# COURSE STRUCTURE AND SYLLABUS

## For

## V & VI Semesters (V18 Regulation)

## B. Tech COMPUTER SCIENCE &ENGINEERING

## (Applicable for batches admitted from 2018-2019)

SRI VASAVI ENGINEERING COLLEGE (Autonomous)

PEDATADEPALLI, TADEPALLIGUDEM-534 101

# COURSE STRUCTURE

| V - Semester | | | | | | | |
|---|---|---|---|---|---|---|---|
| **S.No.** | **Course Code** | | **Course** | **L** | **T** | **P** | **C** |
| 1 | V18CST10 | PCC | Database Management Systems | 3 | 0 | 0 | 3 |
| 2 | V18CST11 | PCC | Computer Networks | 3 | 0 | 0 | 3 |
| 3 | V18CST12 | PCC | Operating Systems | 3 | 0 | 0 | 3 |
| 4 | V18CST13 | PCC | Design and Analysis of Algorithms | 3 | 0 | 0 | 3 |
| 5 | V18CST14 | PCC | Unix Programming | 3 | 0 | 0 | 3 |
| 6 | **Elective – I** | | | | | | |
| | V18CST15 | PEC | 1. Advanced Computer Architecture | 3 | 0 | 0 | 3 |
| | V18CST16 | | 2.Advanced Data Structures | | | | |
| | V18CST17 | | 3.Artificial Intelligence | | | | |
| | V18CST18 | | 4. Computer Graphics | | | | |
| 7 | V18MBET53 | HSS | Organizational Behavior | 3 | 0 | 0 | 3 |
| 8 | V18CSL06 | PCC | Database Management Systems Lab | 0 | 0 | 3 | 1.5 |
| 9 | V18CSL07 | PCC | Operating System and Unix Lab | 0 | 0 | 3 | 1.5 |
| 10 | V18ENT05 | | Professional Communication Skills -III | 4 | 0 | 0 | MNC |
| 11 | V18CST62 | | Technical Skills-III | 4 | 0 | 0 | MNC |
| **Total** | | | | **29** | **0** | **6** | **24** |

**Total Contact Hours: 35**

| VI - Semester | | | | | | | |
|---|---|---|---|---|---|---|---|
| **S.No.** | **Course Code** | | **Course** | **L** | **T** | **P** | **C** |
| 1 | V18CST19 | PCC | Compiler Design | 3 | 0 | 0 | 3 |
| 2 | V18CST20 | PCC | Data Mining | 3 | 0 | 0 | 3 |
| 3 | V18CST21 | PCC | Object Oriented Analysis and Design through UML | 3 | 0 | 0 | 3 |
| 4 | V18CST22 | PCC | Cryptography & Network Security | 3 | 0 | 0 | 3 |
| 5 | **Elective - II** | | | 3 | 0 | 0 | 3 |
| | V18CST23 | PEC | 1. Software Testing Methodologies | | | | |
| | V18CST24 | | 2. Principles of Programming Languages | | | | |
| | V18CST25 | | 3. Machine Learning | | | | |
| | V18CST26 | | 4. Image Processing | | | | |
| 6 | **Open Elective – I ( Interdisciplinary)** | **OEC** | **OPE I(1-3)** | 3 | 0 | 0 | 3 |
| 7 | V18CSL08 | PCC | Object Oriented Analysis and Design through UML Lab | 0 | 0 | 3 | 1.5 |
| 8 | V18CSL09 | PCC | Data Mining Lab | 0 | 0 | 3 | 1.5 |
| 9 | V18CSMPS | **Mini Project** | Mini Project | 0 | 0 | 4 | 2 |
| 10 | V18ENT05 | | Professional Communication Skills -III | 4 | 0 | 0 | MNC |
| 11 | V18CST63 | | Technical Skills-IV | 4 | 0 | 0 | MNC |
| | | | **Total** | **26** | **0** | **10** | **23** |

**Total Contact Hours: 36**

| V Sem | | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |
| **Database Management Systems (V18CST10)** | | | | | |

**Syllabus Details**

**Course Outcomes: After Successful completion of the Course, the student will be able to:**

| | | |
|---|---|---|
| **CO1:** | Demonstrate Database Systems, various Data Models and Database Architecture. | (K2) |
| **CO2:** | Apply ER Modeling to Design Relational Databases for Real Time Applications. | (K3) |
| **CO3:** | Apply SQL Constructs to Perform Database Operations. | (K3) |
| **CO4:** | Apply Normalization Techniques to Refine Schema. | (K3) |
| **CO5:** | Explain Transaction Management and Concurrency Control. | (K2) |
| **CO6:** | Experiment with various database indexing techniques. | (K3) |

**UNIT-I: An Overview of Database Systems:** Managing Data, File Systems verses DBMS, Advantages of DBMS, Data Independence. **Database System Architecture:** Three Levels of Architecture, External Level, Conceptual Level, Internal Level, Structure of DBMS, The Database Management Systems and Client/Server Architecture.

**UNIT-II: Database Design:** The E/R Models, Database Design and Er Diagrams, Entities, Attributes, Entity Sets, Relationships and Relationship Sets, Conceptual Design with ER Models. **Relational Model:** Integrity Constraints Over Relations, Key Constraints ,Foreign Key Constraints, General Constraints, Relational Algebra- Selection and Projection, Set Operation, Renaming, Joins, Division, Relational Calculus- Tuple Relational Calculus, Domain Relational Calculus.

**UNIT-III: SQL Queries, Constraints and Triggers:** The Form of Basic SQL Query, Union, Intersect, Except, Nested Queries, Aggregate Operators, Null Values, Complex Integrity Constraints in SQL, Triggers and Active Database.

**UNIT-IV: Schema Refinement (Normalization):** Purpose of Normalization or Schema Refinement, Concept of Functional Dependency, Normal Forms based on Functional Dependency (1NF, 2NF and 3NF), Concept of Surrogate Key, Boyce-Codd Normal Form (BCNF), Lossless Join and Dependency Preserving Decomposition, Fourth Normal Form(4NF).

**UNIT-V:Transaction Management:** Transaction, Properties of Transactions, Transaction Log, and Transaction Management with SQL Commit, Rollback and Savepoint. Concurrency Control: Concurrency Control for Lost Updates, Uncommitted Data, Inconsistent Retrievals and the Scheduler. **Concurrency Control with Locking Methods :** Lock Granularity, Lock Types, Two Phase Locking for Ensuring Serializability, Deadlocks, Concurrency Control with Time Stamp Ordering, Transaction Recovery.

**UNIT-VI: Storage and Indexing:** Overview of Storages and Indexing, Data on External Storage, File Organization and Indexing, Clustered Indexing, Primary and Secondary Indexes, Index Data Structures, Hash based Indexing, Tree based Indexing, Comparison of File Organization

**TEXT BOOKS:**


1. Introduction to Databse Systems, CJ Date,8th Edition, Pearson Education.
2. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, 3rd Edition TATA McGraw Hill.


**REFERENCE BOOKS:**


1. Data base Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition, Course Technology.
2. Fundamentals of Database Systems, ElmasriNavrate , 7th Edition, Pearson Education.
3. Database Systems - The Complete Book, H G Molina, J D Ullman, J Widom, 2nd Edition, Pearson.

| V Sem | | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |
| **Computer Networks (V18CST11)** | | | | | |

**Syllabus Details**

**Course Outcomes: After Successful completion of the Course, the student will be able to:**

**CO1:** Discuss fundamentals of network concepts and Reference Models. (K2)
**CO2:** Discuss Communication media and switching techniques. (K2)
**CO3:** Demonstrate Error control and protocols. (K3)
**CO4:** Apply Routing algorithms and congestion control algorithms. (K3)
**CO5:** Discuss Transport layer services and protocols. (K2)
**CO6:** Describe Application layer protocols. (K2)

**UNIT-I: Introduction: Reference models:** The OSI Reference Model- the TCP/IP Reference Model, Examples of Networks: Novell Networks, Arpanet, Internet, Network Topologies WAN, LAN, MAN.

**UNIT– II: Physical Layer: Transmission Media, Multiplexing:** FDM, WDM and TDM- LAN Technologies, introduction to switching: Circuit Switched Networks, Datagram Networks, and Virtual Circuit Networks.

**UNIT–III: Data link layer:** Design issues, Framing, Flow control, error control, error detection and correction, CRC, Checksum: idea, one's complement internet checksum, MAC: ALOHA, CSMA. Elementary Data Link Layer protocols: simplex protocol, Simplex stop and wait, Simplex protocol for Noisy Channel. Sliding window protocol: One bit, Go back N, Selective repeat-Stop and wait protocol, HDLC, point to point protocol (PPP).Piggybacking.

**UNIT-IV : Network Layer :**Network layer design issues- Algorithm shortest path routing, Flooding, Hierarchical routing, Broad cast, Multi cast Routing algorithms-Congestion control and algorithms, Internet Protocol (IP) Addresses, Subnet masking

**UNIT–V :Transport Layer**: Services, Primitives and sockets, Elements of transport protocols, Internet Transport protocols(TCP,UDP,RPC,RTTP/RTP,RTCP) Segment headers, Primitives, Control, Congestion control, Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm.

**UNIT–VI: Application layer:** DNS, SMTP, POP,FTP HTTP Presentation formatting. Network security: Introduction to Cryptography, Authentication, Basics of Public key and private key cryptography, digital signatures and certificates firewalls and wireless security.

**TEXT BOOKS:**


1. Computer Networks — Andrew S Tanenbaum, 4th Edition. Pearson Education/PHI
2. Data Communications and Networks – Behrouz A. Forouzan.Third Edition TMH


**REFERENCES:**


1. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education
2. Understanding communications and Networks, 3rd Edition, W.A. Shay, Thomson

| V Sem | | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |
| **Operating Systems (V18CST12)** | | | | | |

**Syllabus Details**

**Course Outcomes: After Successful completion of the Course, the student will be able to:**

| | | |
|---|---|---|
| **CO1:** | Describe Operating System Services and System Calls | (K2). |
| **CO2:** | Illustrate Process Management Concepts and CPU Scheduling Algorithms | (K3). |
| **CO3:** | Demonstrate Process Synchronization primitives | (K3). |
| **CO4:** | Demonstrate Deadlock Prevention, Avoidance and Detection methods | (K3). |
| **CO5:** | Illustrate Memory Management Techniques and Page Replacement Algorithms | (K3). |
| **CO6:** | Describe File System Concepts and Mass Storage Structures | (K2) . |

**UNIT-I:Introduction:** Operating-System Structure, Operating-System Services, User and Operating-System Interface, System Calls, Types of System Calls

**UNIT-II:Process Management:** Process Concept, Process Scheduling, Operations on Processes, Interprocess Communication. **Threads:** Overview, Multithreading Models. **CPU Scheduling:** Basic Concepts, Scheduling Criteria, Scheduling Algorithms

**UNIT-III : Process Synchronization:** The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic Problems of Synchronization, Monitors

**UNIT-IV:Deadlocks:** System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock

**UNIT-V:Memory ManagementMain Memory:** Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table

**Virtual Memory:** Introduction, Demand Paging, Page Replacement, Allocation of Frames, Thrashing

**UNIT-VI:Storage Management:**Overview of Mass-Storage Structure, Disk Scheduling, File Concept, Access Methods, Directory and Disk Structure, File-System Mounting, File Allocation Methods

Text Book:

1. Operating System Concepts,AbrahamSilberschatz, ,Peter Baer Galvin,Greg Gagne, 9th Edition, John Wiley and Sons Inc., 2012

Reference Books:

1. Operating Systems – Internals and Design Principles, William Stallings, 7th Edition, Prentice Hall, 2012
2. Modern Operating Systems, Andrew S. Tanenbaum, Third Edition, Addison Wesley,2007

| V Sem | | L | T | P | C |
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| | | 3 | 0 | 0 | 3 |
| Design and Analysis of Algorithms (V18CST13) | | | | | |

**Syllabus Details**

**Course Outcomes: After Successful completion of the Course, the student will be able to:**

**CO1:** Describe asymptotic notation and basic concepts of algorithms (K2).
**CO2:** Apply divide and conquer paradigm to solve various problems (K3).
**CO3:** Use greedy technique to solve various problems (K3).
**CO4:** Apply dynamic programming technique to various problems (K3).
**CO5:** Employ backtracking technique to various problems (K3).
**CO6:** Apply branch and bound technique to various problems (K3).

**UNIT-I: Introduction:** What is an Algorithm, Algorithm Specification-Pseudo code Conventions Recursive Algorithm, Performance Analysis-Space Complexity, Time Complexity, Amortized Complexity, Amortized Complexity, Asymptotic Notation, Practical Complexities, Performance Measurement.

**UNIT-II: Divide and Conquer:** General Method, Defective Chessboard, Binary Search, Finding the Maximum and Minimum, Merge Sort, Quick Sort-Performance Measurement, Randomized Sorting Algorithms.

**UNIT-III: The Greedy Method:** The General Method, Knapsack Problem, Job Sequencing with Deadlines, Minimum-cost Spanning Trees-Prim's Algorithm, Kruskal's Algorithms, An Optimal Randomized Algorithm, Optimal Merge Patterns, Single Source Shortest Paths.

**UNIT-IV: Dynamic Programming:** All Pairs Shortest Paths, Single Source Shortest paths General Weights, Explain Optimal Binary Search Trees, String Edition, 0/1 Knapsack, Reliability Design.

**UNIT-V: Backtracking:** The General Method, The 8-Queens Problem, Sum of Subsets, Graph Coloring, Hamiltonian Cycles.

**UNIT-VI: Branch and Bound:** The Method-Least cost (LC) Search, The 15-Puzzle: an Example, Control Abstraction for LC-Search, Bounding, FIFO Branch-and-Bound, LC Branch and Bound, 0/1 Knapsack Problem-LC Branch-and Bound Solution, FIFO Branch-and-Bound Solution, Traveling Salesperson.

**TEXT BOOKS:**

1. Fundamentals of computer algorithms E. Horowitz S. Sahni, University Press

**REFERENCE BOOKS:**

1. Introduction to Algorithms Thomas H. Cormen, PHI Learning.
2. The Design and Analysis of Computer Algorithms, Alfred V. Aho, John E. Hopcroft, JeffreyD.Ullman.
3. Algorithm Design, Jon Kleinberg, Pearson.

| V Sem | | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |
| **Unix programming (V18CST14)** | | | | | |

**Syllabus Details**

**Course Outcomes: After Successful completion of the Course, the student will be able to:**

**CO1:** Illustrate the UNIX basics and the working of the built in commands in Unix (K2).
**CO2:** Demonstrate the file system and change the permissions associated with files (K2).
**CO3:** Illustrate the working of shell programming and debugging scripts (K2).
**CO4:** Demonstrate the grep family and data transforming programs sed, and awk (K2).
**CO5:** Illustrate the concept of process and its system call (K2).
**CO6:** Explain the concept of signals and its system call (K2).

**UNIT-I :Introduction to UNIX:**The UNIX Operating System, A brief history of UNIX, The UNIX Architecture, Basic features of UNIX. General Purpose Utilities- cal, date, man, echo, bc, clear, passwd, who, whoami,unameDirectory Handling Commands: pwd, cd, mkdir, rmdir. File Handling Utilities - cat, touch, cp, ls, rm, mv, nl, pg,tar,wc Displaying Commands: more,head,tail, simple filters and commands: cmp, comm., ulink, diff, head, tail, find, cut, paste,sort, uniq, tr, finger. Disk Utilities– du, df, mount, umount.Process Utilities–ps, kill. Networking Utilities– ping, telnet, rlogin, ftp, finger.

**UNIT-II : THE FILE SYSTEM :** Types of Files, Directories and Files, UNIX File System, Absolute and relative pathnames, File Attributes and Permissions ,The File Command -knowing the File Type, Chmod Command- Changing File Permissions, Chown Command-Changing the Owner of a File, Chgrp Command- Changing the Group of a File. Vi editor-editing with vi, moving the cursor, editing, copying and moving text, pattern searching.

**UNIT-III : Introduction to Shell Programming :** Shell Variables-The Export Command-The Profile File a Script Run During Starting-The First Shell Script-The read Command-Positional parameters-The $? Variable knowing the exit Status-More about the Set Command-The Exit Command-Branching Control Structures-Loop Control Structures-The Continue and Break Statement-The Expr Command: Performing Integer Arithmetic-Real Arithmetic in Shell Programs-The here Document(<<)-I/O Redirection, The Sleep Command-Debugging Scripts-The Script Command-The Eval Command-The Exec Command. Command Line Structure-Met characters

**UNIT-IV :Regular Expressions:**grep, egrep, fgrep, Sed- line addressing, context addressing, text editing,substitution.
Programming with awk: syntax of awk programming statement, structure of awk script, variables ,records fields, and special variables, patterns, operators ,simple input files, awk programming- simple awk programming, awk control structures, looping, functions in awk.

**UNIT-V :Unix process:** What is a process, process structure, process identifiers, starting new process, waiting for a process, zombie process, system call interface for process management - fork, vfork, exit, wait, waitpid, exec, system

**UNIT : VI Signals :** Signal functions, unreliable signals, interrupted system calls, kill and raise functions, alarm, pause functions, abort, sleep functions

**Text Books:**


1. M G venkateshmurthy Introduction to Unix and shell programming Pearson education
2. W. Richard Stevens, Advanced programming in the unix environment, 3rd EditionPearson education


**REFERENCES**


1. B.A. Forouzan& R.F. Giberg, ―Unix and shell Programming, Thomson, First Edition, NewDelhi, 2003.

| V Sem | | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |
| **Advanced Computer Architecture (Elective-I) (V18CST15)** | | | | | |

**Syllabus Details**

**Course Outcomes: After Successful completion of the Course, the student will be able to:**

**CO1:** Describe the basics of quantitative design and analysis (K2).
**CO2:** Illustrate memory hierarchy schemes (K2).
**CO3:** Illustrate concepts of Instruction-Level Parallelism (K2).
**CO4:** Explain concepts of Data-Level Parallelism (K2).
**CO5:** Explain concepts of Thread-Level Parallelism (K2).
**CO6:** Describe architectural aspects of Warehouse-Scale Computers (K2).

**UNIT-I :Fundamentals of Quantitative Design and Analysis:** Classes of Computers, Defining Computer Architecture, Designing the Organization and Hardware to Meet Goals and Functional Requirements, Quantitative Principles of Computer Design

**UNIT-II :Memory Hierarchy Design**: Basics of Memory Hierarchies, Advanced Optimizations of Cache Performance, Memory Technology and Optimizations, Virtual Memory and Virtual Machines.

**UNIT-III : Instruction-Level Parallelism:** Concepts and Challenges, Basic Compiler Techniques, Reducing Branch Costs with Advanced Branch Prediction, Overcoming Data Hazards with Dynamic Scheduling, Tomasulo's Approach, Hardware-Based Speculation, Multiple Issue and Static Scheduling

**UNIT-IV :Data-Level Parallelism:** Vector Architecture, VMIPS, Vector Processors, SIMD Instruction Set Extensions for Multimedia

**UNIT-V :Thread-Level Parallelism:** Introduction, Centralized Shared-Memory Architectures- Multiprocessor Cache Coherence, Basic Schemes for Enforcing Coherence, Snooping Coherence Protocols

**UNIT-VI :Warehouse-Scale Computers:** Introduction, Programming Models and Workloads for Warehouse-Scale Computers, Computer Architecture of Warehouse-Scale Computers

**TEXT BOOK:**


1. Computer Architecture: A Quantitative Approach, John L. Hennessy, David A. Patterson, 5th Edition, Morgan Kaufmann, Elsevier.


**REFERENCE BOOKS:**


1. Advanced Computer Architectures: A Design Space Approach, D Sima, T Fountain, P Karsuk, 1st Edition, Pearson
2. Advanced Computer Architecture, K Hwang, N Jotwani, 2nd Edition, McGraw-Hill

| V Sem | | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |
| **Advanced Data Structures (Elective-I) (V18CST16)** | | | | | |

**Syllabus Details**

**Course Outcomes: After Successful completion of the Course, the student will be able to:**

| | | |
|---|---|---|
| **CO1:** | Explain external sorting method | (K2). |
| **CO2:** | Discuss pattern matching Algorithms | (K2). |
| **CO3:** | Illustrate various hash functions with appropriate examples | (K3). |
| **CO4:** | Illustrate various priority queues with appropriate examples | (K3). |
| **CO5:** | Construct self balanced tree with appropriate examples | (K3). |
| **CO6:** | Discuss Multiway search trees | (K2). |

**UNIT-I: SORTING:** Introduction - External Sorting- K-way Merging - Buffer Handling for parallel Operation- Run Generation- Optimal Merging of Runs.

**UNIT-II: STRING MATCHING ALGORITHMS**: The Navi String matching algorithms – The Robin-Krap algorithm – String Matching algorithm using finite automata – The Knuth Morris Pratt algorithm.

**UNIT-III: SKIP LIST AND HASHING: Dictionaries** – ADT- Linear List representation - Skip List representation: Ideal case – Insertion and Deletion –Assigning levels – The struct skip node – The class skip list – complexity of skipList methods. Hash Table Representation: Ideal hashing – Hash functions and tables -Linear probing- Hashing with Chains

**UNIT-IV: PRIORITY QUEUES (HEAPS) :** Definition and Applications – ADT – Linear lists – Heaps : Definition – Max heap and Min heap operations, Applications – Heap Sort – Huffman Codes.

**UNIT-V: EFFICIENT BINARY SEARCH TREES :**Introduction to AVL Trees- Red-Black Trees- Definition- Representation of a Red- Black Tree- Searching a Red-Black Tree- Inserting into a Red Black Tree- Deletion from a Red-Black Tree- Joining Red-Black Trees, Splitting a Red-Black tree – Splay Trees – Introduction – operation – Amortized complexity.

**UNIT-VI: MULTIWAY SEARCH TREES :** ISAM - M-Way Search Trees, Definition and Properties- Searching an M-Way Search Tree, B-Trees, Definition and Properties- search Elements in a B-tree- Insertion into B-Tree- Deletion from a B-Tree- Node Structure.

**TEXT BOOKS:**


1. Data Structures, Algorithms and Applications in C++; SartajSahni; UniverstiyPress ; Second Edition.
2. Introduction to Algorithms By Thomas H Cormen, Charless E leiserson, Ronald L Rivest and Cliford Stein PHI publication Third Edition (UNIT – II)


**REFERENCES:**


1. Data Structures, a Pseudocode Approach, Richard F Gilberg, BehrouzA Forouzan, Cengage.
2. An Introduction to Data Structures with applications By Jean Paul Trembly and Paul G Sorenson Tata McGraw Hill Second Edition
3. Fundamentals of Data Structures and algorithms by C V Sastry, Rakesh Nayak, Ch. Raja Ramesh, IK Publications, new Delhi.

| V Sem | | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |
| **Artificial Intelligence (Elective-I) (V18CST17)** | | | | | |

**Syllabus Details**

**Course Outcomes: After Successful completion of the Course, the student will be able to:**

**CO1:** Illustrate the concept of intelligent systems and current trends in AI. (K2)
**CO2:** Apply Problem solving, Problem reduction and Game Playing techniques in AI. (K3)
**CO3:** Illustrate the Logic concepts in AI. (K2)
**CO4:** Explain the Knowledge representation techniques in AI. (K2)
**CO5:** Describe Expert systems and their applications. (K2)
**CO6:** Illustrate Uncertainty Measures. (K2)

**UNIT-I: Introduction to Artificial Intelligence:** Introduction, history, intelligent systems, foundations of AI, applications, tic-tac-toe game playing, current trends in AI

**UNIT-II: Problem solving: State-space Search and Control Strategies:** Introduction, General Problem Solving, Characteristics of problem, Exhaustive searches, Heuristic search techniques, Iterative deepening a*, constraint satisfaction
**Problem reduction and game playing:** Introduction, problem reduction, game playing, alpha beta pruning, two-player perfect information games

**UNIT-III: Logic concepts:** Introduction, Propositional Calculus, Proportional Logic, Natural Deduction system, Axiomatic system, Semantic tableau system in proportional logic, Resolution Refutation in Propositional logic, Predicate Logic

**UNIT-IV: Knowledge representation:** Introduction, approaches to Knowledge representation, Knowledge representation using Semantic Networks, Extended Semantic Networks for KR, Knowledge representation using Frames

**UNIT-V: Expert Systems and Applications:** Introduction phases in building Expert Systems, Expert System versus Traditional Systems, Rule-based Expert Systems, Blackboard systems, Truth maintenance systems, applications of Expert Systems.

**UNIT-VI: Uncertainty measure:** Probability theory- Introduction, Probability Theory, Bayesian Belief networks, Certainty Factor Theory, Dempster-Shafer theory

**Text Book:**


1. Artificial Intelligence, Saroj Kaushik, 1st Edition, Cengage Learning.


**Reference Books:**


1. Artificial Intelligence, Elaine Rich, Kevin Knight, Shivashankar B Nair, 3rd Edition, Tata McGraw Hill Education Private Limited., 2009
2. Artificial Intelligence- A modern Approach, 3rd Edition, Stuart Russel, Peter Norvig, Pearson Education.

| V Sem | | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |
| **Computer Graphics (Elective-I) (V18CST18)** | | | | | |

**Syllabus Details**

**Course Outcomes: After Successful completion of the Course, the student will be able to:**

**CO1:** Understand the applications of computer graphics and learn basic algorithms (K2).
**CO2:** Analyze the concepts of 2D graphics along with transformation techniques (K3).
**CO3:** Understand 2D Views of objects and clipping algorithms (K2).
**CO4:** Illustrate 3D graphics and will get an idea about projections views of objects (K2).
**CO5:** Determine different visible surface detection methods (K2).
**CO6:** Understand different animation sequences and Color Models (K2).

**UNIT I: Introduction:** Application of Computer Graphics, raster scan systems, random scan systems, raster scan display processors. Output Primitives : Points and lines, line drawing algorithms( Bresenham's and DDA Line derivations and algorithms), mid-point circle and ellipse algorithms.

**UNIT II: Filled area primitives:** Boundary-fill and flood-fill algorithms. **2-D geometrical transforms:** Translation, scaling, rotation, reflection and shear transformations, and homogeneous coordinates, composite transforms.

**UNIT III: 2-D viewing:** The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, Cohen-Sutherland, Sutherland –Hodgeman polygon clipping algorithm.

**UNIT IV: 3-D Geometric transformations:** Translation, rotation, scaling, reflection and shear transformations, composite transformations. 3D Viewing pipeline, clipping, projections (Parallel and Perspective). **3-D object representation:** Polygon surfaces, quadric surfaces, spline representation, Bezier curve and B-Spline curves

**Unit V: Visible surface detection methods:** Classification, back-face detection, depth-buffer, scan-line, BSPtree methods, area sub-division

**Unit VI: Computer animation:** Design of animation sequence, general computer animation functions, raster animation, computer animation languages. **Color Models** – RGB, YIQ, CMY, HSV

**TEXT BOOKS:**


1. Computer Graphics C version, Donald Hearn, M.Pauline Baker, Pearson
2. Zhigand xiang,Roy Plastock, Computer Graphics, Schaum's outlines", 2nd Edition,Tata Mc-Graw Hill Edition.
3. Principles of Computer Graphics, 1st Edition, Springer International Edtion,2005.


**REFERENCE BOOKS:**


1. Computer Graphics Principles & practice, 2/e, Foley, VanDam, Feiner, Hughes, Pearson
2. Computer Graphics, Peter, Shirley, CENGAGE
3. Principles of Interactive Computer Graphics, Neuman , Sproul, TMH.


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| V Sem | | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 3 | 1.5 |
| **Data Base Management System Lab (V18CSL06)** | | | | | |

**Syllabus Details**

**Course Outcomes: After Successful completion of the Course, the student will be able to:**

| | | |
|---|---|---|
| **CO1:** | Build SQL Queries and Constraints | (K3). |
| **CO2:** | Experiment with various Database Indexing Techniques. | (K3). |
| **CO3:** | Construct PL/SQL Cursors and Exceptions | (K3). |
| **CO4:** | Develop application programs using PL/SQL | (K3). |
| **CO5:** | Develop PL/SQL Functions, Procedures, Packages | (K3). |
| **CO6:** | Model Information System such as Student Information System | (K3). |

**List of Experiments:**

1. Queries to facilitate acquaintance of Built-In Functions, String Functions, NumericFunctions, Date Functions and Conversion Functions.
2. Queries using operators in SQL
3. Queries to Retrieve and Change Data: Select, Insert, Delete, and Update
4. Queries using Group By, Order By, and Having Clauses
5. Queries on Controlling Data: Commit, Rollback, and Save point
6. Queries to Build Report in SQL *PLUS
7. Queries for Creating, Dropping, and Altering Tables, Views, and Constraints
8. Queries on Joins and Correlated Sub-Queries
9. Queries on Working with Index, Sequence, Synonym, Controlling Access, andLocking Rows for Update, Creating Password and Security features PL/SQL.
10. Write a PL/SQL Code using Basic Variable, Anchored Declarations, and Usage ofAssignment Operation.
11. Write a PL/SQL Code Bind and Substitution Variables. Printing in PL/SQL
12. Write a PL/SQL block using SQL and Control Structures in PL/SQL
13. Write a PL/SQL Code using Cursors, Exceptions and Composite Data Types
14. Write a PL/SQL Code using Procedures, Functions, and Packages FORMS
15. Write a PL/SQL Code Creation of forms for any Information System such as StudentInformation System, Employee Information System etc.
16. Demonstration of database connectivity

**TEXT BOOKS:**


1. Oracle Database 11g The Complete Reference by Oracle Press, Kevin Loney
2. Database Systems Using Oracle, Nilesh Shah, 2nd Edition ,PHI.
3. Introduction to SQL, Rick F Vander Lans, 4th Edition, Pearson Education.


**REFERENCE BOOKS:**


1. Introduction to SQL, Rick F. Vander Lans, 4th Edition, Pearson education.
2. Oracle PL/SQL Interactive Workbook, B. Rosenzweig and E. Silvestrova,2nd Edition, Pearson education.
3. SQL & PL/SQL for Oracle 10 g, Black Book, Dr. P. S. Deshpande, Dream Tech.

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| **Operating System and Unix Lab (V18CSL07)** | | | | | |

**Syllabus Details**

**Course Outcomes: After Successful completion of the Course, the student will be able to:**

**CO1:** Illustrate CPU scheduling algorithms (K3)
**CO2:** Apply Bankers Algorithm for Deadlock Avoidance and Deadlock Prevention (K3)
**CO3:** Use Page replacement algorithms for memory management (K3)
**CO4:** Demonstrate the basic knowledge of Linux commands and file handling utilities by using Linux shell environment.
**CO5:** Experiment with the concept of shell scripting programs.
**CO 6:** Illustrate the process of how the parent and child relationships

## List of Experiments:

**Part-A: OS Lab**

1. Simulate the following CPU scheduling algorithms:
   a) FCFS b) SJF c) Round Robin d) Priority
2. Implement : fork (), wait (), exec() and exit () system calls
3. Simulate Producer and Consumer problem using Semaphores
4. Simulate Bankers Algorithm for Dead Lock Avoidance
5. Simulate Bankers Algorithm for Dead Lock Prevention
6. Simulate the following page replacement algorithms:
   a) FIFO b) LRU c) LFU
7. Simulate the following File allocation strategies:
   a) Sequenced b) Indexed c) Linked

**Part-A: UNIX Lab**

8. **Study of Unix Commands:** General Purpose Utilities, Directory Handling Commands, File Handling Utilities, Displaying Commands, Filters, Disk Utilities
9. Shell Script to list all of the directory files in a directory.
10. Shell Script to find the factorial of a given number
11. Shell Script to generate a Multiplication table.
12. Shell Script to Perform arithmetic operations
13. Implement an AWK script to count the number of lines in a file that do not contain vowels
14. Design an awk script to find the number of characters, words and lines in a file?
15. Design a C program to create a child process and allow the parent to display “parent” and the child to display “child” on the screen
16. Design a C program to create a Zombie Process.
17. Design a C program that illustrates how an orphan is created.

**Reference Books:**


1. Operating System Concepts,AbrahamSilberschatz, ,Peter Baer Galvin,Greg Gagne, 9th Edition, John Wiley and Sons Inc., 2012
2. Operating Systems – Internals and Design Principles, William Stallings, 7th Edition, Prentice Hall, 2012
3. Modern Operating Systems, Andrew S. Tanenbaum, Third Edition, Addison Wesley,2007
4. M G venkateshmurthy Introduction to Unix and shell programming Pearson education
5. W. Richard Stevens, Advanced programming in the unix environment, 3rd EditionPearson education.

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| **Technical Skills-III (V18CST62)** | | | | | |

**Syllabus Details**

**Course Outcomes: After Successful completion of the Course, the student will be able to:**

**CO1:** Apply fundamental data structures like List, Stack, Queue to solve real work problems in linear time i.e. O(n). (K3)
**CO2:** Make use of advanced data structures like priority queue, linked list to solve complex problems in linear time , logarithmic time i.e. O(n) or O(nlogn). (K3)
**CO3:** Develop programs to solve problems by with the help of searching and sorting techniques. (K3)
**CO4:** Analyze greedy method by comparing with brute force method and develop programs to solve optimization Problems. (K4)
**CO5:** Experiment with backtracking approach to solve complex combinatorial problems. (K3)
**CO6:** Develop programs to solve complex optimization, a combinatorial problem that involves optimal sub problems by using dynamic programming method. (K3)

## Part-A Data Structures

1. Problem solving using Array List
2. Problem solving using Linked List
3. Problem solving using Stack
4. Problem solving using Queue
5. Problem solving using Deque
6. Problem solving using Hashing and Dictionary
7. Problem solving using Searching
8. Problem solving using Sorting

## Part B Algorithm Techniques

9. Problem Solving on Brute Force method based on Arrays
10. Problem Solving on Brute Force method based on Strings
11. Problem Solving on Divide and Conquer
12. Problem Solving on Greedy method
13. Problem Solving on Backtracking
14. Problem Solving on Dynamic Programming

**TEXT BOOKS:**


1. Introduction to Algorithms, Second Edition, Thomas H. Cormen Charles E. Leiserson.
2. Data Structures and Algorithms Made Easy: Narasimha Karumanchi .
3. The Algorithm Design Manual, Springer series, Steven Skiena.

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| **Compiler Design (V18CST19)** | | | | | |

**Syllabus Details**

**Course Outcomes: After Successful completion of the Course, the student will be able to:**

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| **CO1:** | Describe the compilation process and lexical analyzer | (K2) |
| **CO2:** | Construct top down parsing Techniques | (K3) |
| **CO3:** | Construct bottom up parsing techniques | (K3) |
| **CO4:** | Construct syntax directed translation | (K3) |
| **CO5:** | Produce intermediate code generation process and run time environments | (K3) |
| **CO6:** | Explain the code generation process. | (K2) |

**UNIT-I: Introduction:** Language Processors, the Structure of a Compiler. **Lexical Analysis:** The Role of the Lexical Analyzer, Specification of Tokens, Recognition of Tokens and the Lexical-Analyzer Generator Lex.

**UNIT-II: Syntax Analysis:** Definition of CFG, Lexical Versus Syntactic Analysis, Writing a Grammar- Elimination of Left Recursion, Left Factoring. **Top Down Parsing:** Recursive Descent Parsing, First and Follow, LL(1) Grammars, Non recursive Predictive Parsing, Error Recovery in Predictive Parsing.

**UNIT-III: Bottom-Up Parsing:** Bottom Up Parser Classification, Reductions, Handle Pruning, Shift-Reducing, Conflicts During Shift Reduce Parsing. Introduction to LR Parsing: Difference between LR and LL Parsers, Why LR Parsers?, Items and the LR(0) automaton, The LR-Parsing Algorithm, Constructing SLR Parsing Tables

**UNIT-IV: More powerful LR parsers:** construction of CLR (1), LALR Parsing tables, Comparison of all Bottom Up approaches. Semantic Analysis: Syntax Directed Definitions, Evaluation Orders for SDD's, Applications of SDT.

**UNIT-V: Intermediate Code Generation:** Variants of Syntax Trees, Three-Address Code, Control Flow, Back-patching. Run-Time Environments: Storage Organization, Stack Allocation of Space, Heap Management.

**UNIT-VI: Code Generation:** Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Peephole Optimization, Register Allocation and Assignment. **Machine-Independent optimizations:** The Principal Sources of Optimizations, Introduction to Data-Flow Analysis.

.**TEXT BOOKS:**


1. Compilers, Principles Techniques and Tools- Alfred V Aho, Monica S Lam, Ravi Sethi, Jeffrey D. Ullman,2nded, Pearson,2007


**REFERENCE BOOKS:**


1. Principles of compiler design, V. Raghavan, 2nd ed, TMH, 2011
2. Compiler Design, K. Muneeswaran, Oxford

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| Data Mining (V18CST20) | | | | | |

**Syllabus Details**

**Course Outcomes: After Successful completion of the Course, the student will be able to:**

**CO1:** Explain the concept of Data Mining and its functionalities (K2)
**CO2:** Discuss various Data Preprocessing Techniques (K3)
**CO3:** Demonstrate Association Analysis Techniques (K3)
**CO4:** Illustrate various Classification Techniques (K3)
**CO5:** Demonstrate Alternative techniques for Classification (K3)
**CO6:** Use different Clustering techniques to cluster data (K3)

**UNIT-I : Introduction:** Need for Data Mining, Knowledge Discovery from Data, Kinds of Data mined, Kinds of Patterns mined, Technologies used, Kinds of Applications targeted, Major Issues in Data Mining, Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Measuring Data Similarity and Dissimilarity

**UNIT-II: Data Preprocessing:** Overview of Data Preprocessing, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization

**UNIT-III: Mining Frequent Patterns, Associations, and Correlations:** Basic Concepts, Frequent Itemset Mining Methods- Apriori Algorithm: Finding Frequent Itemsets by Confined Candidate Generation, Generating Association Rules from Frequent Itemsets, Improving the Efficiency of Apriori, Pattern-Growth Approach for Mining Frequent Itemsets

**UNIT-IV: Classification:** Basic Concepts, Decision Tree Induction, Attribute Selection Measures, Tree Pruning

**UNIT-V: Bayes Classification Methods:** Bayes' Theorem, Naive Bayesian Classification. **Bayesian Belief Networks:** Concepts and Mechanisms, Training Bayesian Belief Networks

**UNIT-VI: Cluster Analysis:** Basic Concepts and Methods, Partitioning Methods, Hierarchical Methods, Density Based Method-DBSCAN

**Text Books:**

1. Data Mining Concepts and Techniques, Jiawei Han, Micheline Kamber, Jian Pei,3rd Edition, Morgan Kaufmann Publishers

**Reference Books:**

1. Introduction to Data Mining, Pang-Ning Tan, Michael Steinbach, Vipin Kumar, 1st Edition, Pearson Education Inc.
2. Data Mining and Analysis,Mohammed J Zaki, Wagner Meira JR, 1st Edition ,Cambridge University Press

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| **Object Oriented Analysis and Design Through UML (V18CST21)** | | | | | |

**Syllabus Details**

**Course Outcomes: After Successful completion of the Course, the student will be able to:**

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| **CO1:** | Discuss importance of modeling. | [K2] |
| **CO2:** | Describe classes and relationships. | [K2] |
| **CO3:** | Develop class diagrams and object diagrams. | [K3] |
| **CO4:** | Develop Interaction, Use case and Activity Diagrams. | [K3] |
| **CO5:** | Illustrate advanced behavioral modeling. | [K3] |
| **CO6:** | Develop component and deployment diagrams. | [K3] |

**UNIT-I: Introduction to UML:** Importance of modeling - Principles of modeling - Object oriented modeling - Conceptual model of the UML – Architecture - Software Development Life Cycle.

**UNIT-II: Advanced Structural Modeling:** Classes – Relationships - Common Mechanisms and diagrams - Advanced classes - Advanced relationships – Interfaces - Types and Roles – Packages.

**UNIT-III: Class & Object Diagrams:** Terms, concepts - Modeling techniques for Class Diagrams - Modeling techniques for Object Diagrams.

**UNIT-IV: Basic Behavioral Modeling-I:** Interactions - Interaction diagrams.

Basic Behavioral Modeling-II: Use cases - Use case Diagrams - Activity Diagrams.

**UNIT-V: Advanced Behavioral Modeling:** Events and signals - State machines - Processes and Threads - Time and space - State chart diagrams.

**UNIT-VI: Architectural Modeling:** Component- Deployment - Component diagrams - Deployment diagrams.

**TEXT BOOK:**


1. The Unified Modeling Language User Guide, Grady Booch, James Rumbaugh, Ivar Jacobson, Pearson Education.


**REFERENCE BOOKS:**


1. UML 2 Toolkit, Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado, WILEY-Dreamtech India Pvt. Ltd.
2. Fundamentals of Object Oriented Design in UML, Meilir Page-Jones, Pearson Education.
3. Modeling Software Systems Using UML2, Pascal Roques, WILEY-Dreamtech IndiaPvt. Ltd.

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| **Cryptography and Network Security (V18CST22)** | | | | | |

**Syllabus Details**

**Course Outcomes: After Successful completion of the Course, the student will be able to:**

**CO1**: Describe the fundamentals of networks security, security architecture, threats and vulnerabilities (K2).
**CO2:** Discuss the mathematical support for both symmetric and asymmetric key cryptography (K2).
**CO3:** Discuss the concept of developing encryption and decryption algorithms (K2).
**CO4:** Illustrate various techniques of encryption and message authentication functions (K3).
**CO5:** Apply various Key management and Distribution techniques and its importance (K3).
**CO6:** Discuss the Need of Transport level and Electronic mail security algorithms (K2).

**UNIT-I: Computer Security concepts,** security services, and Active vs. Passive attacks, Security mechanisms, OSI Security Architecture, A Model for Network security, Classical Encryption Techniques, Substitution ciphers, Transposition ciphers.

**UNIT-II: Introduction to Number Theory,** Fermat's and Euler's Theorem, the Chinese Remainder Theorem, Euclidean Algorithm, and Modular Arithmetic.

**UNIT-III: Block Ciphers, Stream Ciphers,** RC4 Stream cipher, Data Encryption Standard (DES), Triple DES, Advanced Encryption Standard (AES), IDEA.

**UNIT-IV:RSA, Diffie-Hellman Key Exchange,** Elliptic Curve Cryptography, Message Authentication Code-Message Authentication Functions, Requirements, and Security, HMAC, Hash functions, Secure Hash algorithm,SHA-512.

**UNIT-V: Digital Signatures,** Authentication Protocols, Kerberos, Key Management and Distribution, X.509 Digital Certificate, NIST Digital Signature Algorithm.

**UNIT-VI: Transport Level Security:** Web Security Requirements, Secure Socket Layer(SSL), Transport Layer Security(TLS).Electronic mail security: Pretty Good Privacy (PGP), S/MIME.

**TEXT BOOKS:**


1. William Stallings, "Cryptography and Network Security, Principles and Practices", Pearson Education, Sixth Edition.
2. William Stallings, "Network Security Essentials (Applications and Standards)", Pearson Education Fourth Edition.
3. Cryptography and Network Security, Behrouz A Forouzan, Debdeep Mukhopadhyay, (3e) Mc Graw Hill.


**REFERENCE BOOKS:**


1. Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security – Private Communication in a Public World" Pearson/PHI.

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| **Software Testing Methodologies (Elective-II) (V18CST23)** | | | | | |

**Syllabus Details**

**Course Outcomes: After Successful completion of the Course, the student will be able to:**

**CO1:** Describe Software testing objectives and methodology. (K2)
**CO2:** Apply various Software testing techniques. (K3)
**CO3:** Discuss Static testing techniques for software testing. (K2)
**CO4:** Differentiate software testing and debugging process. (K2)
**CO5:** Construct test cases by understanding test suite management. (K3)
**CO6:** Explain modern software testing tools to support software testing. (K2)

**UNIT-I: Introduction to Software Testing:** Evolution of software Testing, Myths and Facts, Goals of software Testing, Definitions of Testing, Model for Software Testing, Software Testing Terminology, Software Testing Life Cycle.

**UNIT-II: Verification and Validation:** Verification & Validation Activities, Verification, Verification of Requirements, Verification of High level and low level designs, How to verify code, Validation. **Dynamic Testing I:** Black Box testing techniques: Boundary Value Analysis, Equivalence Class Testing, Decision Table based Testing,

**UNIT-III: Dynamic Testing II:** White-Box Testing: Need of White-Box Testing, Logic coverage criteria, Basis path testing, Loop testing. **Static Testing:** Inspections, Structured Walkthroughs, Technical reviews.

**UNIT-IV: Regression Testing:** Progressive Vs Regressive Testing, Regression testability, Objectives of regression testing, When is Regression Testing done? Regression Testing Types, Regression testing techniques. **Debugging:** Debugging process, Techniques, correcting bugs.

**UNIT-V: Efficient Test Suite Management:** Why does a Test Suite grow, minimizing the Test suite and its benefits, Test suite prioritization, Types of Test case prioritization, Prioritization techniques, measuring the effectiveness of a prioritized Test Suite.

**UNIT-VI: Software Quality Management:** Software quality concept, Quality control and Quality Assurance, Software Quality metrics. **Automation and Testing Tools:** Need for automation, categorization of Testing tools, selection of testing tools, Overview of some commercial testing tools.

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**TEXT BOOKS:**


1. Software Testing, Principles and Practices, Naresh Chauhan, 9th Edition, Oxford Publisher.


**REFERENCE BOOKS:**


1. Software testing techniques - Boris Beizer, 2nd Edition, Dreamtech publisher..
2. Foundations of Software testing, Aditya P Mathur, 2nd ed, Pearson.
3. Software Testing- Yogesh Singh, CAMBRIDGE.

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| **Principles of Programming Languages (Elective-II) (V18CST24)** | | | | | |

**Syllabus Details**

**Course Outcomes: After Successful completion of the Course, the student will be able to:**

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| **CO1:** | Describe Syntax and Semantics of Programming Languages | (K2). |
| **CO2:** | Illustrate Data, Data Types and basic statements of Programming Languages | (K3). |
| **CO3:** | Explain various sub programming Issues | (K2). |
| **CO4:** | Construct programs using Object Oriented, Concurrency and Event Handling | (K3). |
| **CO5:** | Distinguish Programming Languages, schemes and ML | (K2). |
| **CO6:** | Describe Logic Programming Languages | (K2). |

**UNIT I: SYNTAX AND SEMANTICS:** Reasons for studying Programming Languages, Programming Domains, Evolution of programming languages, describing syntax, context free grammars, attribute grammars, describing semantics, lexical analysis, parsing, recursive – decent bottom – up parsing.

**UNIT II: DATA TYPES AND BASIC STATEMENTS:** Introduction, primitive data types, strings, array types, associative arrays, record types, tuple types , union types, pointers and references, Arithmetic expressions, overloaded operators, type conversions, relational and Boolean expressions, assignment statements , mixed mode assignments, control structures – selection, iterations, branching, guarded Statements.

**UNIT III: SUBPROGRAMS AND IMPLEMENTATIONS:** Subprograms, design issues, local referencing, parameter passing, overloaded methods, generic methods, design issues for functions, semantics of call and return, implementing simple subprograms, stack and dynamic local variables, nested subprograms, blocks, dynamic scoping.

**UNIT IV: OBJECT- ORIENTED PROGRAMMING,EVENT HANDLING:** Object Model – Classes, Visibility and Information Hiding, Inheritance, Polymorphism, Abstract Classes, Event Handling- Mouse Clicks, Mouse Motion, Buttons, Labels, Text areas, Combo boxes, Examples.

**UNIT V: FUNCTIONAL PROGRAMMING LANGUAGES:** Introduction to lambda calculus, fundamentals of functional programming languages, Programming with Scheme, – Programming with ML.

**UNIT VI: LOGIC PROGRAMMING LANGUAGES:** Introduction to logic and Horn Clauses, logic programming – Programming in Prolog, Prolog Examples-Solving Word Puzzles, Eight Queens Problem.

**TEXT BOOKS**


1. Robert W. Sebesta, "Concepts of Programming Languages", Tenth Edition, Addison Wesley, 2012.
2. Programming Languages, Principles & Paradigms, 2ed, Allen B Tucker, Robert E Noonan, TMH


**REFERENCES**


1. R. Kent Dybvig, "The Scheme programming language", Fourth Edition, MIT Press, 2009.
2. Jeffrey D. Ullman, "Elements of ML programming", Second Edition, Prentice Hall, 1998.
3. Richard A. O'Keefe, "The craft of Prolog", MIT Press, 2009.

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| **Machine Learning (Elective-II) (V18CST25)** | | | | | |

**Syllabus Details**

**Course Outcomes: After Successful completion of the Course, the student will be able to:**

**CO1:** Demonstrate basics of Machine Learning. (K2)
**CO2:** Explain Various Classification Techniques. (K2)
**CO3:** Explain Tree Based Learning and Ensemble Learning (K2)
**CO4:** Demonstrate Neural Networks and Multi Layer Perceptrons. (K2)
**CO5:** Explain Dimensionality Reduction techniques (K2).
**CO6:** Demonstrate clustering algorithms (K2).

**Unit-I: Introduction:** Learning: Machine Learning, Types Of Machine Learning, Supervised Learning Regression, Classification, The Machine Learning Process. Some Terminology Weight Space, The Curse Of Dimensionality, Knowing What You Know:, Testing Machine Learning Algorithms, Overfitting Training, Testing, And Validation Sets, Some Basic Statistics. Averages Variance And Covariance, The Bias-Variance Tradeoff.

**UNIT II: Classification:** The General Problem, Probablistic Classifiers, Bayes Classifier, Logistic Regression,,K-Nearest Neighbor Classifiers, Supprot Vector Machines, Assessing Performance Of Classifiers: The Confusion Matrix Accuracy 0/1 Losss, Sensititivy And Specificity, The Receiver Operator Characteristic (Roc) Curve Unbalanced Datasets Measurement: Precision, Recall And F1 Score.

**UNIT-III: Tree Learning:** Using Decision Trees Constructing Decision Trees Quick Aside: Entropy In Information Theory, ID3, Dealing With Continuous Variables ,Computational Complexity, Classification And Regression Trees (Cart), Gini Impurity Regression In Trees. Classification Example. Ensemble Learning Boosting Adaboost, Stumping Bagging , Subagging, Random Forests.

**UNIT-IV: Neural Networks:** The Brain And The Neuron Hebb's Rule Mcculloch And Pitts Neurons Limitations Of The Mcculloch And Pitts Neuronal Model Neural Networks The Perceptron The Learning Rate H The Bias Input The Perceptron Learning Algorithm An Example Of Perceptron Learning: Logic Functions Implementation Linear Separability Linear Regression Linear Regression Examples

**UNIT-V: Dimensionality Reduction:** Linear Discriminant Analysis (LDA),Pprincipal Components Analysis (PCA) Relation With The Multi-Layer Perceptron, Kernel PCA, Factor Analysis Independent Components Analysis (ICA) Locally Linear Embedding.

**UNIT VI: Unsupervised Learning:** The K-Means Algorithm Dealing With Noise The K-Means Neural Network Normalisation Better Weight Update Rule Example: The Iris Dataset Using Competitive Learning For Clustering Vector Quantisation The Self-Organising Feature Maps.

**TEXT BOOKS:**


1. Machine Learning: An Algorithmic Approach.Stephen Marsland, 2nd Edition, CRC Press.
2. A First Course in Machine Learning; Volume in Machine Learning and Pattern Recognition Series – CRC-Taylor & Francis-Chapman & Hall Rogers S., Girolami M., (2011).


**REFERENCE BOOKS:**


1. Machine Learning: The art and Science of Algorithms that Make sense of Data. Peter Flach, Cambridge.
2. Machine Learning: Tom Mitchel, McGraw Hill Learning, 1997

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| **Image Processing (Elective-II) (V18CST26)** | | | | | |

**Syllabus Details**

**Course Outcomes: After Successful completion of the Course, the student will be able to:**

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| **CO1:** | Illustrate the different Transforms Techniques & their use in Image Processing applications | (K3). |
| **CO2:** | Demonstrate Spatial & frequency domain filtering (like smoothing & sharpening operations) on Images | (K3). |
| **CO3:** | Describe Restoration operations/techniques on Images | (K2). |
| **CO4:** | Demonstrate the Image compression Techniques and multi-resolution processing on Images | (K3). |
| **CO5:** | Illustrate Morphological operations on Images & Image segmentation | (K3). |
| **CO6:** | Illustrate the different color Image Processing Techniques on Images | (K3). |

**UNIT-I : Introduction:** Introduction to Image Processing, Fundamental steps in digital image processing, components of an image processing system, image sensing and acquisition, image sampling and quantization, some basic relationships between pixels, an introduction to the mathematical tools used in digital image processing. **Image Transforms:** Need for image transforms, Discrete Fourier transform (DFT) of one variable, Extension to functions of two variables, some properties of the 2-D Discrete Fourier transform, Importance of Phase, Walsh Transform. Hadamard transform, Haar Transform, Slant transform, Discrete Cosine transform.

**UNIT-II: Intensity Transformations and Spatial Filtering:** Background, Some basic intensity transformation functions, histogram processing, fundamentals of spatial filtering, smoothing spatial filters, sharpening spatial filters. **Filtering in the Frequency Domain:** Preliminary concepts, The Basics of filtering in the frequency domain, image smoothing using frequency domain filters, Image Sharpening using frequency domain filters, Selective filtering.

**UNIT-III: Image Restoration and Reconstruction:** A model of the image degradation / Restoration process, Noise models, restoration in the presence of noise only-Spatial Filtering, Periodic Noise Reduction by frequency domain filtering, Linear, Position –Invariant Degradations, Estimating the degradation function, Inverse filtering, Minimum mean square error (Wiener) filtering, constrained least squares filtering ,geometric mean filter .

**UNIT-IV: Image compression:** Fundamentals, Basic compression methods: Huffman coding, Arithmetic coding, LZW coding, Run-Length coding, Bit-Plane coding. **Wavelets and Multiresolution Processing:** Image pyramids, subband coding, Multiresolution expansions, wavelet transforms in one dimensions & two dimensions, Wavelet coding.

**UNIT-V: Image segmentation:** Fundamentals, point, line, edge detection, thresholding, region –based segmentation. **Morphological Image Processing:** Preliminaries, Erosion and dilation, opening and closing, basic morphological algorithms for boundary extraction, thinning, gray-scale morphology.

**UNIT-VI: Color image processing:** color fundamentals, color models, pseudo color image processing, basics of full color image processing, color transformations, smoothing and sharpening. Image segmentation based on color, noise in color images, color image compression.

**TEXT BOOKS:**


1. R. C. Gonzalez and R. E. Woods, Digital Image Processing, 3rd edition, Prentice Hall, 2008.
2. Jayaraman, S. Esakkirajan, and T. Veerakumar," Digital Image Processing", Tata McGraw-Hill Education, 2011.


**REFERENCE BOOKS:**


1. Anil K.Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India, 9th Edition, Indian Reprint, 2002.
2. B.Chanda, D.Dutta Majumder, "Digital Image Processing and Analysis", PHI, 2009.

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| Object Oriented Analysis and Design Through UML Lab (V18CSL08) | | | | | |

**Syllabus Details**

**Course Outcomes: After Successful completion of the Course, the student will be able to:**

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| **CO1:** | Develop OOAD and UML concepts to identify Classes, Use Cases and their relationships | (K3). |
| **CO2:** | Develop Class diagrams | (K3). |
| **CO3:** | Develop Use case diagrams | (K3). |
| **CO4:** | Construct Interaction diagrams | (K3). |
| **CO5:** | Develop State chart, Activity diagrams | (K3). |
| **CO6:** | Develop Component and Deployment diagrams | (K3). |

**List of Experiments**

1. Draw basic class diagrams to identify and describe key concepts like classes, and their relationships.
2. Draw one or more Use Case diagrams for capturing and representing requirements of the system. Use case diagrams must include template showing description and steps of the Use Case for various scenarios.
3. Draw sequence diagrams OR communication diagrams with advanced notation for system to show objects and their message exchanges.
4. Draw activity diagrams to display either business flows or like flow charts.
5. Develop State chart diagrams.
6. Draw component diagrams assuming that build the system reusing existing components along with a few new ones.
7. Draw deployment diagrams to model the runtime architecture of system.
8. Case study-Library Management System
9. Case study-Hospital Management System
10. Case study-Railway Reservation System

**TEXT BOOKS:**

1. The Unified Modeling Language User Guide, Grady Booch, James Rumbaugh, Ivar Jacobson, Pearson Education.

.

**REFERENCE BOOKS:**

1. UML 2 Toolkit, Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado, WILEY-Dreamtech India Pvt. Ltd.
2. Fundamentals of Object Oriented Design in UML, Meilir Page-Jones, Pearson Education.
3. Modeling Software Systems Using UML2, Pascal Roques, WILEY- Dreamtech India Pvt. Ltd.

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| Data Mining Lab (V18CSL09) | | | | | |

**Syllabus Details**

**Course Outcomes: After Successful completion of the Course, the student will be able to:**

**CO1:** Demonstrate Data Preprocessing techniques. (K3)
**CO2:** Demonstrate Association Rule Mining techniques. (K3)
**CO3:** Demonstrate Classification techniques. (K3)
**CO4:** Demonstrate the Clustering techniques. (K3)

**List of Experiments (Using Weka Tool):**

1. Demonstrate Data Preprocessing on predefined Weka dataset labor.arff
2. Create a student.arff dataset and Demonstrate Data Preprocessing on it
3. Demonstrate Association rule process on predefined Weka dataset contactlenses.arff using apriori algorithm.
4. Create an employee.arff dataset and demonstrate Association rule process on it using apriori algorithm
5. Demonstrate Classification process on student.arff dataset using j48 algorithm
6. Create a customer.arff dataset and demonstrate Classification process on it using j48 algorithm
7. Demonstrate Classification process on employee.arff dataset using id3 algorithm
8. Demonstrate Classification process on employee.arff dataset using Naïve Bayes algorithm
9. Demonstrate Clustering process on predefined Weka dataset iris.arff using simple k-means algorithm.
10. Demonstrate Clustering process on dataset student.arff using simple k- means algorithm.

**Reference Books:**

1. Data Mining: Practical Machine Learning Tools and Techniques, Ian H. Witten, Eibe Frank, Mark A. Hall, 3rd Edition, Morgan Kaufmann Publishers
2. Data Mining Concepts and Techniques, Jiawei Han, Micheline Kamber, Jian Pei, 3rd Edition, Morgan Kaufmann Publishers
3. Introduction to Data Mining, Pang-Ning Tan, Michael Steinbach, Vipin Kumar, 1st Edition, Pearson Education Inc.

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| **Technical Skills-IV (V18CST63)** | | | | | |

**Syllabus Details**

**Course Outcomes: After Successful completion of the Course, the student will be able to:**

CO1: Demonstrate java fundamentals to solve real world computational problems. (K2)
CO2: Illustrate object orientated concepts in solving problems with reusability feature. (K2)
CO3: Apply collections on java to solve complex problems in linear time. (K3)
CO4: Make use of divide and conquer approach and java collections to solve problems in linear and logarithmic time. (K3)
CO5: Experiment with backtracking algorithm approach and java collections to solve complex problems in O(n) or O(nlogn). (K3)
CO6: Develop programs to solve optimization, NP Hard problems using java collections and dynamic programming method. (K3)

## Part-A: Java Programming

1. Problem solving using Control Statements
2. Problem solving using Arrays
3. Problem solving using Strings ,StringBuffer, StringBuilder
4. Problem solving using OOP Concepts
5. Problem solving using Inheritance
6. Problem solving using Polymorphism
7. Problem solving Collections (includes all)
8. Problem solving using Exception Handling

## Part B: Algorithm Techniques in Java

9. Problem Solving on Divide and Conquer
10. Problem Solving on Greedy method
11. Problem Solving on Backtracking
12. Problem Solving on Dynamic Programming

**TEXT BOOKS:**


1. Data structures and Algorithms made easy on Java: Narasimha Karumanchi.
2. Thinking on Java - O'Reilly.
3. Java Complete Reference.