for a give problem
• Suggest areas to apply big data to increase business outcome
• Contextually integrate and correlate large amounts of information automatically to gain faster insights.

REFERENCES:

CP8019 ETHICAL HACKING AND DIGITAL FORENSICS L T P C
3 0 0 3

OBJECTIVES:
- To learn various hacking techniques and attacks.
- To know how to protect data assets against attacks from the Internet.
- To assess and measure threats to information assets.
- To understand the benefits of strategic planning process.
- To evaluate where information networks are most vulnerable.
- To perform penetration tests into secure networks for evaluation purposes.
- To enable students to understand issues associated with the nature of forensics.

UNIT I HACKING WINDOWS 9

UNIT II TCP/IP 9

UNIT III FUNDAMENTALS OF COMPUTER FRAUD 9

UNIT IV ARCHITECTURE 9

UNIT V KEY FRAUD INDICATOR SELECTION PROCESS CUSTOMIZED 9

TOTAL: 45 PERIODS
OUTCOMES:
- On completion of this course, a student should be able to:
- Defend hacking attacks and protect data assets.
- Defend a computer against a variety of different types of security attacks using a number of hands-on techniques.
- Defend a LAN against a variety of different types of security attacks using a number of hands-on techniques.
- Practice and use safe techniques on the World Wide Web.
- Understand computer Digital forensics.

REFERENCES:

CP8020 PARALLEL AND DISTRIBUTED DATABASES

OBJECTIVES:
- To realize the need of parallel processing, to cater the applications that require a system capable of sustaining trillions of operations per second on very large data sets
- To understand the need of data integration over data centralization

UNIT I INTRODUCTION TO PARALLEL DATABASES
Need of Parallelism - Forms of parallelism – architecture – Analytical models. Basic Query Parallelism – Parallel Search- Parallel sort and Group By- Parallel Join

UNIT II ADVANCED QUERY PROCESSING IN PARALLEL DATABASES
Parallel indexing. Parallel Universal Qualification – Collection Join Queries. Parallel Query Scheduling – Optimization, Applications

UNIT III INTRODUCTION TO DISTRIBUTED DATABASES

UNIT IV QUERY PROCESSING IN DISTRIBUTED DATABASES
Overview- of Query Processing – Query Decomposition and Data Localization – Optimization of Distributed Queries, Multi-database Query Processing.

UNIT V TRANSACTION MANAGEMENT AND OTHER ADVANCED SYSTEMS

TOTAL: 45 PERIODS
OUTCOMES:

STUDENTS WILL
- Get good knowledge on the need, issues, design and application of both parallel and distributed databases.
- Know how to write optimal queries to cater applications of that need these forms of databases.
- Be able to fragment, replicate and localize their data as well as their queries to get their work done faster.
- Get idea on other similar trends of optimal data processing.

TEXT BOOKS:

CP8021 STATISTICAL NATURAL LANGUAGE PROCESSING L T P C 3 0 0 3

OBJECTIVES:
- To understand the representation and processing of Morphology and Part-of Speech Taggers.
- To appreciate various techniques used for speech synthesis and recognition.
- To understand different aspects of natural language syntax and the various methods used for processing syntax.
- To understand different methods of disambiguating word senses.
- To appreciate the various representations of semantics and discourse.
- To know about various applications of natural language processing.

UNIT I MORPHOLOGY AND PART-OF SPEECH PROCESSING 9

UNIT II SPEECH PROCESSING 9
UNIT III SYNTAX ANALYSIS

UNIT IV SEMANTIC AND PRAGMATIC INTERPRETATION

UNIT V APPLICATIONS

OUTCOMES:
Upon Completion of the course, the students will be able to

- To identify the different linguistic components of given sentences
- To design a morphological analyser for a language of your choice using finite state automata concepts
- To implement the Earley algorithm for a language of your choice by providing suitable grammar and words
- To use a machine learning algorithm for word sense disambiguation
- To build a tagger to semantically tag words using WordNet
- To design a business application that uses different aspects of language processing.

REFERENCES:
2. Christopher D. Manning and Hinrich Schütze, ‘Foundations of Statistical Natural Language Processing”, MIT Press, 1999

TOTAL : 45 PERIODS
OBJECTIVES:
- To learn the basics of XML technology.
- To understand the background of distributed information system.
- To analyze and design a web service based application.
- To learn the security features of web services and service composition.

UNIT I    DISTRIBUTED INFORMATION SYSTEM

UNIT II WEB SERVICES BUILDING BLOCK

UNIT III WEB SERVICE SECURITY

UNIT IV SEMANTIC WEB SERVICES

UNIT V SERVICE COMPOSITION

TOTAL: 45 PERIODS

OUTCOMES:
Upon Completion of the course, the students should be able to:
- Create, validate, parse, and transform XML documents.
- Design a middleware solution based application.
- Develop web services using different technologies.
- Compose set of web services using BPEL.

REFERENCES:
OBJECTIVES:
At the end of the course the students would be able to
- Design and implement relational database solutions for general applications.
- Develop database scripts for data manipulation and database administration.
- Understand and perform common database administration tasks, such as database monitoring, performance tuning, data transfer, and security.
- To balance the different types of competing resources in the database environment so that the most important applications have priority access to the resources.

UNIT I  INTRODUCTION TO DATABASE ADMINISTRATION

UNIT II DATABASE SECURITY, BACKUP AND RECOVERY

UNIT III FUNDAMENTALS OF TUNING

UNIT IV INDEX TUNING AND QUERY OPTIMIZATION

UNIT V TROUBLESHOOTING

TOTAL: 45 PERIODS
OUTCOMES:

- advanced features of databases in design, administration, and applications
- aspires to improve the performance of a database
- optimize the use of existing resources within the database environment.

REFERENCES:


IF8252 CLOUD COMPUTING TECHNOLOGIES L T P C
3 0 0 3

OBJECTIVES:

- To understand the concept of cloud and utility computing.
- To understand the various issues in cloud computing.
- To familiarize themselves with the state of the art in cloud.
- To appreciate the emergence of cloud as the next generation computing paradigm.
- To be able to set up a private cloud.

UNIT I INTRODUCTION

UNIT II VIRTUALIZATION

UNIT III CLOUD INFRASTRUCTURE

UNIT IV PROGRAMMING MODEL
Parallel and Distributed Programming Paradigms – Map Reduce, Twister and Iterative MapReduce – Hadoop Library from Apache – Mapping Applications - Programming Support -
Google App Engine, Amazon AWS - Cloud Software Environments - Eucalyptus, Open Nebula, Open Stack.

UNIT V SECURITY IN THE CLOUD

TOTAL: 45 PERIODS

OUTCOMES:
Upon Completion of the course, the students should be able to:

- Articulate the main concepts, key technologies, strengths and limitations of cloud computing
- Identify the architecture, infrastructure and delivery models of cloud computing
- Explain the core issues of cloud computing such as security, privacy and interoperability
- Choose the appropriate technologies, algorithms and approaches for the related issues

REFERENCES: