### Department of Computer Science & Information Technology

**Shepherd School of Engineering & Technology, SHIATS**

**M. Tech. Computer Science and Engineering (Effective From 2010-2011)**

#### Semester – I

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits (L-T-P)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>CSE 711</td>
<td>Advanced Data Structures</td>
<td>4 (2-1-1)</td>
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<tr>
<td>2.</td>
<td>CSE 712</td>
<td>Advanced Computer Networks</td>
<td>4 (3-1-0)</td>
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<td>3.</td>
<td>CSE 713</td>
<td>Computer Organization and Operating Systems</td>
<td>4 (4-0-0)</td>
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<td>4.</td>
<td>CSE 714</td>
<td>Object Oriented Systems</td>
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#### Semester – II

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<tr>
<td>1.</td>
<td>CSE 721</td>
<td>Software Engineering</td>
<td>4 (3-1-0)</td>
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<td>2.</td>
<td>CSE 722</td>
<td>Simulation and Modeling</td>
<td>4 (2-1-1)</td>
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<td>3.</td>
<td>CSE 821</td>
<td>Advanced Database Management Systems</td>
<td>4 (3-0-1)</td>
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<td>4.</td>
<td>CSE 822</td>
<td>Network Security</td>
<td>4 (3-1-0)</td>
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#### Semester – III

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<tbody>
<tr>
<td>1.</td>
<td>CSE 831</td>
<td>Advanced Computer Architecture</td>
<td>3 (3-0-0)</td>
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<td>2.</td>
<td>CSE 832</td>
<td>Mobile Computing</td>
<td>3 (2-1-0)</td>
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<td>3.</td>
<td>CSE 851-854</td>
<td>Elective I</td>
<td>4 (3-0-1)</td>
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<td>4.</td>
<td>CSE 861-864</td>
<td>Elective II</td>
<td>4 (3-1-0)</td>
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<td>5.</td>
<td>CSE 780</td>
<td>Seminar</td>
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#### Semester – IV

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<th>S. No.</th>
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<th>Course Name</th>
<th>Credits</th>
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<tbody>
<tr>
<td>1.</td>
<td>CSE 899</td>
<td>Thesis</td>
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#### Elective -I

<table>
<thead>
<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>CSE 851</td>
<td>Data Mining and Data Warehousing</td>
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<tr>
<td>CSE 852</td>
<td>Advanced Data Modeling</td>
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<tr>
<td>CSE 853</td>
<td>Distributed Computing</td>
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<tr>
<td>CSE 854</td>
<td>Internet Programming and Web Engineering</td>
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#### Elective -II

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<tr>
<td>CSE 861</td>
<td>Security Models and Architecture</td>
</tr>
<tr>
<td>CSE 862</td>
<td>Real Time Systems</td>
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<tr>
<td>CSE 863</td>
<td>Parallel Algorithms</td>
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<tr>
<td>CSE 864</td>
<td>Knowledge Based Systems</td>
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ADVANCED DATA STRUCTURES

Code: CSE 711  
Credits: 4(2-2-1)

UNIT-I

Basic Data Structures

UNIT-II


UNIT-III


UNIT-IV


UNIT-V

Advanced Design Techniques: Dynamic programming, Greedy algorithms, Backtracking, Branch and Bound. Case studies-Matrix Multiplication, 0/1 Knapsack problem.

Text Books:
2. Coreman, Rivest, Lisserson, : ”Introduction to Algorithms”, PHI.

Reference Books:
2. R. Kruse etal, “Data Structures and Program Design in C” Pearson Education Asia
ADVANCED COMPUTER NETWORKS

Code: CSE 712
Credits: 4(3-1-0)

UNIT-I

UNIT-II
Data link Layer Basic Concepts: Error detection and correction, Data Link Protocols (HDLC, PPP). MAC, IEEE standard 802.X for LAN. WAN standards – FDDI, ATM, SONET and ISDN.

UNIT-III
Internetworking: Review of IP Addressing and Routing, Internet Architecture: Layer 3 Switch, Edge Router and Core Router. Overview of Control Plane, Data Plane and Management Plane. Internet Routing Protocols: OSPF, BGP, Broadcast and Multicast Routing, Mobility Issues and Mobile IP.
Ad-hoc Routing: Basic concepts, Routing Protocols: Dynamic source Routing, Destination Sequenced Distance Vector Routing, Ad-hoc On-Demand Distance Vector Routing.

UNIT-IV
Transport Layer: Design Issues, connection management, Transport layer protocols: UDP, TCP and SCTP.

UNIT-V
Introduction to Distributed Computer Networks.
Case study of Internet.

Text Books:

Reference Books:
Computer Organization & Operating Systems

Unit- I  Basic Organization & System Concepts:

Unit- II  Micro-programmed Control & Central Processing Unit:
Hardwired Control, Micro-programmed Control: Control Memory, Address Sequencing, Design of Control Unit. Memory Hierarchy, Cache Memory. Instruction set: Characteristics and Functions, addressing modes and formats. CPU structure and function, Reduced Instruction Set Computers(RISC). Case Study: Working of a Stored Program Computer (SMAC).

Unit- III Operating System Overview & Processes:
Operating system objectives and functions, Evolution of operating systems, Characteristics of Modern operating systems, Process Description and Control, Threads. Concurrency: Mutual exclusion and synchronization. Deadlocks, handling deadlocks.

Unit- IV Memory Management and Scheduling:
Memory management requirements, Memory Partitioning, Paging, Segmentation. Virtual memory, operating system software. Types of Uni-processor scheduling, scheduling algorithms. Multi-processor scheduling, real time scheduling.

Unit- V  Input/ Output and Files:

Text Books:


Reference Books:

2) “Digital Logic and Computer Organization”, V. Rajaraman and T. Radhakrishna, PHI.
4) “Operating Systems”, Tanenbaum, PHI.
Object Oriented Systems

Code: CSE 714  Credits: 4(2-1-2)

UNIT-I
Introduction
Overview of Object Oriented Systems Development, Object Basics: The object Model-Classes and Objects, Complexity, Notation, Process, Object types, Object state, Object Oriented Systems Development Life Cycle.

UNIT-II
Object Oriented Methodologies

UNIT-III
Object Oriented Analysis and Design
Identifying use cases, Object analysis, Classification-Identifying object relationships, Attributes and Methods. Design axioms, Designing classes, Access layer, Object storage, Object interoperability.

UNIT-IV
Software Quality and Usability
Designing interface objects, Software quality assurance, System usability- metrics.

UNIT-V
Case Study
Case studies on Elevator Control System and Automated Teller Machine.

Text Books:
3. Object Oriented Modeling and Design with UML, Micheal R. Blaha James, R. Rumbaugh et al Pearson Education LPE.

Reference Books:
2. Object Oriented Software Construction, by Betrond Meyor, II\textsuperscript{nd} Edn, Prentice Hall PTR, New Jersey,1997
Software Engineering

Code: CSE 721
Credits: 4(3-1-0)

Unit- I

Unit- II

Unit- III
Testing: Black- Box testing, White Box testing, Testing Process, Defect Analysis and Prevention, Software Quality, Software Reliability estimation. Software configuration management, Developing test cases for testing software.

Unit- IV
Web Engineering: Attributes, Framework, Formulation and Planning, Design of web based applications, testing and management issues. Case study: Net banking software

Unit- V
Advanced Software Engineering topics: Cleanroom Software Engineering, Component Based Software Engineering(CBSE), Computer Aided Software Engineering(CASE).

Text Book:

Reference Books:
Simulation & Modeling

Credit: CSE 722  Credits: 4(2-1-1)

Unit- I Introduction


Unit- II Design of Simulation Experiments

Problem formulation, Data collection and Reduction, Key variables, Length of Simulation runs, Starting Condition, Experimental layout, Interpreting Validation.

Unit- III Probability Distribution


Unit- IV Simulation Languages

Types of Simulation Languages, Factors in selecting Simulation Languages, Simulation Software Classification, Desirable Software Features, Introduction to Simulation Languages: SIMULA, GPSS

Unit- V

Study of simulation models: queuing system, Inventory Control and forecasting, PERT network.

Text Books:

Reference Books:
**Advanced Database Management Systems**

**Code:** CSE 821  
**Credits:** 4(3-0-1)

**Unit- I**  
**Introduction:** An overview of database management system, database system Vs file system, Database system concepts and architecture, data models, schema and instances, data independence and database languages, Data definition language, DML, overall database structure, E-R model concepts, notation for E-R diagram, mapping constraints, keys, concepts of super key, candidate key, primary key, generalization, aggregation, normalization.

**Unit- II**  
**Relational Data Model and Languages:** Relational data model concepts, integrity constraints: entity integrity, referential integrity, keys constraints, domain constraints, relational algebra, relational calculus, tuple and domain calculus.  
**Introduction to SQL:** Characteristics of SQL, Advantages of SQL, SQL data types and literals, types of SQL commands, SQL operators and their procedure, Tables, views and indices, queries and sub queries, Aggregate functions, Insert, update and delete operations, Set operations: Union, Intersection, Minus, Join Operations, Cursors.

**Unit-III**  
**Object Oriented Database:** Concept of the object, Names and Identity, Implementation of object identifiers, object class and instantiation, inheritance, object database.

**Unit- IV**  
**Distributed DBMS-advanced Concepts:** Distributed Transaction Management, Distributed Concurrency Control, Distributed Deadlock Management, Distributed Database Recovery, Replication Servers, Distributed Query Optimization, Mobile Database.

**Unit- V**  
**Case Study:** Design the database of banking system.

**Text Books:**

**Reference Books:**
1. Date C J, “An Introduction to Database Concepts”, Addison Wesley

**Practical list**
**Oracle/ Ms-SQL**
1. Write the queries for Data Definition and Data Manipulation Language.
2. Write SQL queries using Logical Operators(=,<,>,etc.)
3. Write SQL queries using SQL operators(Between…. AND, IN(LIST), LIKE, ISNULL and also with negating expressions).
4. Write SQL query using character, number, date and group functions.
5. Write SQL queries for relational algebra(UNION, INTERSECT and MINUS etc.)
6. Write SQL queries for extracting data from more than one table(Equi-Join, Non Equi-Join, Outer Join)
Network Security

Unit- I: Introduction


Unit- II: Electronic mail and IP security


Unit- III: Web and Network Management Security


Unit- IV: System Security


Unit- V: Security in Wireless Networks


Case Study: Security implementation in Banking Systems.

Text Books:

Reference Books:
Advanced Computer Architecture

Code: CSE 831  
Credits: 3(3-0-0)


Unit II Memory Organization: Types of memories: Random access, serial access and semi random access. Core semiconductor and bubble memories, Multi-level memory systems, address translation and memory allocation: non-preemptive allocation, pre-emptive allocation, replacement policies, Caches: organization, address mapping, levels, structure vs performance: cache types, performance and design process.


Unit IV Instruction level parallelism (ILP): high performance instruction delivery ILP, software approach- compiler techniques - hardware based speculation- limitation of ILP, register tagging, hazard detection, job sequencing and collision prevention.


Text Books:

References books:
3 A.S. Tanenbaum : “Structured Computer Organization”, PHI.
**Mobile Computing**

**Code:** CSE-832  
**Credits:** 3(2-1-0)  

**Unit – I**

Basic concepts, principles of cellular communication, overview of 2G, 3G, and 4G technologies, GSM, CDMA architecture. Issues in mobile computing, location management: home location register, visiting location register, handoffs.

**Unit - II**

Wireless networking, wireless LAN overview: MAC issues, IEEE 802.11, wireless multiple access protocols. TCP over wireless, wireless applications, data broadcasting, mobile IP, WAP: architecture, protocol stack, applications.

**Unit – III**

Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, coda file system, disconnected operations in coda file system, weak connectivity for mobile file access. Weakly connected replicated storages system.

**Unit - IV**

Process and Task Migration issues, Mobile Agents computing, security and fault tolerance, transaction processing in mobile computing environment.

**Unit – V**

Ad-hoc networks, localization, MAC issues, routing protocols, global state routing (GSR), destination sequenced distance vector routing (DSDV), dynamic source routing (DSR), Ad-hoc on demand distance vector routing (AODV), temporary ordered routing algorithm (TORA), QoS in Ad-hoc networks, applications.

**Text books:**

1. Mobile Communications by J. Schiller, Addison Wesley.

**Reference books:**

1. Mobile IP by Charles Perkins, Addison Wesley.
2. Ad hoc Networks by Charles Perkins, Addison Wesley.
Elective-II

Data Mining and Data Warehousing

Course Code: CSE 851 Credits: 4 (3-0-1)

Unit - 1
Introduction: Data warehousing – definitions and characteristics, Multi-dimensional data model, Warehouse schema. Data Marts: Data marts, types of data marts, loading a data mart, metadata, data model, maintenance, nature of data, software components; external data, reference data, performance issues, monitoring requirements and security in a data mart.

Unit - 2
Online Analytical Processing: OLTP and OLAP systems, Data Modeling, LAP tools, State of the market, Arbor Essbase web, Micro strategy DSS web, Brio Technology, star schema for multi dimensional view, snowflake schema; OLAP tools.

Unit - 3
Developing a Data Warehouse: Building of a Data Warehousing, Architectural strategies & organizational issues, Design considerations, Data content, Distribution of data, Tools for Data Warehousing.

Unit - 4
Data Mining: Definitions; KDD (Knowledge Discovery database) versus Data Mining; DBMS versus Data Mining, Data Mining Techniques; Issues and challenges; Applications of Data Warehousing & Data mining in Government Organizations.


Clustering Techniques: Clustering paradigm, Partition algorithms, CLARA, CLARANS; Hierarchical clustering, DBSCAN, BIRCH, CURE; Categorical clustering, STIRR, ROCK, CACTUS.

Decision Trees: Tree construction principle, Best split, Splitting indices, Splitting criteria, Decision tree construction with presorting.

Unit – 5
Advanced Concepts
Web Mining: Web content Mining, Web structure Mining, Web usage Mining, Text Mining.

Temporal and Spatial Data Mining: Basic concepts of temporal data Mining, GSP algorithm, SPADE, SPIRIT, WUM.

Textbooks:
1. Data Mining, Han & Kamber, Morgan Kaufman

References:
1. Data Warehousing –Concepts, Techniques, products, application; Prabhu; PHI.
3. Data Warehousing, Data Mining and OLAP; Alex Berson and Stephen J Smith; TMH.
4. Data Warehousing in the real world; Anahory; Pearson Education.
5. Data Mining Introductory & Advanced Topic; Dunham; Pearson Education.
Advanced Data Modeling

Course Code: CSE 852       Credits: 4 (3 -0- 1)

Unit -1
Extended Entity Relationship Model and Object Model: The ER model revisited, Motivation for complex data types, User defined abstract data types and structured types, Subclasses, Superclasses, Inheritance, Specialization and generalization, Relationship types of degree higher than two

Unit -2
Object–Oriented Databases: Overview of object–oriented concepts, Object identity, Object structure and type constructors, Encapsulation of operations, Methods and persistence, Type hierarchies and inheritance, Type extents and persistent programming languages, OODBMS architecture and storage issues, Transactions and concurrency control, Examples of ODBMS

Object Relational and Extended Relational Databases: Database design for an ORDBMS, Nested relations and collections, Storage and access methods, Query processing and optimization, An overview of SQL3, Implementation issues for extended type, Systems comparison of RDBMS, OODBMS, ORDBMS

Unit – 3
Parallel and Distributed Databases and Client–Server Architecture: Architectures for parallel databases, Parallel query evaluation, Parallelizing individual operations, Sorting Joins, Distributed database concepts, Data fragmentation, Replication and allocation techniques for distributed database design, Query processing in distributed databases, Concurrency control and recovery in distributed databases, An overview of client–server architecture

Unit - 4

Unit – 5
Enhanced Data Models for Advanced Applications: Active database concepts, Temporal database concepts, Spatial databases: concept and architecture, Deductive databases and query processing, Mobile databases, Geographic information systems

Textbooks:
1. Elmsari and Navathe, Fundamentals of Database Systems
2. Ramakrishnan and Gehrke, Database Management Systems

References:
1. Korth, Silberschatz, Sudarshan, Database System Concepts
3. Date and Longman, Introduction to Database Systems
Distributed Computing

Course Code: CSE 853       Credits: 4 (3-0-1)

Unit-I: Introduction and Architectures
Goals, types of distributed systems, centralized architectures, decentralized architectures, hybrid architectures, architectures versus middleware, interceptors, self-management in distributed systems, The feedback control model.

Unit-II: Communication
Fundamentals of layered protocols, Types of communication, remote procedure call- Basic RPC operation, parameter passing, asynchronous RPC, Message-oriented transient communication, message-oriented persistent communication, streams and Quality of Service.

Unit-III: Synchronization
Clock Synchronization- Physical Clocks. Global positioning systems, clock synchronization algorithms: lamport’s logical clocks, Vector clocks, Mutual exclusion, Centralized, Distributed Algorithm.

Unit-IV: Fault tolerance and security
Introduction to fault tolerance- basic concepts, failure models, failure masking by redundancy, design issues, failure masking and replication, agreement in faulty systems, failure detection, reliable client-server communication, reliable group communication, Introduction to security- security threats, policies and mechanisms, design issues, firewalls, secure mobile code, denial of service.

Unit-V: Distributed Object based and Distributed Co-ordination based Systems
Distributed objects, binding a client to an object, static versus dynamic remote method invocations, Parameter passing, Example: Java RMI, Object based messaging, Client side caching, server side replication, mobility and coordination, Content based Routing, describing composite events, consistency and replication.

Text books:
1. Distributed systems concept and design. G Couloris, Jean Dollimore, T Kindberg, Pearson Education
2. Distributed Systems- Principles and Paradigm, A S Tanenbaum, M V Steen, Pearson Education

References:
1. Data and computer Communications- William Stallings, PHI
Internet Programming and Web Engineering

Course Code: CSE 854       Credits: 4 (3 -0- 1)

Unit- I
Markup Language(HTML) Forms, Tables, Frames and executable content.
DHTML: Cascading style sheet(CSS), adding multimedia, working with data and dialog boxes, working with browser object models.

Unit-II
Client side programming: Introduction to VB Script, embedding Active-X controls in web document.
Server Side Programming: Introduction to ASP, Session Tracking, Database Connectivity.

Unit-III
XML: Anatomy of an XML document, mark up elements and attributes, creating valid documents, developing advanced Document Type Definition(DTD) based XML objects, checking validity, creating XML links, advanced addressing, viewing XML in browsers, processing, event-driven programming, programming with DOM, metadata, styling XML with CSS.

Unit-IV

Unit-V
Testing Web Applications: Testing Concepts, Content testing, user interface testing, usability testing, compatibility testing, component level testing, navigation testing, configuration testing, security and performance testing.

Case Study: Web based applications

Text Books:
1. Web Programming: Building Internet Applications, 3rd edition by Chris Bates, Publisher: Wiley India Pvt Ltd(June 2007)

Reference Books:
1. Programming Internet E-mail by David Wood, Publisher Shroff/ O’ Reilly(1999)
3. Web Engineering by Gerti Kappel, Brigit Proll, Siegfried Reich, Werner Rerchitzegger, Publisher: Wiley India Pvt Ltd( Aug 2009)
4. Ontological Engineering: with examples from the areas of knowledge management, e-commerce and semantic web by Gomez- perez, Publisher: Elsevier(2011)
Elective-II

SECURITY MODELS AND ARCHITECTURE

Code: CSE-861  Credits: 4(3-1-0)


References Books:
Real Time Systems

Code: CSE-862          Credits: 4(3-1-0)

UNIT-I: Introduction

UNIT-II: Approaches to Real Time Scheduling
Clock driven approach, weighted, round robin approach, priority driven approach, dynamic versus static systems, optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) algorithms, rate monotonic algorithm, offline versus online scheduling, scheduling Aperiodic and Sporadic jobs in priority driven and clock driven systems.

UNIT-III: Resources and Resource Access Control

UNIT-IV: Real Time Communication
Basic concepts in real time communication, soft and hard real time communication systems, Model of real time communication, priority-based service and weighted round-robin service disciplines for switched networks, medium access control protocols for broadcast networks, Internet and resource reservation protocols.

UNIT-V: Real Time Operating Systems
Features of RTOS, time services, characteristic of temporal data, temporal consistency, concurrency control.

Text books:

Reference books:
2. Real Time Systems by Mall Rajib, Pearson Education Publication.
Parallel Algorithms

Code: CSE 863
Credits: 4(3-1-0)

Unit-I

Unit-II
Parallel algorithm techniques: Divide and Conquer, Randomization and Parallel pointer technique. Performance measures of parallel algorithms, speed-up and efficiency of PA, Cost-optimality, Cost-optimal algorithms- such as summation, Min/Max on various models.

Unit-III
Parallel sorting networks, Parallel merging algorithms on CREW and EREW, Parallel sorting algorithms on CREW and EREW, Linear array.

Unit-IV
Parallel searching algorithms, Parallel matrix transposition and multiplication algorithms on PRAM and MCC. Vector-Matrix multiplication algorithms, Solution of linear equation, Root finding.

Unit-V
Graph Algorithms - Connected Graphs, Search and traversal, Combinatorial Algorithms- Permutation, Combinations.

Text Book:
S.G. Akl, “Design and Analysis of Parallel Algorithms”

References:
2. S.G. Akl, ”Parallel Sorting Algorithm” by Academic Press
Unit 1  **Introduction to knowledge Base**  
DIKW chain, types of knowledge, KBS structure, KBS development process,  
KBS tools, KBS applications, Advantages and Limitations

Unit 2  **Knowledge Representation:**  
Ontology and knowledge representation, properties of knowledge representation,  
challenges of knowledge representation  
Rule based representation, Structure based representation, reasoning under uncertainty, statistical reasoning

Unit 3  **Knowledge Acquisition and Validation**  
Acquisition techniques(1:1, collaborative acquisition), Methodology, difficulties in knowledge acquisition, Performance measures  
Learning: definition, formal learning theory, types: induction based, explanation based, validation techniques

Unit 4  **Search and Control Strategies:**  
Examples of search problems, heuristic search techniques, types of search, Uninformed search: Informed search: best-first search, constraint satisfaction, means-ends analysis, branch and bound, A* AO*

Unit 5  **Expert System**  
Expert system shell, rule based system architecture, non-production system  
Architecture, case study of any expert system

**Text Books:**  
1. Knowledge- based systems, Priti Sajja and Rajendra Akerkar, jones and barlette  
2. Artificial intelligence, Elaine rich and knight, TMH

**Reference books:**  
1. Artificial intelligence and Expert System, Dan W. Patterson, PHI