PROGRAM OBJECTIVES:

a) Enable students to appreciate review and understand the foundations in computing systems and optimization techniques
b) Enable students to use optimization techniques to enhance computing systems
c) Enable students to understand the management of enterprise resources using current tools, frameworks and reusable resources
d) Prepare students to critically analyze existing literature in an area of specialization and develop innovative and research oriented methodologies to tackle gaps identified
e) 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 engineering solutions within a global, societal, and environmental context

PROGRAM OUTCOMES:

After Successful completion of this program, the students

a. Acquire knowledge in resource management techniques and tools and have the capability apply in any systems concerned, like, computer system or electrical system or mechanical system, or so.
b. Have the capability to apply mathematical knowledge, data structure and algorithmic principles in design and development for software system
c. Acquire leadership/managerial capabilities in decision making, analyse the alterable and mange the digital assets.
d. Acquire knowledge in the area of computer networks, including wireless mobile networks, with the due experience
e. Ability to write object oriented programs, sql scripts for rdbms and other scripts for simulators like, ns2, matlab, etc.
f. Critically analyze existing literature in the area(s) of specialization and develop innovative and research oriented methodologies to tackle gaps identified
g. Communicate effectively, both orally with the range of audiences and prepare technical documents.
# M.E. Systems Engineering and Operations Research

## Curriculum I to VI Semesters (Part - Time)

### Semester I

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OBJECTIVES:

• To have a thorough understanding of the basic structure and operation of a digital computer.
• To discuss in detail the operation of the processing units.
• To study the hierarchical memory system including cache memories and virtual memory.
• To study the concept of pipelining and shared memory.

UNIT I  BASIC STRUCTURE OF COMPUTERS  9
Functional units - Basic operational concepts - Bus structures - Software performance – Memory locations and addresses – Memory operations – Instruction and instruction sequencing – Addressing modes – Assembly language – Basic I/O operations – Stacks and queues.

UNIT II  ARITHMETIC AND PROCESSING UNITS  9

UNIT III  MEMORY AND I/O SYSTEM  9

UNIT IV  PIPELINEING  9
Pipelining – Basic concepts – Data hazards – Instruction hazards – Influence on Instruction sets – Data path and control consideration – Superscalar operation. Linear and non-linear processors

UNIT V  PARALLEL COMPUTING AND CACHE COHERENCE  9

TOTAL: 45 PERIODS

OUTCOMES:

• Acquired knowledge of organization of computer, memory and I/O
• Understand the exploitation of power of microprocessor

REFERENCES:
OBJECTIVES:

- To review & understand data structure and algorithms, 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  INTRODUCTION TO DATA STRUCTURES  9

UNIT II  INTRODUCTION TO C++  9
Programming Paradigms - Comparison of Programming Paradigms – Object Oriented Languages - Benefits of Object Oriented Programming - Comparison with C - Overview of C++ - Types and Declarations - Pointers, Arrays, References and Structures - Expressions and Statements – Functions – Scope and Namespaces - Source Files and Programs.

UNIT III CLASSES AND OBJECTS  9
Dynamic Memory Allocation - Classes and Objects – Constructors and Destructors - Function Overloading – Copy Constructor - Friends - Operator Overloading.

UNIT IV  DERIVED CLASSES AND ADDITIONAL FEATURES  9
Composition and Inheritance – Access Control - Virtual functions and Polymorphisms – Abstract Base Classes - Design of Class Hierarchies - I/O Stream - File I/O - Exception Handling.

UNIT V  DYNAMIC DATA STRUCTURES IMPLEMENTATION  9

TOTAL: 45 PERIODS

OUTCOMES:

- Acquire ability to select the better algorithm based on complexity and efficiency.
- Master a variety of advanced data structures and their implementations.
- Ability to apply and implement learned algorithm design techniques and data structures to solve problems.

REFERENCES:

OBJECTIVE:
- Introduce the concepts related to system engineering, with design, analysis, game theory, decision making analysis, etc.

UNIT I  SYSTEMS ENGINEERING PROCESSES  9

UNIT II  ANALYSIS OF ALTERNATIVES  9
Generation of Alternatives/ system synthesis – Identification of activities and activity measures; Uncertain/ Imperfect information; Cross-impact analysis, Hierarchical inference, logical reasoning inference; Coupled uncoupled events – Baye’s model – event trees, probability trees; Causal loop diagrams, influence diagrams

UNIT III  STRUCTURAL MODEL & SYSTEM DYNAMICS  9
Structural modeling; System Dynamics; Structural models – Tree structures, reachability graph and matrix; System Dynamic Models – population models, urban dynamics, world dynamic models; Economic models

UNIT IV  DECISION MAKING  9
Types of decisions – descriptive, prescriptive, normative; Decision assessment efforts types – under certainty, probabilistic uncertainty, probabilistic imprecision, information imperfection, conflict and cooperation; Prescriptive normative decision assessments; Utility theory;

UNIT V  GAME THEORY, SYSTEMS PLANNING & MANAGEMENT  9
Game Theory basics – Decision making and game theory, Game theory in Group decision making, SE management plan; Network based systems planning and management methods; Cognitive factors in SE

OUTCOMES:
- Have the capability to design and analyse the system
- Decision making ability
- Familiarity in system engineering design tools

REFERENCES:
MA8154 ADVANCED MATHEMATICS FOR COMPUTING  L T P C
3 1 0 4

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 QUEUEING 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 queueing 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:
OBJECTIVES:
To acquire practical experience in object oriented programming
1. Implement fundamental algorithms to generate number sequences.
2. Implement factorial methods like finding factors and random number generation.
3. Implement Array techniques to remove duplicates and find longest Monotone sequence.
4. Implement Merging, Sorting and Searching techniques.
5. Text Processing and Pattern Searching algorithms Implementation.

OUTCOMES:
- Capable of implementing object oriented programming concepts with C++
- Ability to implement data structures using C++

SO8201 ADVANCED DATABASE MANAGEMENT SYSTEM

OBJECTIVES:
- Able to design and implement relational databases,
- distributed databases, XML databases, multimedia
- databases and be familiar with the current issues

UNIT I RELATIONAL MODEL
Data Model – Types of Data Models - Entity Relationship Model – Relational Data Model – Relational Algebra – Transforming Entity Relationship Model to Relational Model – Structured Query Language

UNIT II DATABASE NORMALIZATION

UNIT III TRANSACTION MANAGEMENT

UNIT IV PARALLEL AND DISTRIBUTED DATABASES
UNIT V XML DATABASES  

TOTAL: 45 PERIODS  

OUTCOME:  
- Ability to design and implement the concepts of relational, distributed and XML databases  

REFERENCES:  

SO8202 COMPUTER NETWORKS  

L T P C  
3 0 0 3  

OBJECTIVES:  
- The course is designed to present an overview of the Modern Telecommunication, and of those communication applications that will expand student’s skill and expertise in Networking.  
- Data communication layout and application in enterprise world will be covered.  

UNIT I NETWORK ARCHITECTURE  

UNIT II DATALINK LAYER  
Error detection and correction - Data Link control - Multiple accesses.-Flow control – Error Control- Bridges and Switches  

UNIT III NETWORK LAYER  

UNIT IV TRANSPORT LAYER  

UNIT V APPLICATION LAYER  

TOTAL: 45 PERIODS
OUTCOMES:
- Student can use the knowledge gained to analyze the network architecture and infrastructure.
- Fundamental understanding in telecom industry business is enhanced.

REFERENCES:

TOTAL : 45 PERIODS

SO8203 LINEAR PROGRAMMING AND APPLICATIONS  L  T  P  C
3  0  0  3

OBJECTIVES:
- To introduce the basic concepts and some tools in optimization.
- To explore the advanced concepts vertically to make clear understanding and application of the concepts in engineering and scientific applications.

UNIT I INTRODUCTION 9
Formulation and Graphical Solutions, Solution of Maximization Model, Solution of Minimization Model, Simplex method, Degeneracy, Unbounded Solution, Infeasible Solution, Alternative Optima.

UNIT II ADVANCED LINEAR PROGRAMMING 9
BIG-M method, Two-Phase method, Special cases in the Simplex method, Transportation and Assignment Problems, Revised Simplex Method, Duality in Linear Programming Problems, Dual Simplex method, Bounded variable technique.

UNIT III SENSITIVITY ANALYSIS 9
Sensitivity Analysis or Post Optimality Analysis-Changes in the Right hand side, Objective function, Changes affecting feasibility, Changes affecting optimality.

UNIT IV INTEGER PROGRAMMING 9
Knapsack Problem, Cutting plane algorithm, Branch and bound algorithm, Mixed integer programming, travelling salesperson problem.

UNIT V CASE STUDIES AND TOOLS 9
Case Studies: Urban Planning model, Investment problem, Currency Arbitrage, Production Planning and Inventory Control, Manpower planning, Solving LP problems using TORA / LINDO/ LINGO.

OUTCOMES:
- Conceptually understand and emerge towards optimization.
- Optimize effectively through LP methods and tools.
REFERENCES:

SO8204 OPERATING SYSTEM L T P C
3 0 0 3

OBJECTIVES:
- The course introduces numerous concepts and principles of operating systems.
- This provides exposure to the students on popular operating system like Windows/Linux and gain hands-on experience.

UNIT I PROCESS MANAGEMENT
Operating system and services - Process structure and PCB - Microkernels - Threads – Inter process communication - CPU scheduling approaches - Process synchronization - semaphores – Deadlocks – handling deadlocks.

UNIT II MEMORY MANAGEMENT
Memory management- Paging- Segmentation-Virtual memory- Demand paging – Page replacement algorithms- Allocation algorithms

UNIT III FILE AND SECONDARY STORAGE MANAGEMENT

UNIT IV DISTRIBUTED OPERATING SYSTEM

UNIT V CASE STUDY (LINUX / WINDOWS)
Case study (Linux / Windows) – Design and implementation of OS - process model and structure in OS - memory management - file system - I/O management and device drivers.

TOTAL : 45 PERIODS
OUTCOMES:
- The course will enhance the knowledge about the operations, implementation and performance of modern operating systems.
- The students will be able to compare the relative merits and suitability of each operating system for complex user applications.

REFERENCES:

SO8211 DATABASE MANAGEMENT SYSTEM LABORATORY L T P C
0 0 3 2

OBJECTIVES:
The expected learning outcome of this course is, a student who has successfully completed this course will be able to:

SOFTWARE:
Oracle 10 G or Higher / Equivalent

TOPICS TO BE COVERED:
1. DATA DEFINITION LANGUAGE
   - Create, Alter, Drop
   - Truncate, Comment, Rename Command
   - Enforcing Integrity Constraints
   - Views, Synonyms, Sequences, Indexes

2. DATA MANIPULATION LANGUAGE
   - Insert
   - Delete
   - Update

3. JOINING DATA FROM MULTIPLE TABLES IN QUERIES
   - The JOIN Condition / The Cartesian Product
   - Equijoin
   - Self-join
   - Outer JOINs
4. SET OPERATIONS
5. AGGREGATE FUNCTIONS AND THE GROUP BY CLAUSE
6. USING SUB-QUERIES
7. ANALYTIC FUNCTIONS
8. INTRODUCTION TO PROCEDURES AND FUNCTIONS
   - Creating stored PL / SQL objects, procedures, functions
9. CREATING PACKAGES
   - Creating package specifications and bodies
10. CREATING DML TRIGGERS
    - Triggering events, Trigger behavior
    - Correlation identifiers, Multi-statement triggers
    - Trigger firing behavior, Enabling / Disabling triggers
11. DISTRIBUTED DATABASE IMPLEMENTATION.
    
    TOTAL : 45 PERIODS

SO8301  NON-LINEAR PROGRAMMING  L T P C
        3 0 0 3

OBJECTIVES:
- To introduce and familiarize non-linear approaches in optimization.
- To conceptualize the real life applications in terms of non-linearity and also to learn MATLAB for solving the same.

UNIT I  INTRODUCTION  9
Linear Vs Non-linear Programming-Basic properties of solutions and Algorithms: First order necessary conditions, Examples of unconstrained problems, second-order conditions, convex and concave functions, minimization and maximization of convex functions-saddle points-jacobian matrix.

UNIT II  ONE DIMENSIONAL OPTIMIZATION  9

UNIT III  MULTI-DIMENSIONAL OPTIMIZATION  9

UNIT IV  UNCONSTRAINED OPTIMIZATION FOR CONSTRAINED PROBLEMS  9
Lagrange method-Inequality constraints-KKT conditions-Quadratic programming-Geometric programming-Separable Linear Programming-sequential linear Programming-Feasible Direction method.
UNIT V  
EVOLUTIONARY PROGRAMMING  
Genetic Engineering- Genetic operators-reproduction-Crossover, mutation, Selection-Genetic local search-simulated Annealing - Ant colony Optimization- Particle swarm Optimization- Matlab - Simulation of NLP techniques / concepts with Matlab  
TOTAL: 45 PERIODS

OUTCOMES:
- Applying the concepts of non-linear programming in real life scenarios.
- Provide instant results through MATLAB.

REFERENCES:

IF8351  
VIRTUALIZATION  
L T P C 
3 0 0 3

OBJECTIVES:
- To understand the concept of virtualization.
- To understand the various issues in virtualization.
- To familiarize themselves with the types of virtualization.
- To compare and analyze various virtual machines products.

UNIT I  
OVERVIEW OF VIRTUALIZATION  
10

UNIT II  
SERVER CONSOLIDATION  
8

UNIT III  
NETWORK VIRTUALIZATION  
10
UNIT IV        VIRTUALIZING STORAGE

UNIT V         VIRTUAL MACHINES PRODUCTS
Xen Virtual machine monitors- Xen API – VMWare – VMWare products - VMware Features – Microsoft Virtual Server – Features of Microsoft Virtual Server.

OUTCOMES:
Upon Completion of the course, the students should be able to
• Create a virtual machine and to extend it to a virtual network.
• Discuss on various virtual machine products.
• Compile all types of virtualization techniques and utilize them in design of virtual machines.

REFERENCES:

SO8311        VIRTUALIZATION LABORATORY
OBJECTIVES :
• To acquire hands-on experience & familiarity in virtualization environment & techniques.
• To acquire the capability of implementing the virtualization techniques/concepts

OUTCOMES :
• Knowledge in the virtualization environment like vmware
• Ability to implement virtualization concepts/techniques
1. Install and Configuring Type-2 Hypervisors
2. Install and Configuring Type-1 Hypervisors
3. Deploying virtual machines using templates and converters
4. Modifying, managing and migrating virtual machines
5. Configuring user access control through roles and permissions, Workload assessment and monitoring configuration
6. Setup of resource pools and distributed resource scheduler cluster
7. Setup of high availability of cluster, Patch upgrades,Backup and recovery of virtual machines
8. Install and Configuring Application Virtualization Infrastructures
REQUIREMENTS:
- CPU - Single socket, dual core
- Memory - Minimum: 2GB
- Network - one NIC, plus one for Management interface
- Local Storage (SATA/SAS) - Minimum: one 80GB drive
- Shared Storage - NFS, iSCSI, Fibre Channel for VM storage
- Hypervisor – Xen / vmwarevSphere(free edition) / KVM
- Application Virtualisation – Ulteo VDI (Open Source)

TOTAL: 45 PERIODS

SO8401 SYSTEMS MODELLING AND SIMULATION

OBJECTIVES:
- To obtain sufficient knowledge to model any given system,
- to simulate the modeled system for performance study.

UNIT I INTRODUCTION
System definition, Types and characteristics-Need for modeling and simulation-Types of Simulation-Introduction to discrete event simulation-Single server- Multiserver Exercises - system modeling - Simple Petrinets: Introduction to Petrinets,

UNIT II MODELLING APPROACHES
Modeling concurrent systems, Analysis of Petrinets-Finite state Automata and Regular Expressions: Finite state Automata and Regular Expression relationship, FSA with silent transitions, Pumping lemma for regular sets, Analysis using DFS and model checking.

UNIT III QUEUING MODELS
Characteristics of queuing systems-Notations-Types of Queues-Markovian model-Non-Markovian model-Queuing Networks-Applications of queuing systems.

UNIT IV SIMULATION DATA
Methods for generating random numbers, Testing of random numbers-Methods of generating random variates-Problem formulation-input modeling-Verification and Validation-Output Analysis.

UNIT V CASE STUDY
GPSS-Development of simulation models using GPSS for queuing systems, Production systems, Inventory systems, Networks, Maintenance Systems.

OUTCOMES:
- Modeling any given system with rationality.
- Predicting the behavior through fine grained analysis.
REFERENCES:

IF8254 MOBILE AND PERVERSIVE COMPUTING L T P C
3 0 0 3

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
UNIT V  APPLICATION DEVELOPMENT


TOTAL: 45 PERIODS

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:

SO8411  SIMULATION TOOLS LABORATORY

OBJECTIVES:
- To introduce the basic concepts in simulation.
- To learn and implement the facilities in MATLAB.
- To understand the network related concepts through simulation in NS/2.

TOOLS:
MATLAB 2012 or higher version in Windows environment.
NS/2
(Network Simulator)
LIST OF EXPERIMENTS:
Installation and study of selected MATLAB tools.
Basic exercises (Graph plotting, Arithmetic calculations, Regular Expressions, etc.,) in MATLAB.
- Image Processing in MATLAB.
- Mini project in MATLAB
- Installation of NS/2.
- Study of Wired and Wireless environment in NS/2.
- Simple experiment to plot graph and edit TCL.
- Algorithm implementation for wired environment.
- Algorithm implementation for wireless environment.
- Networking in NS/2.
- Mini project in NS/2.

OUTCOME :
- Ability to simulate with Matlab & ns/2

TOTAL: 45 PERIODS

SO8501 DYNAMIC PROGRAMMING

OBJECTIVES:
To make more specific linear and non-linear approaches that suits both stochastic and deterministic applications. Also to ensure optimal results faster under any given situation.

UNIT I INTRODUCTION AND APPLICATIONS OF DYNAMIC PROGRAMMING 9

UNIT II DETERMINISTIC DYNAMIC PROGRAMMING 9
Introduction, Mathematical description, Principal of Optimality, Recursive computation, Multi stage Forward and Backward Recursion, Selected Dynamic Programming Applications – Cargo loading model, work force size model, equipment replacement model, investment model, inventory models, Problem of Dimensionality.

UNIT III PROBABILISTIC DYNAMIC PROGRAMMING 9
Introduction, Distribution of effort example, New product introduction, A decision Tree, Elementary inventory model, optimal Batch size model, Stochastic regeneration Model-Equipment Replacement, Sales Forecasting problem, Applicability and Computational feasibility.

UNIT IV DYNAMIC PROGRAMMING IN MARKOV CHAINS 9
Introduction, Stochastic Shortest-Route Model, Unbounded horizon with discounting \((\alpha < 1)\), equivalent Average Return \((\alpha = 1)\), Linear Programming Approach, Computational considerations, Markov chain version of the equipment replacement model.
UNIT V RISK, UNCERTAINTY AND COMPETITION
Terminology and Classification, Decision making under risk, Multistage Optimization under Risk, Markovian Decision Processes, A variable stage Stochastic Problem, Uncertainty and Adaptive Optimization, Gambling with unknown Probabilities, Two-Person, Zero-Sum Games, Games in Extensive.

TOTAL: 45 PERIODS

OUTCOMES:
- Discrimination of concepts to be applied for various optimization approaches.
- Choosing appropriate concept for specific model.

REFERENCES:

CP8351 SECURITY PRINCIPLES AND PRACTICES

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

UNIT V SECURITY PRACTICES

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:

SO8003 DECISION MODELS

OBJECTIVES:
- This subject aimed towards helping the engineers and scientist to make rational decision, and to explore the supportive systems.

UNIT I INTRODUCTION
Types of decisions under certainty, probabilistic uncertainty, probabilistic imprecision, information-imperfection, conflict and cooperation- Prescriptive normative decision assessments-Utility theory- Group decision making.

UNIT II GAME THEORY

UNIT III APPLICATION OF GAME THEORY

UNIT IV DECISION SUPPORT SYSTEMS
UNIT V CASE STUDY

OUTCOME:
- Acquire the knowledge in decision models which strengthen the managerial/leadership capability in real time decision making.

TEXT BOOKS:

<table>
<thead>
<tr>
<th>SO8006</th>
<th>ENTERPRISE ARCHITECTURES/ FRAMEWORK</th>
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OBJECTIVES:
- To learn the concepts of ERP,
- Architectures/ Framework

UNIT I INTRODUCTION TO ERP

UNIT II BUSINESS MODELLING FOR ERP

UNIT III ERP AND THE COMPETITIVE ADVANTAGE

UNIT IV COMMERCIAL ERP
Description – Multi-Client Server Solution – Open Technology – User Interface- Application Integration.

UNIT V SAP ARCHITECTURE

OUTCOMES:
- Choosing appropriate concepts of ERP
- Knowing ERP Architectures / Framework

TOTAL: 45 PERIODS
REFERENCES:

SO8007 PARALLEL PROGRAMMING L T P C
3 0 0 3

OBJECTIVES:
- To acquire knowledge in parallel programming
- Review parallel architecture and shared memory
- To study parallel algorithms

UNIT I PARALLEL PROGRAMMING 9

UNIT II MESSAGE PASSING PROGRAMME 9
The message-passing model – the message-passing interface – MPI standard – basic concepts of MPI: MPI_Init, MPI_Comm_size, MPI_Comm_rank, MPI_Send, MPI_Recv, MPI_Finalize – timing the MPI programs: MPI_Wtime, MPI_Wtick – collective communication: MPI_Reduce, MPI_Barrier, MPI_Bcast, MPI_Gather, MPI_Scatter – case studies: the sieve of Eratosthenes, Floyd’s algorithm, Matrix-vector multiplication

UNIT III SHARED-MEMORY PROGRAMMING 9

UNIT IV PARALLEL ALGORITHMS – I 9

UNIT V PARALLEL ALGORITHMS – II 9

TOTAL : 45 PERIODS

OUTCOMES:
- Ability to write programs for parallel systems
- Knowledgeable in parallel architecture and associated concepts
REFERENCES:

SO8009 SUPPLY CHAIN PLANNING AND MANAGEMENT

OBJECTIVES:
- To acquaint the concepts in supply chain in management ranging from planning for purchase to delivery of goods to customers.

UNIT I INTRODUCTION

UNIT II FORECASTING

UNIT III INVENTORY MANAGEMENT AND RISK POOLING

UNIT IV NETWORK PLANNING AND PROCUREMENT STRATEGY
Network design-Inventory positioning and logistics and logistics co-ordination-Resource allocation-Transportation in a supply chain-Outsourcing benefits and risks-Buy/make Decisions-Procurement strategies-E-Procurement.

UNIT V CASE STUDIES
International supply chain-Coordinating SCM through E-Business-Financial Evaluation of supply chain Decision-Bullwhip effect-Information sharing and incentives-Performance impact of centralized and decentralized decision making-Role of IT.

TOTAL: 45 PERIODS

OUTCOMES:
- Acquire knowledge in the management of supply chain assembly and role of IT in it.
- Capability of Inventory management, planning and decision making

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  TROUBLE SHOOTING

## 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:

CP8073 DATA MINING TECHNIQUES L T P C
3 0 0 3

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 Dataware housing 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 8
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 9
Types of OLAP servers, 3–Tier data warehouse architecture, distributed and virtual data warehouses. Data warehouse implementation, 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 data mining, 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 DATA MINING

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:

MM8251          MULTIMEDIA DATABASES

OBJECTIVES:
- To study issues concerning both the traditional and modern database systems and technologies for multimedia data management.
- To understand the basic concepts and techniques pertinent to multimedia databases.
- To learn about Image databases and Text/Document databases, Audio and Video databases.
- To study and use advanced technologies to develop web– based multimedia applications.

UNIT I          INTRODUCTION
An introduction to Object oriented Databases - Multidimensional Data Structures - K d Trees, Point Quad trees, -The MX Quad tree - R Trees – Comparison of Different Data Structures.

UNIT II          IMAGE DATABASES AND TEXT/DOCUMENT DATABASES
UNIT III  VIDEO DATABASES AND AUDIO DATABASES  9

UNIT IV  MULTIMEDIA DATABASES  9

UNIT V  OBJECT MODEL AND SPATIAL DATABASES  9

TOTAL: 45 PERIODS

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

• Provide a basic study of the development of fundamental database systems.
• Understand the most fundamental MDBMS concepts and techniques
• Acquire knowledge of Image databases, Text/Document databases, Audio and Video databases.
• Grasp the modern database technologies suitable for multimedia data management, and Apply some of the advanced technologies such as spatial databases to develop web based multimedia applications.

REFERENCES

SW8071  SOFTWARE VERIFICATION AND VALIDATION  L T P C
3 0 0 3

OBJECTIVES:
• To understand the principles of verification and validation
• To appreciate the different verification and validation techniques
• To understand the various stages of testing
• To appreciate the use of tools for verification and validation
• To appreciate the benefit of using metrics for verification and validation

UNIT I  INTRODUCTION  9
Principles of verification and validation – software architecture frameworks – model driven architecture – UML – systems modeling language – verification, validation and accreditation –
UNIT II   METHODS OF SOFTWARE VERIFICATION  

UNIT III   TESTING  

UNIT IV   TOOLS FOR SOFTWARE VERIFICATION  

UNIT V   ADVANCED APPROACHES  
Automatic approach for verification and validation – validating UML behavioral diagrams – probabilistic model checking of activity diagrams in SysML – metrics for verification and validation

TOTAL: 45 PERIODS

OUTCOMES:
- Upon Completion of the course the students will be able to
- Identify the different techniques for verification and validation
- Use available traceability analysis tools on some sample requirements
- Modify existing coverage analysers in terms of functionality or features used
- Design system test cases for application of your choice
- Use test case generators and test management tools for sample application

REFERENCES:
3. ESA Board for Software Standardisation and Control (BSSC), Guide to software verification and Validation, European Space Agency ESA PSS-05-10 Issue 1 Revision 1, March 1995
OBJECTIVE:

- To make students demonstrate and implement quality design patterns and their underlying object oriented concepts in java and to provide solutions to real world software design problems.

UNIT I   INTRODUCTION
Definition - Design Patterns in Smalltalk MVC - Describing Design Patterns - The Catalog of Design Patterns - Organizing the Catalog - How Design Patterns Solve Design Problems - How to Select a Design Pattern - How to Use a Design Pattern.

UNIT II   CREATIONAL PATTERNS
Abstract Factory - Builder - Factory Method - Prototype - Singleton

UNIT III   STRUCTURAL PATTERN
Adapter - Bridge - Composite - Decorator - Façade - Flyweight - Proxy.

UNIT IV   BEHAVIORAL PATTERNS
Chain of Responsibility - Command - Interpreter - Mediator - Memento - Observer - State - Strategy

UNIT V   ADVANCED TOPICS
Java Core APIs - Distributed Technologies - Jini and J2EE Architectures – Applications and Examples

OUTCOMES:

- Upon successful completion of the course, the student will be able to comprehend most important design patterns and apply object-oriented methodologies for innovating and designing reusable, modular, maintainable and modifiable software.

TOTAL : 45 PERIODS

TEXT BOOKS:
2. Eric Freeman, Elisabeth Robson, Bert Bates, Kathy Sierra, “Head First Design Patterns”, O'Reilly Media, Inc., 2004
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

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 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 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:

OBJECTIVES:
- To learn the key aspects of Soft computing and Neural networks.
- To study the fuzzy logic components.
- To gain insight onto Neuro Fuzzy modeling and control.
- To know about the components and building block hypothesis of Genetic algorithm.
- To gain knowledge in machine learning through Support Vector Machines.

UNIT I INTRODUCTION TO SOFT COMPUTING
Evolution of Computing - Soft Computing Constituents – From Conventional AI to Computational Intelligence - Machine Learning Basics

UNIT II GENETIC ALGORITHMS

UNIT III NEURAL NETWORKS

UNIT IV FUZZY LOGIC

UNIT V NEURO-FUZZY MODELING

TOTAL :45 PERIODS

OUTCOMES:
Upon Completion of the course, the students should be able to
- To discuss on machine learning through Neural networks.
- Apply knowledge in developing a Fuzzy expert system.
- Able to model Neuro Fuzzy system for clustering and classification.
- Discover knowledge to develop Genetic Algorithm and Support vector machine based machine learning system.

REFERENCES:
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<tr>
<th>Objective</th>
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<tr>
<td>To learn the performance of computer systems.</td>
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**UNIT I OVERVIEW OF PERFORMANCE EVALUATION**

- The Art of Performance Evaluation
- Performance Projects
- Overview of Queuing: modeling cycle, workload characterization, sensitivity analysis, sources of insight, common mistakes, Systematic approach, Selection of evaluation techniques and performance metrics, Utility Classification and setting performance requirements.

**UNIT II PERFORMANCE BOUNDS**

- Fundamental laws – basic quantities, little’s law, the forced flow law, the flow assumption, Queuing Network Model Inputs and Outputs – model inputs, outputs, multiple class models, Bounds on performance – Asymptotic bounds, balanced system bounds.
- Types of workloads – addition
- Instruction, kernels, synthetic programs, application benchmarks, popular benchmarks, The art of workload selection – services, levels, representative ness, timeliness, other considerations

**UNIT III MEASUREMENT TECHNIQUES AND TOOLS**

- Data Presentation – Types of variables, graphics chart, Pictorial games, Gantt charts, Kiviat graphs, Schumacher charts, Decision maker’s games, Ratio games – Selection of appropriate Base System and Ratio metric, strategies, correct analysis.

**UNIT IV EXPERIMENT DESIGN AND SIMULATION**

- Types of experimental design, Factorial design, effects of computation, sign table method, allocation of variation, estimation of experimental errors, analysis of variance, visual diagnostic tests, confidence intervals for effects, Simulation – common mistake, causes of failure, terminology, selection of language, types, event set algorithms, models with one job class, multiple job classes, flow equivalence and hierarchical modeling, disk I/O.

**UNIT V QUEUING MODELS AND NETWORKS OF QUEUES**

- Introduction to Queuing theory – Variations, rules, little’s law, types of stochastic processes, Analysis of single queue – Birth – death processes, M/M/1, M/M/m, M/M/m/B with finite buffer, Queuing networks – Open and Closed, Product form, Queuing network models for computer systems. Case studies.

**TOTAL: 45 PERIODS**

**OUTCOME:**

- Learning the performance measurement techniques to evaluate the performance of computer systems
REFERENCES:

SO8008 SOFTWARE TESTING AND QUALITY ASSURANCE L T P C
3 0 0 3

OBJECTIVES:
- To Know what is software and the usage of different types of software’s.
- To know the Quality Metrics of various Software’s.
- Plans, methods and process are executed to get a good Quality software.
- Knowing the methodologies in making Software.
- To test the product finally to check the product Quality.

UNIT I INTRODUCTION

UNIT II TESTING METHODOLOGIES
Basics of software testing – test generation from requirements – finite state models – combinatorial designs - test selection, minimization and prioritization for regression testing – test adequacy, assessment and enhancement

UNIT III TEST STRATEGIES
Testing strategies – white box and black box approach – integration testing – system and acceptance testing – performance testing – regression testing - internationalization testing – ad-hoc testing – website testing – usability testing – accessibility testing Test plan – management – execution and reporting – software test automation – automated testing tools

UNIT IV SOFTWARE QUALITY

UNIT V SQA IN PROJECT MANAGEMENT
Project progress control – costs – quality management standards – project process standards – management and its role in SQA – SQA unit

TOTAL :45 PERIODS
OUTCOMES:
- To analyze the product Quality by various testing methods.
- To use various testing methods for the appropriate applications.
- To assess Quality standards.

REFERENCES:

SO8001 BUSINESS PROCESS MANAGEMENT L T P C
3 0 0 3

OBJECTIVE:
- To learn business process structure, framework and management

UNIT I ORGANIZATIONAL STRUCTURE

UNIT II BUSINESS PROCESS MANAGEMENT

UNIT III THE FRAMEWORK - I

UNIT IV THE FRAMEWORK - II
UNIT V  BPM AND THE ORGANIZATION  9
BPM maturity- BPM maturity model- Application of the BPMM model- Embedding BPM within the organization- Knowledge management and information technology

TOTAL: 45 PERIODS

OUTCOME:
• Acquire leadership/entrepreneurship qualities with respect to business processes

REFERENCES:

SO8005  DIGITAL ASSET MANAGEMENT  L T P C
3 0 0 3

OBJECTIVES:
• To expose students to different aspects of digital content management.
• To explore the concepts of the creation, storage, retrieval, and presentation of digital assets.

UNIT I  INTRODUCTION  9

UNIT II  THE SYSTEM COMPONENTS  9

UNIT III  CONTENT RELATED WORKFLOWS  9
Content Related Workflows - File Formats – Content Representation and Metadata - Content Description Standards – The Presentation Tier – The Application Server.

UNIT IV  CONTENT MANAGEMENT  9
Content Management – Content Management System Infrastructure – System and Data Integration in CMS – Applications – Future Trends.

UNIT V  DOCUMENT SECURITY AND DIGITAL RIGHTS MANAGEMENT  9

TOTAL:45 PERIODS

OUTCOME:
• Acquire the ability to manage, control and efficient utilization of digital resources
REFERENCES: