SRI VASAVI ENGINEERING COLLEGE (**AUTONOMOUS**)
(Sponsored by Sri Vasavi Educational Society)
(Approved by AICTE, New Delhi & Permanently affiliated to JNTUK, Kakinada)
(Accredited by NAAC with 'A' Grade ,Recognized by UGC under section 2(f) & 12(B))
Pedatadepalli, **TADEPALLIGUDEM – 534 101.** W.G.Dist**. (A.P)**
Department of Computer Science & Engineering (Accredited by NBA)

Minutes of the Fifth Board of Studies held on 02/09/2021 at 02.00 PM through online mode

Dt: 03.09.2021

The 5th Meeting of Board of Studies in Department of Computer Science and Engineering is held at 02.00 PM on 02-09-2021 through online mode using,

https://us02web.zoom.us/j/86328881824

The following members attended the meeting:

S.No.	Name of the Member	Designation	Role
1.	Dr. D Jaya Kumari	Professor, HoD-CSE, SVEC	Chairperson
2.	Dr.Krishna Mohan Ankala	Professor, UCEK, Kakinada	University Nominee
3.	Dr. R.B.V. Subramanyam	Professor, Department of CSE, NIT Warangal	Academic Expert
4.	Dr. S Pallam Setty	Professor, Department of CSE, Andhra University, Vishakapatnam	Academic Expert
5.	Sri. Srinivasa Raju Vuppalapati	Senior Consultant, MSR IT Services LLP, Hitech City, Hyderabad.	Industry Expert
6.	Mr.EEdala Rambabu	microfocus, Bangalore	Alumni
7.	Sri Ch. Apparao	Technical Director	Invited Member
8.	Dr. V. Venkateswara Rao	Professor	Member
9.	Dr. G Loshma	Professor	Member
10.	Dr. V S Naresh	Professor	Member
11.	Ch. Raja Ramesh	Associate Professor	Member
12.	Dr.K. ShirinBhanu	Associate Professor	Member
13.	A. Leelavathi	Sr. Assistant Professor	Member
14.	D Anjani Suputhri Devi	Sr. Assistant Professor	Member
15.	R. LeelaPhani Kumar	Assistant Professor	Member
16.	D Sasi Rekha	Assistant Professor	Member
17.	B.SriRamya	Assistant Professor	Member
18.	G.Sriram Ganesh	Assistant Professor	Member
19.	N.V.Murali Krishna Raja	Assistant Professor	Member
20.	N. Hiranmayee	Assistant Professor	Member
21.	A Rajesh	Assistant Professor	Member
22.	Y.DivyaVani	Assistant Professor	Member
23.	K Lakshmi Narayana	Assistant Professor	Member
24.	M NageswaraRao	Assistant Professor	Member
25.	B Kiran Kumar	Assistant Professor	Member
26.	D.S L Manikanteswari	Assistant Professor	Member
27.	P Uma Sankar	Assistant Professor	Member
28.	M V V Krishna	Assistant Professor	Member
29.	M. Anantha Lakshmi	Assistant Professor	Member
30.	K Venkatesh	Assistant Professor	Member
31.	M. Satyanarayana Reddy	Assistant Professor	Member
32.	J.N. Chandra Sekhar	Assistant Professor	Member
33.	David Raju. K	Assistant Professor	Member
34.	P Suneetha	Assistant Professor	Member
35.	M Sree Radha Mangamani	Assistant Professor	Member
36.	Ch Hemanandh	Assistant Professor	Member
37.	M Chilaka Rao	Assistant Professor	Member
38.	G V Lakshmi Narayana	Assistant Professor	Member
39.	A Nageswara Rao	Assistant Professor	Member
40.	A NagaJyothi	Assistant Professor	Member
41.	G Prashanthi	Assistant Professor	Member

The following are the Minutes of the Meeting

Item No.1: Welcome note by the Chairperson BOS.

Chairperson BOS extended a formal welcome and introduced the members.

Item No.2: Progress Report of the Department

Chairperson BOS had given the Brief Progress Report of the Department.

Item No.3: Review of Course Structure for VII and VIII Semesters of B.Tech(CSE) Programme under V18 Regulation.

Reviewed the Course Structure of VII & VIII Semesters of B.Tech (CSE) Programme under V18 Regulation**.** The approved Course Structure is given in **Annexure-I.**

Item No.4: Approval of Syllabi for the Proposed Courses offered in VII and VIII Semesters of B.Tech(CSE) Programme under V18 Regulation.

Approved the Syllabi for the courses offered in VII & VIII semesters of B.Tech(CSE) Programme under V18 Regulation and suggested the following changes:

SEM	Course Code	Suggestions	Inclusions / Modifications
VII	V18CST27	In AJWT Course it was suggested that AngularJS need to be replaced by Angular.	AngularJS concepts modified as Angular.

The Modified and Approved Syllabus is given in **Annexure-II.**

Item No.5: Approval of Course Structure for V to VIII Semesters of B.Tech(CST) Programme under V18 Regulation.

Approved Course Structure for VII & VIII Semesters for B.Tech (CST) Programme under V18 Regulation. The approved Course Structure is given in **Annexure-III**.

Item No.6: Approval of Syllabi for Proposed Courses offered in V to VIII Semesters of B.Tech(CST) Programme under V18 Regulation..

Approved the syllabi for the courses offered in V to VIII semesters of B.Tech(CST) Programme under V18 Regulation and suggested the following changes:

SEM	Course Code	Suggestions	Inclusions / Modifications
VII	V18CST27	In AJWT Course it was suggested that AngularJS need to be replaced by Angular.	AngularJS concepts modified as Angular.

The Modified and Approved Syllabus is given in **Annexure-IV.**

Item No.7: Approval of list of Courses offering under Open Elective-II & Open Elective-III in VII and VIII Semesters respectively under V18 Regulation for all other branches and the approval of their Syllabi.

Approved the list of Courses and Syllabi offered under Open Elective-II & Open Elective-III in VII and VIII Semesters respectively under V18 Regulation for all other branches. The approved Courses and Syllabi are given in **Annexure-V.**

Item No.8: Approval of Course Structure for III to VIII Semesters of B.Tech(CSE) and B.Tech(CST) Programme under V20 Regulation.

Reviewed the Course Structure for III to VIII Semesters for B.Tech(CSE) and B.Tech(CST) Programme under V20 Regulation and suggested the following changes:

Suggestions	Inclusions / Modifications
Suggested to include UML Lab in V Semester	Incorporated UML Lab in V Semester and Merged the AI & DM Labs
In Pool of Skill Oriented Courses add Secure DevOps and remove Source Code Management Using Git & Github.	Included Secure DevOps in pool of Skill Oriented Courses.
In Open Elective replace Computer Organization and Architecture course with Some other course.	Replaced the Open Elective Computer Organization and Architecture course with Information Retrieval Systems.

The Modified and Approved Course Structure is given in **Annexure-VI**.

Item No.9: Approval of Syllabi for Proposed Courses offered in III and IV Semesters of B.Tech (CSE) and B.Tech(CST) Programme under V20 Regulation.

Approved the syllabi for the courses offered in III and IV Semesters of B.Tech (CSE) and B.Tech(CST) Programme under V20 Regulation and suggested the following changes:

SEM	Course Code	Suggestions	Inclusions / Modifications
III	V20CSL03	In OOP through C++ Lab add concepts like how to debug and create libraries using GDB	Included GDB Lab Task in OOP through C++ Lab.
IV	V20CST07	In DAA Course add NP Hard & NP Complete Introduction Concepts	Included Basic Concepts of NP-Hard and NP-Complete problems in UNIT-V.

The Modified and Approved Syllabus is given in **Annexure-VII**.

Item No.10: Approval of Proposed Courses and Syllabi for other branches under V20 Regulation.

Approved the Proposed Courses and Syllabi for other branches under V20 Regulation. The approved Courses and Syllabi are given in **Annexure-VIII**.

Item No.11: Approval of Course Structure and Syllabi for I to IV Semesters of M.Tech(CS) Programme under V21 Regulation.

Approved the Course Structure and Syllabi for I to IV Semesters of M.Tech(CS) Programme under V21 Regulation and suggested the following changes:

SEM	Course Code	Suggestions	Inclusions / Modifications
I	V21CTT06 **(Program Elective-II)**	**Advanced Databases:** - Add Graph Databases / neo4j : Real Time Case Studies - Add Time series Databases: Real Time Case Studies.	Included, as per the suggestions given by the BOS Members
I	V21CTT07 **(Program Elective-II)**	**Advanced computer networks:** - Add SDN - Software Defined Networks - Real Time Case Study	Included, as per the suggestions given by the BOS Members

The Modified and Approved Course Structure and Syllabus is given in **Annexure-IX.**

Dr.D Jaya Kumari
Chairperson of BOS

Head of the Department
Dept. of Computer Science & Engineering
Sri Vasavi Engineering College
TADEPALLIGUDEM-534 101

Annexure-I

S.No.	Course Code	Category	Course	L	T	P	C
	VII – Semester						
1	V18CST27	PCC	Advanced Java and Web Technologies	3	0	0	3
2	V18MBET52	HSS	Management Science	3	0	0	3
3	**Elective – III**						
	V18CST28	PEC	1. Advanced Operating Systems	3	0	0	3
	V18CST29		2. Statistics with R Programming				
	V18CST30		3. Information Retrieval Systems				
	V18CST31		4 Human Computer Interaction				
4	**Elective – IV**						
	V18CST32	PEC	1.Distributed Systems	3	0	0	3
	V18CST33		2.Scripting Languages				
	V18CST34		3.Deep Learning				
	V18CST35		4.Social Networks and Semantic Web				
5	**Open Elective – II (Interdisciplinary)**	**OEC**	**OPE II(1-3)**	3	0	0	3
6	V18CSL10	PCC	Advanced Java and Web Technologies Lab	0	0	2	1
7	V18CSP01	Project	Project Work (Part-A)	0	0	06	3
Total				**15**	**0**	**08**	19

Total Contact Hours: 23

S.No.	Course Code	Category	Course	L	T	P	C
	VIII – Semester						
1	**Elective – V**						
	V18CST36	PEC	1. Software Project Management	3	0	0	3
	V18CST37		2. Big Data Analytics				
	V18CST38		3. Soft Computing				
	V18CST39		4. Cloud Computing				
2	**Elective – VI**			3	0	0	3
	V18CST40	PEC	1. Software Architecture and Design Patterns				
	V18CST41		2. Middleware Technologies				
	V18CST42		3. Natural Language Processing				
	V18CST43		4. Cyber Security				
3	**Open Elective – III (Interdisciplinary)**	OEC	**OPE III(1-3)**	3	0	0	3
4	V18CSP02	Project	Project Work (Part-B)	0	0	16	8
Total				**9**	**0**	**16**	**17**

Total Contact Hours: 25

Annexure-II

VII Sem	Advanced Java and Web Technologies	Course Code: VI8CST27	L	T	P	C
			3	0	0	3

Syllabus Details

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

CO1: Illustrate the basic concepts of HTML and CSS (K2)
CO2: Develop dynamic webpages and validate with java Script. (K3)
CO3: Illustrate Extensible markup language (K2)
CO4: Illustrate the basic concepts of NODE JS and Angular. (K2)
CO5: Build database driven web applications using JSP (K3)
CO6: Develop web applications using PHP and MySQL (K3)

UNIT-I :HTML: Basic Syntax, Standard HTML Document Structure, Basic Text Markup, Images, Hypertext Links, Lists, Tables, Frames Forms.CSS: Cascading style sheets, Levels of Style Sheets, Style Specification Formats, Selector Forms.

UNIT-II: JavaScript & DHTML: Overview of JavaScript, General Syntactic Characteristics, Primitives Operations and Expressions, Screen output and Keyboard Input, Control Statements, Object creation and Modification, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions, Events and Event Handling.

UNIT-III: Working with XML: Introduction, The syntax of XML, XML Document Structure, Document Type Definition (DTD), Namespaces, XML schemas, XSLT, XML Parsers - DOM and SAX.

UNIT-IV: Fundamentals of NODE JS and Angular: Understanding Node.js, Installing Node.js, Working with Node Packages, Creating a Node.js Application, Understanding Angular, Modules, Directives, Data Binding, Dependency Injection, Services, Separation of Responsibilities, Creating a Basic Angular Application.

UNIT-V: Introduction to Servlets & JSP: Introduction to servlets, Life cycle of Servlet, Limitations of servlets, Java Server Pages: JSP Overview, Components of a JSP Page: Directives, comments, Expressions, Scriptlets, Declarations, implicit objects, Database Access, session tracking.

UNIT-VI: PHP Programming: Overview of PHP, General syntactic characteristics, Primitives, operations, Expressions, Output, Control statements, Arrays, Functions, Pattern Matching, Form Handling, Cookies, Session Tracking. PHP with MySQL connectivity.

Text Books:

1. Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson, 2013.
2. Node.js, MongoDB and Angular Web Development, 2nd Edition,Brad Dayley Brendan Dayley Caleb Dayley,Pearson Education,2018
3. JSP:The Complete reference,Phil Hanna,The McGraw-Hill Copanies,2001

Reference Books:

1. Web Technologies: HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, Dream Tech.
2. An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage Learning
3. Web Technologies, 1st Edition 7th impression, Uttam K Roy, Oxford, 2012.

VII Sem	Advanced Operating Systems (**Elective – III)**	Course Code: VI8CST28	L	T	P	C
			3	0	0	3

Syllabus Details

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

CO1: Describe Architectures of Distributed Systems and Distributed Mutual Exclusion. **(K2)**
CO2: Illustrate the concepts of Deadlock Handling Strategies in Distributed Systems. **(K3)**
CO3: Explain the various Resource Management Techniques for Distributed Systems. **(K2)**
CO4: Discuss Fault Tolerance and Fault Recovery concepts in Distributed Systems . **(K2)**
CO5: Interpret the concepts of Cryptography and Data Security in Distributed Systems. **(K3)**
CO6: Describe Multiprocessor Operating System, Process Synchronization, Scheduling. **(K2)**

UNIT I: Architectures of Distributed Systems –System Architecture types - issues in distributed operating systems - communication networks - communication primitives. Distributed Mutual Exclusion - introduction - the classification of mutual exclusion and associated algorithms

UNIT II: Distributed Deadlock Detection -Introduction - deadlock handling strategies in distributed systems - issues in deadlock detection and resolution - control organizations for distributed deadlock detection - centralized and distributed deadlock detection algorithms -hierarchical deadlock detection algorithms.

UNIT III: Distributed Resource Management- Algorithms for implementing DSM - memory coherence and protocols - design issues. Distributed Scheduling - introduction - issues in load distributing - components of a load distributing algorithm - stability - load distributing algorithm – performance comparison - selecting a suitable load sharing algorithm - requirements for load distributing.

UNIT IV: Failure Recovery and Fault tolerance: Introduction- basic concepts - classification of failures - backward and forward error recovery, backward error recovery- recovery in concurrent systems - consistent set of check points - synchronous and asynchronous check pointing and recovery - check pointing for distributed database systems- recovery in replicated distributed databases.

UNIT V: Protection and Security - Preliminaries, the access matrix model and its implementations.- safety in matrix model, advanced models of protection. Data security - cryptography: Model of cryptography, conventional cryptography- modern cryptography, multipleencryptions - authentication in distributed systems.

UNIT VI: Multiprocessor Operating Systems - Basic multiprocessor system architectures - inter connection networks for multiprocessor systems .Multiprocessor Operating System - structures of multiprocessor operating system, operating system design issues- threads- process synchronization and scheduling.

Text Books:

1. Advanced Concepts in Operating Systems: Distributed, Database and Multiprocessor Operating Systems, MukeshSinghal, NiranjanG.Shivaratri,TMH, 2001.
2. Distributed Operating System-Concepts and Design,PradeepK.Sinha ,PHI, 2003.

Reference Books:

1. Modern operating system, Andrew S.Tanenbaum, PHI, 2003
2. Distributed operating system,Andrew S.Tanenbaum,Pearson education, 2003.
3. Operating System Concepts, Abraham Silberschatz; Peter Baer Galvin; Greg Gagne, Seventh Edition, John Wiley & Sons, 2004.

VII Sem	Statistics with R Programming **(Elective – III)**	Course Code: VI8CST29	L	T	P	C
			3	0	0	3

Syllabus Details

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

CO1: Illustrate different data structures in R. **(K2)**
CO2: Demonstrate about control statements and functions in R. **(K3)**
CO3: Compute different mathematical operations using R pre defined functions. **(K3)**
CO4: Construct and edit visualizations with R. **(K3)**
CO5: Identify appropriate statistical tests using R. **(K2)**
CO6: Examine linear and non linear models to create testable hypotheses. **(K3)**

UNIT I: Introduction and Data Structures: Introduction, How to install and run R, R Sessions, Functions, Basic Math, constants, Variables, Expressions, Reserved words in R, Arithmetic, and Boolean Operators and values, Data Types, Vectors, Advanced Data Structures: Data Frames, Lists, Matrices, Arrays, Classes.

UNIT II: Control Statements and Functions in R: R Programming Structures, Control Statements, Loops, – Looping Over Nonvector Sets,- If-Else, Default Values for Argument, return values, Deciding Whether to explicitly call return- returning Complex Objects, Functions are Objects, No Pointers in R, Recursion, A Quick sort Implementation- Extended Example: A Binary Search Tree.

UNIT III: Math and Simulation and Input/output in R: Doing Math and Simulation in R, Math Function, Extended Example Calculating Probability Cumulative Sums and Products-Minima and Maxima- Calculus, Functions for Statistical Distribution, Sorting, Linear Algebra, Operations on Vectors and Matrices, Extended Example: Vector cross Product, Set Operations. **Input /output:** Accessing the Keyboard and Monitor, Reading and writing Files

UNIT IV: Graphics: Graphics, Creating Graphs, The Workhorse of R Base Graphics, the plot() Function ,Customizing Graphs, Saving Graphs to Files.

UNIT V: Probability Distributions and Basic Statistics: Probability Distributions, Normal Distribution- Binomial Distribution- Poisson Distributions Other Distribution, Basic Statistics, Correlation and Covariance, T-Tests,-ANOVA.

UNIT VI: Linear Models in R: Linear Models, Simple Linear Regression, -Multiple Regression Generalized Linear Models, Logistic Regression, - Poisson Regression, Nonlinear Models, Splines-Decision- Random Forests.

Text Books:

1. R for Everyone, Lander, Pearson, 2nd edition 2018.
2. The Art of R Programming, Norman Matloff, Cengage Learning, 2nd edition, 2017.

Reference Books:

1. R Cookbook, PaulTeetor, Oreilly, 2nd edition, 2017.
2. R in Action, Rob Kabacoff, Manning, 3rd edition, 2019.

VII Sem	Information Retrieval Systems (**Elective – III)**	Course Code: VI8CST30	L	T	P	C
			3	0	0	3

Syllabus Details

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

CO1: Identify the basic concepts of information retrieval. **(K2)**
CO2: Describe the Capabilities of IRS, cataloging and indexing. **(K2)**
CO3: Explain the data structures and retrieving documents. **(K2)**
CO4: Describe the difficulty of representing and retrieving documents. **(K2)**
CO5: Explain the latest technologies for describing and searching the web. **(K2)**
CO6: Illustrate searching procedure for user-text and Information System Evaluation. **(K2)**

UNIT I: Introduction: Definition, Objectives, Functional Overview, Relationship to DBMS, Digital libraries and Data Warehouses.

UNIT II: Information Retrieval System Capabilities: Search, Browse, Miscellaneous **Cataloging and Indexing:** Objectives, Indexing Process, Automatic Indexing, Information Extraction.

UNIT III: Data Structures: Introduction, Stemming Algorithms, Inverted file structures, N-gram data structure, PAT data structure, Signature file structure, Hypertext data structure.

UNIT IV: Automatic Indexing: Classes of automatic indexing, Statistical indexing, Natural language, Concept indexing, Hypertext linkages. **Document and Term Clustering:** Introduction, Thesaurus generation, Item clustering, Hierarchy of clusters.

UNIT V: User Search Techniques: Search statements and binding, Similarity measures and ranking, Relevance feedback, Selective dissemination of information search, weighted searches of Boolean systems, Searching the Internet and hypertext. **Information Visualization:** Introduction, Cognition and perception, Information visualization technologies.

UNIT VI: Text Search Algorithms: Introduction, Software text search algorithms, Hardware text search systems. **Information System Evaluation:** Introduction, Measures used in system evaluation, Measurement example – TREC results.

Text Books:

1. Information Storage and Retrieval System: Theory and Implementation, Gerald J. Kowalski, Mark T. Maybury, 2nd edition, 2002, Kluwer Academic Press.

Reference Books:

1. Information Retrieval Data Structures and Algorithms, Frakes, W.B., Ricardo Baeza-Yates Prentice Hall.
2. Information Storage & Retrieval by Robert Korfhage – John Wiley & Sons, Wiley computer publisher, 1997.

VII Sem	Human Computer Interaction **(Elective – III)**	Course Code: VI8CST31	L	T	P	C
			3	0	0	3

Syllabus Details

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

CO1: Describe the principles and characteristics of GUI. **(K2)**
CO2: Recognize how a computer system may be modified to include human diversity. **(K2)**
CO3: Select an effective style for a specific application. **(K2)**
CO4: Discuss Screen Designing mock-ups and carry out user and expert evaluation of interfaces. **(K2)**
CO5: Explain System Menus & Navigation Schemes. **(K2)**
CO6: Discuss Device and Screen based controls. **(K2)**

UNIT I: The User Interface: Introduction, Importance of the User Interface, Importance and benefits of Good Design History of Human Computer Interface. Characteristics of Graphical and Web User Interface: Graphical User Interface, popularity of graphics, concepts of Direct Manipulation, Graphical System advantage and disadvantage, Characteristics of GUI. Web User Interface, popularity of web, Characteristics of Web Interface, Merging of Graphical Business systems& the Web, Principles of User Interface Design.

UNIT II: The User Interface Design Process: Obstacles and Pitfall in the development Process, Usability, The Design Team, Human Interaction with Computers, Important Human Characteristics in Design, Human Consideration in Design, Human Interaction Speeds, Performance versus Preference, Methods for Gaining and Understanding of Users.

UNIT III: Understanding Business Functions: Business Definitions & Requirement analysis, Determining Business Functions, Design standards or Style Guides, System Training and Documentation.

UNIT IV: Principles of Good Screen Design: Human considerations in screen Design, interface design goals, test for a good design, screen meaning and purpose, Technological considerations in Interface Design.

UNIT V: System Menus and Navigation Schemes: Structure, Functions, Context, Formatting, Phrasing and Selecting, Navigating of Menus, Kinds of Graphical Menus Windows Interface: Windows characteristic, Components of Window, Windows Presentation Styles, Types of Windows, Window Management, Websystems

UNIT VI: Device and Screen-Based Control: Device based controls, Operable Controls, Text entry/read-Only Controls, Section Controls, Combining Entry/Selection Controls, Other Operable Controls and Presentation Controls, Selecting proper controls

Text Books:

1. "The Essential Guide to User Interface Design", Wilbert O. Galitz, 2nd edition,2002,Wiley India Edition.
2. Prece, Rogers, "Sharps Interaction Design", Wiley India.
3. "Designing the user interfaces". Ben Shneidermann 3rd Edition, Pearson Education Asia.

.**Reference Books:**

1. "User Interface Design" , SorenLauesen, Pearson Education
2. "Essentials of Interaction Design", Alan Cooper, Robert Riemann, David Cronin, Wiley
3. "HumanComputer Interaction", Alan Dix, Janet Fincay, GreGoryd, Abowd, Russell, Bealg, Pearson Education.

VII Sem	Distributed Systems (**Elective – IV)**	Course Code: VI8CST32	L	T	P	C
			3	0	0	3

Syllabus Details

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

CO1: Describe distributed system and desired properties of such systems. **(K2)**
CO2: Discuss the theoretical concepts, namely, virtual time and agreement. **(K2)**
CO3: Discuss the basic concepts of distributed systems and Characteristics of IPC protocols. **(K2)**
CO4: Explain the mechanisms such as Remote procedure call (RPC/RMI) and OSS . **(K2)**
CO5: Explain the mechanisms such as file systems and P2P algorithms. **(K2)**
CO6: Discuss the Transactions and Replications in distributed systems. **(K2)**

UNIT I: Characterization of Distributed Systems: Introduction, Examples of Distributed Systems, Resource Sharing and the Web, Challenges. **System Models:** Introduction, Architectural Models- Software Layers, System Architecture, Variations, Interface and Objects, Design Requirements for Distributed Architectures, Fundamental Models- Interaction Model, Failure Model, Security Model.

UNIT II: Time and Global States: Introduction, Clocks Events and Process States, Synchronizing Physical Clocks, Logical Time and Logical Clocks, Global States, Distributed Debugging.
Coordination and Agreement: Introduction, Distributed Mutual Exclusion, Elections, Multicast Communication, Consensus and Related Problems.

UNIT III: Inter process Communication: Introduction, The API for the Internet Protocols- The Characteristics of Inter process communication, Sockets, UDP Datagram Communication, TCP Stream Communication; External Data Representation and Marshalling; Client Server Communication; Group Communication, Case Study: MPI.

UNIT IV:: Remote Invocation: Introduction, Request-reply protocols, Remote Procedure Call, Events and Notifications, **Case Study:** JAVA RMI.. **Operating System Support:** Introduction, The Operating System Layer, Protection, Processes and Threads –Address Space, Creation of a New Process, Threads.

UNIT V: Distributed File Systems: Introduction, File Service Architecture; Peer-to-Peer Systems: Introduction, Napster and its Legacy, Peer-to-Peer Middleware, Routing Overlays. **Case Study1:** Sun Network File system. **Case Study 2:** The Andrew File System.

UNIT VI: Transactions & Replications: Introduction, System Model and Group Communication, Concurrency Control in Distributed Transactions, Distributed Dead Locks, Transaction Recovery; Replication-Introduction, Passive (Primary) Replication, Active Replication.

Text Books:

1. "Distributed Systems- Concepts and Design", George Coulouris, Jean Dollimore, Tim Kindberg, Fourth Edition, Pearson Publication
2. "Distributed Computing, Principles, Algorithms and Systems", Ajay D Kshemkalyani, MukeshSighal, Cambridge.

Reference Books:

1. "Distributed Systems, Principles and Paradigms", Andrew S. Tanenbaum, Maarten Van Steen, 2d Edition, PHl.
2. "Distributed Systems, An Algorithm Approach," Sukumar Ghosh, Chapman & HalyCRC, Taylor & Fransis Group, 2007.

VII Sem	Scripting Languages (**Elective – IV)**	Course Code: VI8CST33	L	T	P	C
			3	0	0	3

Syllabus Details

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

CO1: Illustrate the concepts of scripting languages. **(K2)**
CO2: Develop Scripting for application using Ruby. **(K3)**
CO3: Explain the concepts of Programming in Perl. **(K2)**
CO4: Construct programs using Perl. **(K3)**
CO5: Describe TCL Scripting and their applications. **(K2)**
CO6: Discuss features of Groovy when compare with other Scripting Languages. **(K2)**

UNIT I: Introduction: Ruby, Rails, the structure and Execution of Ruby Programs, Package Management with RUBYGEMS, Ruby and web: Writing CGI scripts, cookies, Choice of Webservers, SOAP and web services. RubyTk – Simple Tk Application, widgets, Binding events, Canvas, scrolling.

UNIT II: Extending Ruby: Ruby Objects in C, the Jukebox extension, Memory allocation, Ruby TypeSystem, Embedding Ruby to Other Languages, Embedding a Ruby Interpreter.

UNIT III: Introduction to PERL and Scripting: Scripts and Programs, Origin of Scripting, Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.

UNIT IV: Advanced Perl: Finer points of looping, pack and unpack, file system, eval, data structures, packages, modules, objects, interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Issues.

UNIT V:TCL: TCL Structure, syntax, Variables and Data in TCL, Control Flow, Data Structures, input/output, procedures, strings, patterns, files, Advance TCL- eval, source, exec and uplevel commands, Name spaces, trapping errors, event driven programs, making applications internet aware, Nuts and Bolts Internet Programming, Security Issues, C Interface.

UNIT VI: Groovy: Features of Groovy, Environment, Basic Syntax, data types, variables, operators, loops, decision making, methods, File i/o, Optionals , numbers, strings, ranges, lists, maps, date and time, Regular expressions, Exception Handling, OO concepts.

Text Books:

1. The World of Scripting Languages, David Barron, Wiley Publications.
2. Ruby Programming language by David Flanagan and Yukihiro Matsumoto O‟Reilly.
3. “Programming Ruby” The Prammatic programmers guide by Dabve Thomas Second edition.

Reference Books:

1. Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP, J.Lee and B.Ware (Addison Wesley) Pearson Education.
2. Perl by Example, E.Quigley, Pearson Education.
3. Programming Perl, Larry Wall T.Christiansen and J.Orwant, O‟Reilly, SPD.
4. Tcl and the Tk Toolkit, Ousterhout, Pearson Education.
5. Pearl Power, J.P. Flynt, Cengage Learning.

VII Sem	Deep Learning **(Elective – IV)**	Course Code: VI8CST34	L	T	P	C
			3	0	0	3

Syllabus Details

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

CO1: Explain the basics of machine learning. **(K2)**
CO2: Demonstrate the working of an artificial neural network. **(K2)**
CO3: Identify various parameters and issues while training a deep neural network. **(K2)**
CO4: Explain the working of convolution neural networks. **(K2)**
CO5: Explain the working of recurrent neural networks. **(K2)**
CO6: Recognize the ways of applying deep learning techniques for complex problem-solving. **(K2)**

UNIT I: Machine Learning Basics: Learning Algorithms, Capacity, Overfitting and Underfitting, Hyper parameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood Estimation, Bayesian Statistics, Supervised Learning Algorithms, Unsupervised Learning Algorithms, Stochastic Gradient Descent.

UNIT II: Introduction to Neural Networks: The Basic Architecture of Neural Networks- Single Computational Layer: The Perceptron, Multilayer Neural Networks; Training a Neural Network with Backpropagation, Practical Issues in Neural Network Training-The Problem of Overfitting, The Vanishing and Exploding Gradient Problems, Difficulties in Convergence, Local and Spurious Optima;

UNIT III: Training Deep Neural Networks: Introduction, Backpropagation: Backpropagation with the Computational Graph Abstraction, Dynamic Programming to the Rescue, Backpropagation with Post-Activation Variables and Pre-activation Variables, Setup and Initialization Issues, The Vanishing and Exploding Gradient Problems, Parameter-Specific Learning Rates- AdaGrad, RMSProp, AdaDelta, Adam.

UNIT IV: Convolutional Neural Networks: Introduction, The Basic Structure of a Convolutional Network- Padding, Strides, Typical Settings, The ReLU Layer, Pooling, Fully Connected Layers, The Interleaving Between Layers, Local Response Normalization, Hierarchical Feature Engineering; Training a Convolutional Network- Backpropagating Through Convolutions.

UNIT V: Recurrent Neural Networks: Introduction, The Architecture of Recurrent Neural Networks- Language Modeling Example of RNN, Backpropagation Through Time, Bidirectional Recurrent Networks, Multilayer Recurrent Networks; Long Short-Term Memory (LSTM), Gated Recurrent Units (GRUs).

UNIT VI: Applications Deep Learning: Applications of Convolutional Networks: Content-Based Image Retrieval, Object Localization, Object Detection, Natural Language and Sequence Learning; Application of Recurrent Neural Networks: Application to Automatic Image Captioning, Time-Series Forecasting and Prediction, End-to-End Speech Recognition, Handwriting Recognition.

Text Books:

1. Deep Learning, Ian Goodfellow, Ian Goodfellow, and Aaron Courville, MIT Press.
2. Neural Networks and Deep Learning, Charu C. Aggarwal, Springer.

Reference Books:

1. Neural Networks: A Systematic Introduction, Raúl Rojas, Springer.
2. Introduction to Deep Learning, Eugene Charniak, MIT Press.

VII Sem	Social Networks and semantic web (**Elective – IV)**	Course Code: VI8CST35	L	T	P	C
			3	0	0	3

Syllabus Details

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

CO1: Demonstrate knowledge by explaining the three different "named" generations of the web. **(K3)**
CO2: Construct a social network. **(K3)**
CO3: Relate knowledge representation methods for semantic web. **(K3)**
CO4: Explain the key aspects of Web Architecture. **(K2)**
CO5: Describe web services and its Applications. **(K2)**
CO6: Develop "Linked Data" Applications using Semantic Web Technologies. **(K3)**

UNIT-I: The Semantic web: Limitations of the current Web, The semantic solution, Development of the Semantic Web, The emergence of the social web.

UNIT-II: Social Network Analysis: What is network analysis? Development of Social Network Analysis, Key concepts and measures in network analysis. Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities, Web-based networks.

UNIT-III: Knowledge Representation on the Semantic Web: Ontologies and their role in the Semantic Web, Ontology languages for the semantic Web.

UNIT-IV: Modeling and Aggregating Social Network Data: State of the art in network data representation, Ontological representation of Social individuals, Ontological representation of social relationships, Aggregating and reasoning with social network data.

UNIT-V: Developing social semantic applications: Building Semantic Web applications with social network features, Flink- the social networks of the Semantic Web community, Open academia: distributed, semantic-based publication management.

UNIT-VI: Evaluation of Web-Based Social Network Extraction: Differences between survey methods and electronic data extraction, context of the empirical study, Data collection, Preparing the data, optimizing goodness of fit, Comparison across methods and networks, Predicting the goodness of fit, Evaluation through analysis.

Text Books:

1. Social Networks and the Semantic Web, PeterMika, Springer,2007.
2. Semantic Web Technologies, Trends and Research in Ontology basedsystems, J.Davies,RudiStuder,PaulWarren,JohnWiley&Sons.

Reference Books:

1. Semantic Web and Semantic Web Services –Liyang Lu Chapman and Hall/CRC Publishers, (Taylor & Francis Group)
2. Information Sharing on the semantic Web – Heiner Stuckenschmidt; Frank Van Harmelen, Springer Publications

VII Sem	Advanced Java and Web Technologies Lab	Course Code: VI8CSL10	L	T	P	C
			0	0	2	1

Syllabus Details

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

CO1: Develop static web pages using HTML, CSS. **(K3)**
CO2: Demonstrate the concepts of JavaScript, DHTML & XML **(K3)**
CO3: Develop Web Applications using JSP. **(K3)**
CO4: Develop dynamic Web Applications using PHP & MySQL. **(K3)**

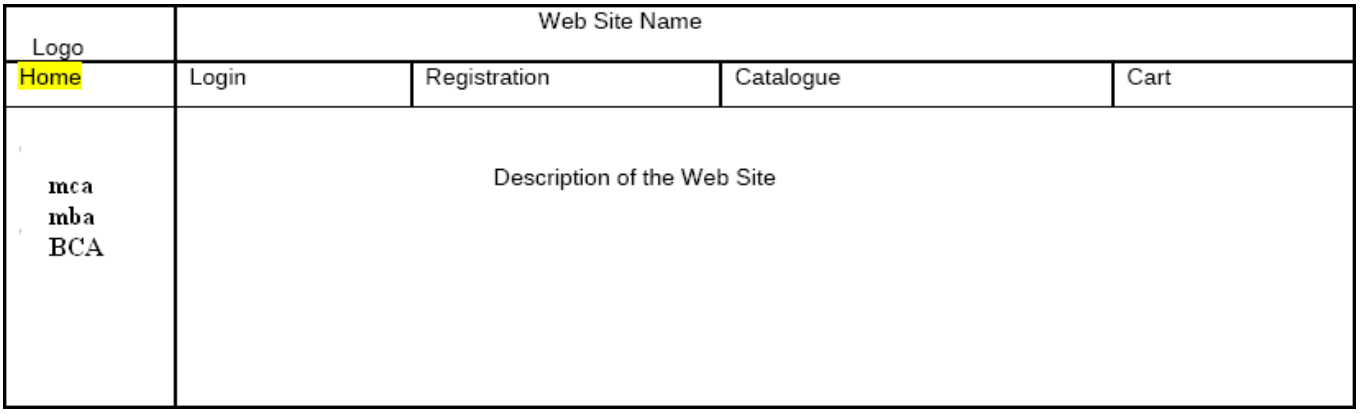
List of Experiments

1) Design the following static web pages required for an online book store web site:

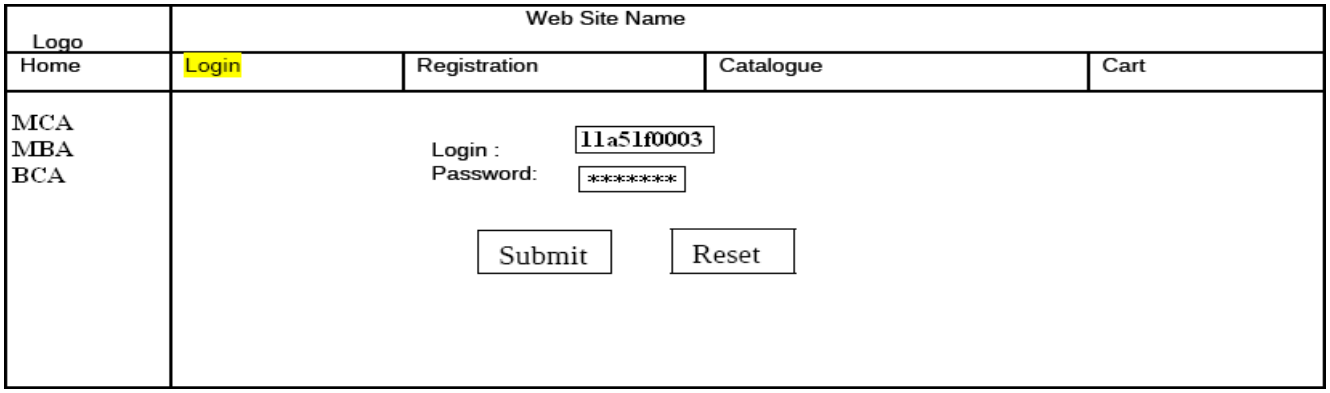
(a) HOME PAGE:

The static home page must contain three **frames**.

Top frame: Logo and the college name and links to Home page, Login page, Registration page, Catalogue page and Cart page (the description of these pages will be given below). Left frame: At least four links for navigation, which will display the catalogue of respective links. For e.g.: When you click the link **"MCA"** the catalogue for MCA Books should be displayed in the Right frame. Right frame: The *pages to the links in the left frame must be loaded here*. Initially this page contains description of the web site



(b) LOGIN PAGE:

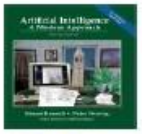


(c) CATOLOGUE PAGE:

The catalogue page should contain the details of all the books available in the web site in a table: The details should contain the following:

1. Snap shot of Cover Page.

2. Author Name.
3. Publisher.
4. Price.
5. Add to cart button.

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
MCA MBA		Book : XML Bible Author : Winston Publication : Wiely	$ 40.5	Add to cart
BCA		Book : AI Author : S.Russel Publication : Princeton hall	$ 63	Add to cart
		Book : Java 2 Author : Watson Publication : BPB publications	$ 35.5	Add to cart
		Book : HTML in 24 hours Author : Sam Peter Publication : Sam	$ 50	Add to cart

(d). **REGISTRATION PAGE:**
Create a "*registration form* "with the following fields
1) Name (Text field)
2) Password (password field)
3) E-mail id (text field)
4) Phone number (text field)
5) Sex (radio button)
6) Date of birth (3 select boxes) 7) Languages known (check boxes – English, Telugu, Hindi, Tamil)

2) Design a web page using **CSS (C**ascading **S**tyle **S**heets**)** which includes the following: Use different font, styles:
In the style definition you define how each selector should work (font, color etc.).

3) Design a login page and Make use of Events to perform validation using JavaScript.

4) Demonstrate a JavaScript program to perform On Mouse over event.

5) Demonstrate the concept of Mouse events (Ex:ng-click) with the help of Angular JS.

6) Design a simple Angular JS form.

7) Write an XML file which will display the Book information which includes the following:
1) Title of the book
2) Author Name
3) ISBN number
4) Publisher name
5) Edition
6) Price

a) Write a Document Type Definition (DTD) to validate the above XML file.
b) Write a XML Schema Definition (XSD)

8) Create a simple JSP to print the current Date and Time.

9)Create JSP to insert the details of 3 or 4 users using a registration form store these values in the data base and then check the authentication of the user by entering the name and password using a login form.
10) Assume four users user1, user2, user3 and user4 having the passwords pwd1, pwd2, pwd3 and pwd4 respectively. Write a PHP for doing the following.
A)
1. Create a Cookie and add these four user id‟s and passwords to this Cookie.
2. Read the user id and passwords entered in the Login form (week1) and authenticate with the values (user id and passwords) available in the cookies.
If he is a valid user (i.e., user-name and password match) you should welcome him by name (user-name) else you should display "You are not an authenticated user ‟".
B) Use init-parameters to do the same.

11) Create a table which should contain at least the following fields: name, password, email id, phone number (these should hold the data from the registration form).
Write a PHP program to connect to that database and extract data from the tables and display them. Experiment with various SQL queries. Insert the details of the users who register with the web site, whenever a new user clicks the submit button in the registration page.

12) Insert the details of the 3 or 4 users who register with the web site by using registration form. Authenticate the user when he submits the login form using the user name and password from the database.

Reference Books:
1. Web Technologies: HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, Dream Tech.
2. An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage Learning
3. Web Technologies, 1st Edition 7th impression, Uttam K Roy, Oxford, 2012.

VIII Sem	Software Project Management (**Elective – V**)	Course Code: VI8CST36	L	T	P	C
			3	0	0	3

Syllabus Details

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

CO1: Describe Software Project Management Terminology. **(K2)**
CO2: Explain various Software development process Models and software Life cycle phases. **(K2)**
CO3: Illustrate various Effort Estimation Techniques and activity network models for Software Project Planning. **(K3)**
CO4: Demonstrate Risk Management Concepts and resource allocation. **(K3)**
CO5: Explain the importance of Project monitoring and control for accomplishing project goals. **(K2)**
CO6: Describe Software Quality models. **(K2)**

UNIT I: Introduction to Software Project Management: Software Project versus other types of projects, Activities covered by Software Project Management, Categorizing projects ,Stakeholders, Objectives& goals, what is management. **Project Planning:** Step-wise planning, Identify Project Scope and objectives, Infrastructure, Project Products &deliverables, Project activities, Effort estimation.

UNIT II: Project Approach: Build or buy, **process models**: waterfall model, Prototyping, Incremental delivery model, **Agile methods**: Extreme Programming, Atern method, selecting an appropriate process model. **Lifecycle phases:** Engineering and Production stages, Inception, Elaboration, Construction, Transition phases.

UNIT III: Software effort estimation and Activity planning: Overview of Effort Estimation techniques, Function Point analysis, COCOMO. **Activity planning:** Objectives, Network planning models, forward pass and backward pass, Identify Critical path and activities.

UNIT IV: Risk Management and Resource Allocation: Introduction, Risk and its categories, Identification, Assessment, Risk Planning and management, applying PERT technique. Resource Allocation: Types of Resources, Identifying resource requirements, Resource scheduling.

UNIT V: Project Monitoring and Control: Creating framework for monitoring& control, Collecting Data, Visualizing Progress, Cost monitoring, Earned value Analysis.

UNIT VI: Software Quality: Defining Quality, Importance of quality, ISO 9126, Product Quality Vs Process Quality management. **Process Capability Models:** Capability Maturity Model, Enhancing software Quality.

Text Books:

1. Software Project Management, Bob Hughes & Mike Cotterell, 6th edition, TATA Mcgraw-Hill
2. Software Project Management, Walker Royce 2nd edition, Pearson Education.

.

Reference Books:

1. Software Project Management in practice, Pankaj Jalote, 9th edition, Pearson Education.
2. Software Project Management, Joel Henry, 3rd edition, Pearson Education.

VIII Sem	Big Data Analytics (**Elective – V**)	Course Code: VI8CST37	L	T	P	C
			3	0	0	3

Syllabus Details

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

CO1: Discuss the challenges of Big Data using Hadoop. **(K2)**
CO2: Interpret Hadoop's architecture and core components of Hadoop Distributed File System. **(K2)**
CO3: Apply data modelling techniques to large data sets using map reduce programs. **(K3)**
CO4: Describe the Hadoop I/O classes. **(K2)**
CO5: Examine the use of Pig Framework to work with big data. **(K3)**
CO6: Develop a data analytical system using HIVE. **(K3)**

UNIT I: Introduction to Big Data: What is Big Data, Why Big Data is Important, Data Storage and Analysis, Comparison with other systems, Grid Computing. **Introduction to Hadoop:** A brief history of Hadoop, Meet Hadoop Data, Apache Hadoop and the Hadoop Ecosystem.

UNIT II: Working with Big Data & HDFS: Google File System, Hadoop Distributed File System (HDFS) –Building blocks of Hadoop (Namenode, Datanode, Secondary Namenode, JobTracker, and TaskTracker). **Introducing and Configuring Hadoop cluster:** Local distributed mode, Pseudo-distributed mode, Fully Distributed mode, Configuring XML files.

UNIT III: Writing Map Reduce Programs: A Weather Dataset –Data Format, Analyzing Data with UNIX Tools, Analyzing the Data with Hadoop-Map Reduce. **Basic programs of Hadoop Map Reduce:** Driver code,Mapper code, Reducer code, RecordReader, Combiner functions. Map Reduce Types, Input Formatclass Hierarchy, other map reduce examples (word count).

UNIT IV: Hadoop I/O: The Writable Interface, Writable Comparable and Comparators. **Writable Classes:** Writable wrappers for Java primitives, Text & Bytes Writable, NullWritable, ObjectWritable and Generic Writable, Writable collections. **Implementing a Custom Writable:** Implementing a Raw Comparator for speed, Custom comparators

UNIT V: Pig - Hadoop Programming Made Easier: Admiring the Pig Architecture, Going with the Pig Latin Application Flow, Working through the ABCs of Pig Latin, Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin.

UNIT VI: Applying Structure to Hadoop Data with Hive: Saying Hello to Hive, Seeing How the Hive is Put Together, Getting Started with Apache Hive, Examining the Hive Clients, Working with Hive Data Types, Creating and Managing Databases and Tables, Seeing How the Hive Data Manipulation Language Works, Querying and Analyzing Data.

Text Books:

1. Hadoop: The Definitive Guide, Tom White, O,,Reilly, 3rd Edition, 2012.
2. Hadoop in Action, Chuck Lam, MANNING Publ., 2016.
3. Hadoop for Dummies, Dirk deRoos, Paul C.Zikopoulos, Roman B.Melnyk, Bruce Brown, Rafael Coss, 2014.

.

Reference Books:

1. Hadoop in Practice, Alex Holmes, MANNING Publ., 2014.
2. Hadoop Map Reduce Cookbook, Srinath Perera, Thilina Gunarathne, PACKT, 2013.

VIII Sem	Soft Computing (**Elective – V**)	Course Code: VI8CST38	L	T	P	C
			3	0	0	3

Syllabus Details

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

CO1: Discuss about Soft Computing, Requirements and Applications of Soft Computing. **(K2)**
CO2: Discuss about various Supervised and Unsupervised Learning Networks. **(K2)**
CO3: Illustrate various Fuzzy Logic, Fuzzy Sets, Crisp sets, Fuzzification and De-fuzzification Principles. **(K2)**
CO4: Discuss about Fuzzy Arithmetic and Fuzzy measures. **(K2)**
CO5: Discuss about Genetic Algorithms and its Operators. **(K2)**
CO6: Discuss about Various Hybrid Soft Computing Techniques. (**K2)**

UNIT I: Introduction: What is Soft Computing? Difference between Hard and Soft computing, Requirements of Soft computing, Major Areas of Soft Computing, Applications of Soft Computing.

UNIT II: Associative Memory Networks: (Supervised Learning): Introduction, Training Algorithms for Pattern Association, Auto-associative Memory Network, Hetero-associative Memory Network, Bidirectional Associative Memory (BAM),Hopfield Networks, Iterative Auto-associative Memory Networks, Temporal Associative Memory Network. **Unsupervised Learning Networks:** Introduction, Fixed Weight Competitive Nets, Kohonen Self-Organizing Feature Maps, Learning Vector Quantization, Counter propagation Networks, Adaptive Resonance Theory Network.

UNIT III: Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets: Introduction to Fuzzy Logic, Classical Sets (Crisp Sets), Fuzzy Sets and Operations on Fuzzy sets- Compliment, Intersections, Unions. **Membership Function:** Introduction, Features of the Membership Functions, Fuzzification, Methods of Membership Value Assignments. **Defuzzification:** Introduction, Lambda-Cuts for Fuzzy Sets (Alpha-Cuts), Lambda-Cuts for Fuzzy Relations, Defuzzification Methods

UNIT IV: Fuzzy Arithmetic and Fuzzy Measures: Introduction, Fuzzy Arithmetic, Extension Principle, Fuzzy Measures, Measures of Fuzziness, Fuzzy Integrals.

UNIT V: Genetic Algorithm: Introduction to genetic algorithm, operators in genetic algorithm, stopping condition for genetic algorithm flow.

UNIT VI: Hybrid Soft Computing Techniques: Introduction, Neuro-Fuzzy Hybrid Systems, Genetic Neuro-Hybrid Systems.

Text Books:

1. Principles of Soft Computing, S.N. Sivanandam and S.N. Deepa, 3-edition, Wiley India, 2007.
2. "Fuzzy Sets & Fuzzy Logic", G.J. Klir & B. Yuan, PHI, 1995.
3. "An Introduction to Genetic Algorithm", Melanie Mitchell, PHI, 1998.

Reference Books:

1. Neural Networks, Fuzzy Logic and Genetic Algorithms, S. Rajasekaran and G.A.V.Pai, PHI, 2003.
2. Fuzzy Logic with Engineering Applications, Timothy J.Ross, McGraw-Hill, 1997.
3. Neuro-Fuzzy and Soft Computing, J.S.R.Jang, C.T.Sun and E.Mizutani, PHI, 2004, Pearson Education.

VIII Sem	Cloud Computing (**Elective – V**)	Course Code: VI8CST39	L	T	P	C
			3	0	0	3

Syllabus Details

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

CO1: Outline the concepts of cloud computing architecture. **(K2)**
CO2: Describe the Virtualization concepts in different scenarios. **(K2)**
CO3: Explain the best policies for cloud deployment. **(K2)**
CO4: Illustrate the design issues of Cloud computing. **(K2)**
CO5: Illustrate the security and privacy of the data in cloud computing. **(K2)**
CO6: Demonstrate cloud instances in Amazon Web Services. **(K3)**

UNIT I: Introduction to Cloud Computing: Trends in Computing - Distributed Computing, Grid Computing, Cluster Computing, Utility Computing, Cloud Computing, Definition of Cloud Computing, Characteristics, Service Models, Deployment Models, Cloud Service Models Providers, Advantages and Disadvantages of Cloud Computing, Cloud-based Services &Applications.

UNIT II: Cloud Concepts & Technologies: Virtualization and its types, Software Defined Networking, Network Function Virtualization (NFV). **Cloud Services:** Compute Services, Storage Services, Database Services, Application Services

UNIT III: Cloud Application Design: Design Considerations for Cloud Applications, Reference Architectures for Cloud Applications, Cloud Application Design Methodologies: SOA, Cloud Component Model and MVC, Data Storage Approaches.

UNIT IV: Cloud Security: Cloud Security Architecture (CSA), Authentication, Authorization, Identity & Access Management, Data Security, Key Management.

UNIT V: Migrating into a Cloud: Broad Approaches to Migrating into the Cloud, The Seven-Step Model of Migration into a Cloud, Migration Risks and mitigation, Phases of Migrating to Cloud, benefits and risks of Migrating to Cloud.

UNIT VI: SLA Management in Cloud Computing: Service Level Agreements (SLA), Considerations for SLA, SLA Requirements, Types of SLA, Life Cycle of SLA, SLA Management in Cloud. **Case Study:** Amazon AWS: EC2, Amazon Simple DB, Amazon S3, Amazon Cloud Front and Amazon SQS.

Text Books:

1. Cloud Computing: A Hands-on Approach, ArshdeepBahga, Vijay Madisetti,Universities Press.
2. Cloud Computing: Principles and Paradigms, Rajkumar Buyya, James Broberg, Andrzej Goscinski, Wiley Publication.

Reference Books:

1. Cloud Computing – Web-Based Applications That Change the way you Work and Collaborate Online, Michael Miller, Pearson Education.
2. Cloud Computing: A Practical Approach, Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, McGraw-Hill, (2010).

VIII Sem	Software Architecture & Design Patterns (**Elective – VI)**	Course Code: VI8CST40	L	T	P	C
			3	0	0	3

Syllabus Details

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

CO1: Describe Architectural Structures and Quality Attributes. (K2)
CO2: Explain the mechanism of Evaluating Architecture. (K2)
CO3: Demonstrate Creational Patterns. (K3)
CO4: Construct Structural Patterns for a given Scenario. (K3)
CO5. Construct Behavioural Patterns for a given Scenario. (K3)
CO6. Examine various Case Studies in utilizing Software Architectures. (K3)

UNIT-I: Envisioning Architecture The Architecture Business Cycle, What is Software Architecture, Architectural patterns, reference models, reference architectures, architectural structures and views. Creating and Architecture Quality Attributes, Achieving qualities, Designing the Architecture.

UNIT-II: Analyzing Architectures Architecture Evaluation, Architecture design decision making, ATAM, CBAM. Software Product Lines, Software architecture in future.

UNIT-III: Pattern Description, role in solving design problems, Selection and usage.**Creational Patterns**: Abstract factory, Builder, Factory method, Prototype, Singleton.

UNIT-IV: Structural Patterns: Adapter, Bridge, Composite, Decorator, Façade, Flyweight, PROXY.

UNIT-V: Behavioural Patterns: Chain of responsibility, command, Interpreter, iterator, mediator, memento, observer, state, strategy, template method, visitor.

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

Text Books:

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

Reference Books:

1. Beyond Software architecture, Luke Hohmann, Addison wesley, 2003.
2. Software architecture, David M. Dikel, David Kane and James R. Wilson, Prentice Hall PTR, 2001
3. Software Design, David Budgen, second edition, Pearson education, 2003
4. Head First Design patterns, Eric Freeman & Elisabeth Freeman, O‟REILLY, 2007.
5. Design Patterns in Java, Steven John Metsker & William C. Wake, Pearson education, 2006.

.

VIII Sem	Middleware Technologies (**Elective – VI)**	Course Code: VI8CST41	L	T	P	C
			3	0	0	3

Syllabus Details

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

CO1: Illustrate Middleware, E- Business, IT architecture, RPC, RDC. **(K2)**
CO2: Demonstrate Internet Applications and Web services. **(K2)**
CO3: Summarize Technical issues in Middleware. **(K2)**
CO4: Demonstrate the Use of Middleware in Building Distributed Technologies. **(K2)**
CO5: Identify Security Issues with Distributed Applications. **(K3)**
CO6: Apply Appropriate Middleware Technology to Develop Real Time Applications. **(K3)**

UNIT I: Introduction: Moving to e-business, what is IT architecture? Why is this different from what we did before? Rewrite or evolve?, Who develops the architecture?, Early days, Preliminaries, Remote procedure calls, Remote database access, Distributed transaction processing, Message queuing, Message queuing versus distributed transaction processing, what happened to all this technology.

UNIT II: Objects, Components and the Web: Using object middleware, Transactional component middleware- COM+, EJB, Final comments on TCM, Internet Applications. WEB SERVICES: Service concepts, Web services, and Using Web services: A pragmatic approach.

UNIT III: A Technical Summary Of Middleware: Middleware elements- The communications link, The middleware protocol, The programmatic interface, Data presentation, Server control, Naming and directory services, Security, System management, Comments on Web services, Vendor architectures- Vendor platform architectures, Vendor-distributed architectures, Using vendor architectures, Positioning, Strawman for user target architecture, Marketing, Implicit architectures, Middleware interoperability.

UNIT IV: Using Middleware to Build Distributed Applications: What is middleware for? -Support for business processes, Information retrieval, Collaboration, Tiers- The presentation tier, The processing tier, The data tier, Services versus tiers, Architectural choices - Middleware bus architectures, Hub architectures, Web services architectures, Loosely coupled versus tightly coupled.

UNIT V: Security: What security is needed, Traditional distributed system security, Web services security, Architecture and security. **Application Design and It's Architecture :** Problems with today"s design approaches, Design up front or as needed?- The role of business rules, Existing systems, Reuse, Silo and monolithic development, The role of architecture, Levels of design, Reconciling design approaches.

UNIT VI: Building an IT Architecture: Case Studies – Providing an integration infrastructure, creating a service-oriented architecture, Developing a new application. What does the future hold? , The key points to remember-Middleware technology alternatives, IT architecture guideline guidelines, Distribute systems technology principals and Distribute systems implementation design.

Text Books:

1. IT Architectures and Middleware: Strategies for Building Large, Integrated Systems, Chris Britton and Peter Eye, 2nd Edition, Pearson Education.

Reference Books:

1. Middleware for Communications, Qusay H. Mahmoud,1st Edition, John Wiley and Sons.
2. Middleware Networks: Concept, Design and Deployment of Internet Infrastructure, Michah Lerner, 1st Edition, Kluwer Academic Publishers.
3. Middleware and Enterprise Integration Technologies, G. Sudha Sadasivam and Radha Shankarmani, 1st edition, Wiley, 2009.

VIII Sem	Natural Language Processing (**Elective – VI)**	Course Code: VI8CST42	L	T	P	C
			3	0	0	3

Syllabus Details

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

CO1: Illustrate the Syntax and semantics and Language models of Natural Language Processors. **(K2)**
CO2: Classify Morphology and Finite State Transducers, Markov Models and Entropy Models. **(K2)**
CO3: Explain about Statistical parsing and probabilistic CFGs. **(K2)**
CO4: Demonstrate semantic analysis. **(K2)**
CO5: Explain Discourse Analysis and Lexical Resources. **(K2)**
CO6: DevelopaStatisticalMethodsforRealWorldApplicationsandexploredeeplearning-basedNLP. **(K3)**

UNIT I: Introduction: Natural Language Processing tasks in syntax,semantics,andpragmatics–Issues–Applications-Theroleofmachinelearning-ProbabilityBasics–Informationtheory–Collocations-N-gram Language Models - Estimating parameters and smoothing - Evaluating language models.

UNIT II: Morphology And Part Of Speech Tagging: Linguistic essentials - Lexical syntax-Morphology and Finite State Transducers - Part of speech Tagging - Rule-Based Part of Speech Tagging - Markov Models - Hidden Markov Models – Transformation based Models - Maximum Entropy Models. Conditional Random Fields.

UNIT III: Syntax Parsing: Syntax Parsing - Grammar formalisms and tree banks - Parsing with Context Free Grammars- Features and Unification-Statistical parsing and probabilisticCFGs(PCFGs)-LexicalizedPCFGs.

UNIT IV: Semantic Analysis: Representing Meaning – Semantic Analysis - Lexical semantics –Word-sense disambiguation- Supervised – Dictionary based and Unsupervised Approaches - Compositional semantics- Semantic Role Labeling and Semantic Parsing – Discourse Analysis.

UNIT V: Discourse Analysis and Lexical Resources: Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brills Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).

UNIT VI: NLP Applications: Named entity recognition and relation extraction- IE using sequence labeling-Machine Translation (MT) - Basic issues in MT-Statistical translation-word alignment- phrase-based translation – Question Answering.

Text Books:

1. Daniel Jurafsky and James H. Martin Speech and Language Processing (2nd Edition), Prentice Hall; 2nd edition,2008
2. FoundationsofStatisticalNaturalLanguageProcessingbyChristopherD.Manningand Hinrich Schuetze, MIT Press,1999
3. Steven Bird, Ewan Klein and Edward Loper Natural Language Processing with Python, O"Reilly Media; 1 edition,2009
4. Roland R. Hausser, Foundations of Computational Linguistics: Human-Computer Communication in Natural Language, Paperback, MIT Press,2011

References:

1. Pierre M. Nugues, An Introduction to Language Processing with Perl and Prolog: An Outline of Theories, Implementation, and Application with Special Consideration of English, French, and German (Cognitive Technologies) Softcover reprint,2010
2. James Allen, Natural Language Understanding, Addison Wesley; 2 edition 1994
NLTK – Natural Language Tool Kit -http://www.nltk.org/

VIII Sem	Cyber Security (**Elective – VI)**	Course Code: VI8CST43	L	T	P	C
			3	0	0	3

Syllabus Details

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

CO1: Describe about Cybercrimes. **(K2)**
CO2: Explain Cyber criminals and their attacks. **(K2)**
CO3: Illustrate Cybercrimes and security in mobile devices **(K2)**
CO4: Discuss about the Tools and methods used to overcome Cybercrimes. **(K2)**
CO5: Discuss about Cyber Laws and IT Acts. **(K2)**
CO6: Explain about Computer Forensics. **(K2)**

UNIT I: Introduction to Cybercrime: Introduction, Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security Who are Cybercriminals? , Classifications of Cybercrimes, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes, Cybercrime Era: Survival Mantra for the Netizens.

UNIT II: Cyber offenses: How Criminals Plan Them –Introduction, How Criminals Plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector Cloud Computing.

UNIT III: Cybercrime Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/CellPhones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

UNIT IV: Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks. **Phishing and Identity Theft:** Introduction, Phishing, Identity Theft (ID Theft).

UNIT V: Cybercrimes and Cyber security: The Legal Perspectives, Introduction, Why Do We Need Cyber laws: The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Amendments to the Indian IT Act,· Cybercrime and Punishment.

UNIT VI: Understanding Computer Forensics: Introduction, Historical Background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber forensics and Digital Evidence, Forensics Analysis of E-Mail, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics Investigation, Computer Forensics and Steganography, Relevance of the OSI 7 Layer Model to Computer Forensics, Forensics and Social Networking Sites: The Security/Privacy Threats, Computer Forensics from Compliance Perspective, Challenges in Computer Forensics, Special Tools and Techniques, Forensics Auditing, Anti-forensics.

Text Books:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, NinaGodbole, SunitBelapure, 1st edition, Wiley.

Reference Books:

1. Principles of Information Security, MichealE.Whitman and Herbert J.Mattord, 4th edition, Cengage Learning.
2. Information Security the complete reference, Mark Rhodes, Ousley, 2nd edition, MGH.

Annexure-III

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	**Project**	Mini Project with Seminar	0	0	4	2
10	V18ENT06		Professional Communication Skills -IV	4	0	0	MNC
11	V18CST63		Technical Skills-IV	4	0	0	MNC
			Total	**26**	**0**	**10**	**23**

Total Contact Hours: 36

S.No.	VII - Semester						
	Course Code		**Course**	**L**	**T**	**P**	**C**
1	V18CST27	PCC	Advanced Java and Web Technologies	3	0	0	3
2	V18MBET52	HSS	Management Science	3	0	0	3
3	**Elective – III**						
	V18CST28	PEC	1. Advanced Operating Systems	3	0	0	3
	V18CST29		2. Statistics with R Programming				
	V18CST30		3. Information Retrieval Systems				
	V18CST31		4 Human Computer Interaction				
4	**Elective – IV**						
	V18CST32	**PEC**	1.Distributed Systems	3	0	0	3
	V18CST33		2.Scripting Languages				
	V18CST34		3.Deep Learning				
	V18CST35		4.Social Networks and semantic web				
5	**Open Elective – II (Interdisciplinary)**	**OEC**	**OPE II(1-3)**	3	0	0	3
6	V18CSL10	PCC	Advanced Java and Web Technologies Lab	0	0	2	1
7	V18CSP01	**Project**	Project Work (Part-A)	0	0	10	5
Total				**15**	**0**	**13**	21

Total Contact Hours: 28

S.No.	VIII – Semester						
	Course Code		**Course**	**L**	**T**	**P**	**C**
1	**Elective – V**						
	V18CST36	PEC	1. Software Project Management	3	0	0	3
	V18CST37		2. Big Data Analytics				
	V18CST38		3. Soft Computing				
	V18CST39		4. Cloud Computing				
2	**Elective – VI**			3	0	0	3
	V18CST40	PEC	1. Software Architecture and Design Patterns				
	V18CST41		2. Middleware Technologies				
	V18CST42		3. Natural Language Processing				
	V18CST43		4. Cyber Security				
3	**Open Elective – III (Interdisciplinary)**	**OEC**	**OPE III(1-3)**	3	0	0	3
4	V18CSP02	**Project**	Project Work (Part-B)	0	0	12	6
Total				**9**	**0**	**12**	**15**

Total Contact Hours: 21

Annexure-IV

V Sem	**Database Management Systems**	Course Code: V18CST10	L	T	P	C
			3	0	0	3

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	**Computer Networks**	Course Code: V18CST11	L	T	P	C
			3	0	0	3

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	**Operating Systems**	Course Code: V18CST12	L	T	P	C
			3	0	0	3

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 Management Main 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	**Design and Analysis of Algorithms**	Course Code: V18CST13	L	T	P	C
			3	0	0	3

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	**Unix programming**	Course Code: V18CST14	L	T	P	C
			3	0	0	3

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: Develop basic programs using shell script (K3).
CO4: Demonstrate the grep family and data transforming programs sed, and awk (K2).
CO5: Construct programs for process system calls (K3).
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.

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 call.

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

Text Books:

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

References:

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

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

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	**Advanced Data Structures (Elective-I)**	Course Code: V18CST16	L	T	P	C
			3	0	0	3

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 ; 2nd 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	**Artificial Intelligence (Elective-I)**	Course Code: V18CST17	L	T	P	C
			3	0	0	3

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	**Computer Graphics (Elective-I)**	Course Code: V18CST18	L	T	P	C
			3	0	0	3

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. Computer Graphics, Schaum's outlines‖, Zhigand xiang,Roy Plastock, 2nd Edition,Tata Mc-Graw Hill.
3. Principles of Computer Graphics, S. Govil-Pai, 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.

.

V Sem	**Data Base Management System Lab**	Course Code: V18CSL06	L	T	P	C
			0	0	3	1.5

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: Apply projections and aggregation on collection of MongoDB database (K3).

List of Experiments

Part-A

1. Queries to facilitate acquaintance of Built-In Functions, String Functions, Numeric Functions, 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, and Locking Rows for Update, Creating Password and Security features PL/SQL.
10. Write a PL/SQL Code using Basic Variable, Anchored Declarations, and Usage of Assignment 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

Part-B

1. Install and start MongoDB
2. Create and drop database and collection
3. Insert,update ,delete,query document
4. Projection, limiting records, sorting records and aggregation in MongoDB

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.

V Sem	**Operating System and Unix Lab**	Course Code: V18CSL07	L	T	P	C
			0	0	3	1.5

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. (K3)
CO5: Experiment with the concept of shell scripting programs. (K3)
CO 6: Illustrate the process of how the parent and child relationships (K3)

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. Demonstration of GDB tool to understand process programme.
17. Design a C program to create a Zombie Process.
18. 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 Edition,Pearson education.

V Sem	**Technical Skills-III**	Course Code: V18CST62	L	T	P	C
			0	0	4	MNC

Syllabus Details

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

CO1: Apply fundamental data structures like List, Stack to solve real work problems in linear time i.e. O(n). (K3)
CO2: Make use of advanced data structures like queue, 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 linked list by comparing with Array List and develop programs to solve optimization Problems. (K4)
CO5: Experiment with types of Linked List to solve complex combinatorial problems. (K3)
CO6: Develop programs to solve complex problems by using combination of stack, Queue and List. (K3)

Data Structures

1. Problem solving using ArrayList
2. Problem solving using LinkedList
3. Problem solving using Stack
4. Problem solving using Queue
5. Problem solving using Searching
6. Problem solving using Sorting

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.

VI Sem	**Compiler Design**	Course Code: V18CST19	L	T	P	C
			3	0	0	3

Syllabus Details

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

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

VI Sem	**Data Mining**	Course Code: V18CST20	L	T	P	C
			3	0	0	3

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.
2. Data Mining and Analysis,Mohammed J Zaki, Wagner Meira JR, 1st Edition ,Cambridge University Press.

VI Sem	**Object Oriented Analysis and Design Through UML**	Course Code: V18CST21	L	T	P	C
			3	0	0	3

Syllabus Details

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

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.

VI Sem	**Cryptography and Network Security**	Course Code: V18CST22	L	T	P	C
			3	0	0	3

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 Email 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, Data Encryption Standard (DES), Block Cipher Design Principles, Advanced Encryption Standard (AES), Simplified AES, Multiple Encryption and Triple DES, Pseudorandom Number Generators, Pseudorandom Number Generation Using a Block Cipher, Stream Ciphers, RC4.

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, Digital Signature Standards, Authentication Protocols, Kerberos, Key Management and Distribution, X.509 Digital Certificate, NIST Digital Signature Algorithm.

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

Text Books:

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

Reference Books:

1. ―Network Security – PrivateCommunication in a Public World‖ Charlie Kaufman, Radia Perlman and Mike Speciner , Pearson/PHI.

VI Sem	**Software Testing Methodologies (Elective-II)**	Course Code: V18CST23	L	T	P	C
			3	0	0	3

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.

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.

VI Sem	**Principles of Programming Languages (Elective-II)**	Course Code: V18CST24	L	T	P	C
			3	0	0	3

Syllabus Details

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

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

References:

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

VI Sem	**Machine Learning (Elective-II)**	Course Code: V18CST25	L	T	P	C
			3	0	0	3

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 Multi Layer Perceptrons and Back Propagation (K2).
CO6: Demonstrate Dimensionality Reduction Techniques (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, Over fitting, Training, Testing, And Validation Sets. Some Basic Statistics: Averages Variance And Covariance, The Bias-Variance Tradeoff.

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

UNIT-III: Ensemble Learning : Boosting, Adaboost, Stumping, Bagging , Subbagging, Random Forests.

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

UNIT-V: The Multi Layer Perceptron(MLP): Going Forwards, Going Backwards(Back Propagation of Errors), The MLP in practice, Examples of using the MLP: Classification and Regression, Deriving Back-Propagation.

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

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, First Edition, 2012.
2. Machine Learning: Tom Mitchel, McGraw Hill Learning, 1997

VI Sem	**Image Processing (Elective-II)**	Course Code: V18CST26	L	T	P	C
			3	0	0	3

Syllabus Details

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

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

Reference Books:

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

VI Sem	**Object Oriented Analysis and Design Through UML Lab**	Course Code: V18CSL08	L	T	P	C
			0	0	3	1.5

Syllabus Details

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

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. Design Case study on Library Management System
9. Design Case Study on Hospital Management System
10. Case study-Railway Reservation System
11. Design Case study on Library Management System using C4 Model.

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.
4. (https://c4model.com/)

VI Sem	**Data Mining Lab**	Course Code: V18CSL09	L	T	P	C
			0	0	3	1.5

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.

VI Sem	**Technical Skills-IV**	Course Code: V18CST63	L	T	P	C
			0	0	4	MNC

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 StringBuffer and StringBuilder to solve problems in linear and logarithmic time. (K3)
CO5: Experiment with Object Oriented concepts toreduce complexity of problems.(K3)
CO6: Develop programs to solve robust programs by using Exception Handling. (K3)

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

Text Books:

1. Thinking on Java - O'Reilly.
2. Java Complete Reference.
3. Effective Java. Third Edition. Joshua Bloch .

VII Sem	**Advanced Java and Web Technologies**	Course Code: VI8CST27	L	T	P	C
			3	0	0	3

Syllabus Details

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

CO1: Illustrate the basic concepts of HTML and CSS (K2)
CO2: Develop dynamic webpages and validate with java Script. (K3)
CO3: Illustrate the basic concepts of NODE JS and Angular. (K2)
CO4: Illustrate Extensible markup language & AJAX (K2)
CO5: Build database driven web applications using JSP (K3)
CO6: Develop web applications using PHP and MySQL (K3)

UNIT-I :HTML: Basic Syntax, Standard HTML Document Structure, Basic Text Markup, Images, Hypertext Links, Lists, Tables, Frames Forms.**CSS:** Cascading style sheets, Levels of Style Sheets, Style Specification Formats, Selector Forms, Property value forms, Font Properties, List Properties, color, Alignment of Text.

UNIT-II: JavaScript: Overview of JavaScript, General Syntactic Characteristics, Primitives Operations and Expressions, Screen output and Keyboard Input, Control Statements, Object creation and Modification, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions, Events and Event Handling. **DHTML:** Positioning Moving and Changing Elements.

UNIT-III: Fundamentals of NODE JS and Angular : Understanding Node.js, Installing Node.js, Working with Node Packages, Creating a Node.js Application, Understanding Angular, Modules, Directives, Data Binding, Dependency Injection, Services, Separation of Responsibilities, Creating a Basic Angular Application.

UNIT-IV: Working with XML: Introduction, The syntax of XML,XML Document Structure, Document type Definition (DTD), Namespaces, XML schemas, XSLT, XML Processors - DOM and SAX. **AJAX A New Approach**: Overview of AJAX, Basics of AJAX.

UNIT-V: Introduction to Servlets & JSP: Introduction to servlets, Life cycle of Servlet, Limitations of servlets, Java Server Pages: JSP Overview, Components of a JSP Page: Directives, comments, Expressions, Scriptlets , Declarations, implicit objects, Database Access, session tracking.

UNIT-VI: PHP Programming: Overview of PHP, General syntactic characteristics, Primitives, operations, Expressions, Output, Control statements, Arrays, Functions, Pattern Matching, Form Handling, Cookies, Session Tracking. PHP with MySQL connectivity. Integrating PHP and AJAX.

Text Books:

1. Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson, 2013.
2. Node.js, MongoDB and Angular Web Development, 2nd Edition,Brad Dayley Brendan Dayley Caleb Dayley,Pearson Education,2018
3. JSP:The Complete reference,Phil Hanna,The McGraw-Hill Copanies,2001

Reference Books:

1. Web Technologies: HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, Dream Tech.
2. An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage Learning
3. Web Technologies, 1st Edition 7th impression, Uttam K Roy, Oxford, 2012.

VII Sem	Advanced Operating Systems (**Elective – III)**	Course Code: VI8CST28	L	T	P	C
			3	0	0	3

Syllabus Details

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

CO1: Describe Architectures of Distributed Systems and Distributed Mutual Exclusion. **(K2)**
CO2: Illustrate the concepts of Deadlock Handling Strategies in Distributed Systems. **(K3)**
CO3: Explain the various Resource Management Techniques for Distributed Systems. **(K2)**
CO4: Discuss Fault Tolerance and Fault Recovery concepts in Distributed Systems . **(K2)**
CO5: Interpret the concepts of Cryptography and Data Security in Distributed Systems. **(K3)**
CO6: Describe Multiprocessor Operating System, Process Synchronization, Scheduling. **(K2)**

UNIT I: Architectures of Distributed Systems –System Architecture types - issues in distributed operating systems - communication networks - communication primitives. Distributed Mutual Exclusion - introduction - the classification of mutual exclusion and associated algorithms

UNIT II: Distributed Deadlock Detection -Introduction - deadlock handling strategies in distributed systems - issues in deadlock detection and resolution - control organizations for distributed deadlock detection - centralized and distributed deadlock detection algorithms -hierarchical deadlock detection algorithms.

UNIT III: Distributed Resource Management- Algorithms for implementing DSM - memory coherence and protocols - design issues. Distributed Scheduling - introduction - issues in load distributing - components of a load distributing algorithm - stability - load distributing algorithm – performance comparison - selecting a suitable load sharing algorithm - requirements for load distributing.

UNIT IV: Failure Recovery and Fault tolerance: Introduction- basic concepts - classification of failures - backward and forward error recovery, backward error recovery- recovery in concurrent systems - consistent set of check points - synchronous and asynchronous check pointing and recovery - check pointing for distributed database systems- recovery in replicated distributed databases.

UNIT V: Protection and Security - Preliminaries, the access matrix model and its implementations.- safety in matrix model, advanced models of protection. Data security - cryptography: Model of cryptography, conventional cryptography- modern cryptography, multipleencryptions - authentication in distributed systems.

UNIT VI: Multiprocessor Operating Systems - Basic multiprocessor system architectures - inter connection networks for multiprocessor systems .Multiprocessor Operating System - structures of multiprocessor operating system, operating system design issues- threads- process synchronization and scheduling.

TEXT BOOKS:

1. Advanced Concepts in Operating Systems: Distributed, Database and Multiprocessor Operating Systems, MukeshSinghal, NiranjanG.Shivaratri,TMH, 2001.
2. Distributed Operating System-Concepts and Design,PradeepK.Sinha ,PHI, 2003.

REFERENCE BOOKS:

1. Modern operating system, Andrew S.Tanenbaum, PHI, 2003
2. Distributed operating system,Andrew S.Tanenbaum,Pearson education, 2003.
3. Operating System Concepts, Abraham Silberschatz; Peter Baer Galvin; Greg Gagne, Seventh Edition, John Wiley & Sons, 2004.

VII Sem	Statistics with R Programming **(Elective – III)**	Course Code: VI8CST29	L	T	P	C
			3	0	0	3

Syllabus Details

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

CO1: Illustrate different data structures in R. **(K2)**
CO2: Demonstrate about control statements and functions in R. **(K3)**
CO3: Compute different mathematical operations using R pre defined functions. **(K3)**
CO4: Construct and edit visualizations with R. **(K3)**
CO5: Identify appropriate statistical tests using R. **(K2)**
CO6: Examine linear and non linear models to create testable hypotheses. **(K3)**

UNIT I: Introduction and Data Structures: Introduction, How to install and run R, R Sessions, Functions, Basic Math, constants, Variables, Expressions, Reserved words in R, Arithmetic, and Boolean Operators and values, Data Types, Vectors, Advanced Data Structures: Data Frames, Lists, Matrices, Arrays, Classes.

UNIT II: Control Statements and Functions in R: R Programming Structures, Control Statements, Loops, – Looping Over Nonvector Sets,- If-Else, Default Values for Argument, return values, Deciding Whether to explicitly call return- returning Complex Objects, Functions are Objects, No Pointers in R, Recursion, A Quick sort Implementation- Extended Example: A Binary Search Tree.

UNIT III: Math and Simulation and Input/output in R: Doing Math and Simulation in R, Math Function, Extended Example Calculating Probability Cumulative Sums and Products-Minima and Maxima- Calculus, Functions for Statistical Distribution, Sorting, Linear Algebra, Operations on Vectors and Matrices, Extended Example: Vector cross Product, Set Operations. **Input /output:** Accessing the Keyboard and Monitor, Reading and writing Files

UNIT IV: Graphics: Graphics, Creating Graphs, The Workhorse of R Base Graphics, the plot() Function ,Customizing Graphs, Saving Graphs to Files.

UNIT V: Probability Distributions and Basic Statistics: Probability Distributions, Normal Distribution- Binomial Distribution- Poisson Distributions Other Distribution, Basic Statistics, Correlation and Covariance, T-Tests,-ANOVA.

UNIT VI: Linear Models in R: Linear Models, Simple Linear Regression, -Multiple Regression Generalized Linear Models, Logistic Regression, - Poisson Regression, Nonlinear Models, Splines-Decision- Random Forests.

TEXT BOOKS:

1. R for Everyone, Lander, Pearson, 2nd edition 2018.
2. The Art of R Programming, Norman Matloff, Cengage Learning, 2nd edition, 2017.

REFERENCE BOOKS:

1. R Cookbook, PaulTeetor, Oreilly, 2nd edition, 2017.
2. R in Action, Rob Kabacoff, Manning, 3rd edition, 2019.

VII Sem	Information Retrieval Systems (**Elective – III)**	Course Code: VI8CST30	L	T	P	C
			3	0	0	3

Syllabus Details

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

CO1: Identify the basic concepts of information retrieval. **(K2)**
CO2: Describe the Capabilities of IRS, cataloging and indexing. **(K2)**
CO3: Explain the data structures and retrieving documents. **(K2)**
CO4: Describe the difficulty of representing and retrieving documents. **(K2)**
CO5: Explain the latest technologies for describing and searching the web. **(K2)**
CO6: Illustrate searching procedure for user-text and Information System Evaluation. **(K2)**

UNIT I: Introduction: Definition, Objectives, Functional Overview, Relationship to DBMS, Digital libraries and Data Warehouses.

UNIT II: Information Retrieval System Capabilities: Search, Browse, Miscellaneous **Cataloging and Indexing:** Objectives, Indexing Process, Automatic Indexing, Information Extraction.

UNIT III: Data Structures: Introduction, Stemming Algorithms, Inverted file structures, N-gram data structure, PAT data structure, Signature file structure, Hypertext data structure.

UNIT IV: Automatic Indexing: Classes of automatic indexing, Statistical indexing, Natural language, Concept indexing, Hypertext linkages. **Document and Term Clustering:** Introduction, Thesaurus generation, Item clustering, Hierarchy of clusters.

UNIT V: User Search Techniques: Search statements and binding, Similarity measures and ranking, Relevance feedback, Selective dissemination of information search, weighted searches of Boolean systems, Searching the Internet and hypertext. **Information Visualization:** Introduction, Cognition and perception, Information visualization technologies.

UNIT VI: Text Search Algorithms: Introduction, Software text search algorithms, Hardware text search systems. **Information System Evaluation:** Introduction, Measures used in system evaluation, Measurement example – TREC results.

Text Books:

1. Information Storage and Retrieval System: Theory and Implementation, Gerald J. Kowalski, Mark T. Maybury, 2nd edition, 2002, Kluwer Academic Press.

Reference Books:

1. Information Retrieval Data Structures and Algorithms, Frakes, W.B., Ricardo Baeza-Yates Prentice Hall.
2. Information Storage & Retrieval by Robert Korfhage – John Wiley & Sons, Wiley computer publisher, 1997.

VII Sem	Human Computer Interaction **(Elective – III)**	Course Code: VI8CST31	L	T	P	C
			3	0	0	3

Syllabus Details

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

CO1: Describe the principles and characteristics of GUI. **(K2)**
CO2: Recognize how a computer system may be modified to include human diversity. **(K2)**
CO3: Select an effective style for a specific application. **(K2)**
CO4: Discuss Screen Designing mock-ups and carry out user and expert evaluation of interfaces. **(K2)**
CO5: Explain System Menus & Navigation Schemes. **(K2)**
CO6: Discuss Device and Screen based controls. **(K2)**

UNIT I: The User Interface: Introduction, Importance of the User Interface, Importance and benefits of Good Design History of Human Computer Interface. Characteristics of Graphical and Web User Interface: Graphical User Interface, popularity of graphics, concepts of Direct Manipulation, Graphical System advantage and disadvantage, Characteristics of GUI. Web User Interface, popularity of web, Characteristics of Web Interface, Merging of Graphical Business systems& the Web, Principles of User Interface Design.

UNIT II: The User Interface Design Process: Obstacles and Pitfall in the development Process, Usability, The Design Team, Human Interaction with Computers, Important Human Characteristics in Design, Human Consideration in Design, Human Interaction Speeds, Performance versus Preference, Methods for Gaining and Understanding of Users.

UNIT III: Understanding Business Functions: Business Definitions & Requirement analysis, Determining Business Functions, Design standards or Style Guides, System Training and Documentation.

UNIT IV: Principles of Good Screen Design: Human considerations in screen Design, interface design goals, test for a good design, screen meaning and purpose, Technological considerations in Interface Design.

UNIT V: System Menus and Navigation Schemes: Structure, Functions, Context, Formatting, Phrasing and Selecting, Navigating of Menus, Kinds of Graphical Menus Windows Interface: Windows characteristic, Components of Window, Windows Presentation Styles, Types of Windows, Window Management, Websystems

UNIT VI: Device and Screen-Based Control: Device based controls, Operable Controls, Text entry/read-Only Controls, Section Controls, Combining Entry/Selection Controls, Other Operable Controls and Presentation Controls, Selecting proper controls

Text Books:

1. ―The Essential Guide to User Interface Design‖, Wilbert O. Galitz, 2nd edition,2002,Wiley India Edition.
2. Prece, Rogers, ―Sharps Interaction Design‖, Wiley India.
3. ‖Designing the user interfaces‖. Ben Shneidermann 3rd Edition, Pearson Education Asia.

.**Reference Books:**

1. ―User Interface Design‖ , SorenLauesen, Pearson Education
2. ―Essentials of Interaction Design‖, Alan Cooper, Robert Riemann, David Cronin, Wiley
3. ‖HumanComputer Interaction‖, Alan Dix, Janet Fincay, GreGoryd, Abowd, Russell, Bealg, Pearson Education.

VII Sem	Distributed Systems **(Elective – IV)**	Course Code: VI8CST32	L	T	P	C
			3	0	0	3

Syllabus Details

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

CO1: Describe distributed system and desired properties of such systems. **(K2)**
CO2: Discuss the theoretical concepts, namely, virtual time and agreement. **(K2)**
CO3: Discuss the basic concepts of distributed systems and Characteristics of IPC protocols. **(K2)**
CO4: Explain the mechanisms such as Remote procedure call (RPC/RMI) and OSS . **(K2)**
CO5: Explain the mechanisms such as file systems and P2P algorithms. **(K2)**
CO6: Discuss the Transactions and Replications in distributed systems. **(K2)**

UNIT I: Characterization of Distributed Systems: Introduction, Examples of Distributed Systems, Resource Sharing and the Web, Challenges. **System Models:** Introduction, Architectural Models- Software Layers, System Architecture, Variations, Interface and Objects, Design Requirements for Distributed Architectures, Fundamental Models- Interaction Model, Failure Model, Security Model.

UNIT II: Time and Global States: Introduction, Clocks Events and Process States, Synchronizing Physical Clocks, Logical Time and Logical Clocks, Global States, Distributed Debugging.
Coordination and Agreement: Introduction, Distributed Mutual Exclusion, Elections, Multicast Communication, Consensus and Related Problems.

UNIT III: Inter process Communication: Introduction, The API for the Internet Protocols- The Characteristics of Inter process communication, Sockets, UDP Datagram Communication, TCP Stream Communication; External Data Representation and Marshalling; Client Server Communication; Group Communication, Case Study: MPI.

UNIT IV:: Remote Invocation: Introduction, Request-reply protocols, Remote Procedure Call, Events and Notifications, **Case Study:** JAVA RMI.. **Operating System Support:** Introduction, The Operating System Layer, Protection, Processes and Threads –Address Space, Creation of a New Process, Threads.

UNIT V: Distributed File Systems: Introduction, File Service Architecture; Peer-to-Peer Systems: Introduction, Napster and its Legacy, Peer-to-Peer Middleware, Routing Overlays. **Case Study1:** Sun Network File system. **Case Study 2:** The Andrew File System.

UNIT VI: Transactions & Replications: Introduction, System Model and Group Communication, Concurrency Control in Distributed Transactions, Distributed Dead Locks, Transaction Recovery; Replication-Introduction, Passive (Primary) Replication, Active Replication.

Text Books:

1. ―Distributed Systems- Concepts and Design‖, George Coulouris, Jean Dollimore, Tim Kindberg, Fourth Edition, Pearson Publication
2. ―Distributed Computing, Principles, Algorithms and Systems‖, Ajay D Kshemkalyani, MukeshSighal, Cambridge.

Reference Books:

1. ―Distributed Systems, Principles and Paradigms‖, Andrew S. Tanenbaum, Maarten Van Steen, 2d Edition, PHl.
2. ―Distributed Systems, An Algorithm Approach,‖ Sukumar Ghosh, Chapman & HalyCRC, Taylor & Fransis Group, 2007.

VII Sem	Scripting Languages (**Elective – IV)**	Course Code: VI8CST33	L	T	P	C
			3	0	0	3

Syllabus Details

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

CO1: Illustrate the concepts of scripting languages. **(K2)**
CO2: Develop Scripting for application using Ruby. **(K3)**
CO3: Explain the concepts of Programming in Perl. **(K2)**
CO4: Construct programs using Perl. **(K3)**
CO5: Describe TCL Scripting and their applications. **(K2)**
CO6: Discuss features of Groovy when compare with other Scripting Languages. **(K2)**

UNIT I: Introduction: Ruby, Rails, the structure and Execution of Ruby Programs, Package Management with RUBYGEMS, Ruby and web: Writing CGI scripts, cookies, Choice of Webservers, SOAP and web services. RubyTk – Simple Tk Application, widgets, Binding events, Canvas, scrolling.

UNIT II: Extending Ruby: Ruby Objects in C, the Jukebox extension, Memory allocation, Ruby TypeSystem, Embedding Ruby to Other Languages, Embedding a Ruby Interpreter.

UNIT III: Introduction to PERL and Scripting: Scripts and Programs, Origin of Scripting, Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.

UNIT IV: Advanced Perl: Finer points of looping, pack and unpack, file system, eval, data structures, packages, modules, objects, interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Issues.

UNIT V:TCL: TCL Structure, syntax, Variables and Data in TCL, Control Flow, Data Structures, input/output, procedures, strings, patterns, files, Advance TCL- eval, source, exec and uplevel commands, Name spaces, trapping errors, event driven programs, making applications internet aware, Nuts and Bolts Internet Programming, Security Issues, C Interface.

UNIT VI: Groovy: Features of Groovy, Environment, Basic Syntax, data types, variables, operators, loops, decision making, methods, File i/o, Optionals , numbers, strings, ranges, lists, maps, date and time, Regular expressions, Exception Handling, OO concepts.

Text Books:

1. The World of Scripting Languages, David Barron, Wiley Publications.
2. Ruby Programming language by David Flanagan and Yukihiro Matsumoto O'Reilly.
3. ―Programming Ruby‖ The Prammatic programmers guide by Dabve Thomas Second edition.

Reference Books:

1. Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP, J.Lee and B.Ware (Addison Wesley) Pearson Education.
2. Perl by Example, E.Quigley, Pearson Education.
3. Programming Perl, Larry Wall T.Christiansen and J.Orwant, O'Reilly, SPD.
4. Tcl and the Tk Toolkit, Ousterhout, Pearson Education.
5. Pearl Power, J.P. Flynt, Cengage Learning.

VII Sem	Deep Learning **(Elective – IV)**	Course Code: VI8CST34	L	T	P	C
			3	0	0	3

Syllabus Details

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

CO1: Explain the basics of machine learning. **(K2)**
CO2: Demonstrate the working of an artificial neural network. **(K2)**
CO3: Identify various parameters and issues while training a deep neural network. **(K2)**
CO4: Explain the working of convolution neural networks. **(K2)**
CO5: Explain the working of recurrent neural networks. **(K2)**
CO6: Recognize the ways of applying deep learning techniques for complex problem-solving. **(K2)**

UNIT I: Machine Learning Basics: Learning Algorithms, Capacity, Overfitting and Underfitting, Hyper parameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood Estimation, Bayesian Statistics, Supervised Learning Algorithms, Unsupervised Learning Algorithms, Stochastic Gradient Descent.

UNIT II: Introduction to Neural Networks: The Basic Architecture of Neural Networks- Single Computational Layer: The Perceptron, Multilayer Neural Networks; Training a Neural Network with Backpropagation, Practical Issues in Neural Network Training-The Problem of Overfitting, The Vanishing and Exploding Gradient Problems, Difficulties in Convergence, Local and Spurious Optima;

UNIT III: Training Deep Neural Networks: Introduction, Backpropagation: Backpropagation with the Computational Graph Abstraction, Dynamic Programming to the Rescue, Backpropagation with Post-Activation Variables and Pre-activation Variables, Setup and Initialization Issues, The Vanishing and Exploding Gradient Problems, Parameter-Specific Learning Rates- AdaGrad, RMSProp, AdaDelta, Adam.

UNIT IV: Convolutional Neural Networks: Introduction, The Basic Structure of a Convolutional Network- Padding, Strides, Typical Settings, The ReLU Layer, Pooling, Fully Connected Layers, The Interleaving Between Layers, Local Response Normalization, Hierarchical Feature Engineering; Training a Convolutional Network- Backpropagating Through Convolutions.

UNIT V: Recurrent Neural Networks: Introduction, The Architecture of Recurrent Neural Networks- Language Modeling Example of RNN, Backpropagation Through Time, Bidirectional Recurrent Networks, Multilayer Recurrent Networks; Long Short-Term Memory (LSTM), Gated Recurrent Units (GRUs).

UNIT VI: Applications Deep Learning: Applications of Convolutional Networks: Content-Based Image Retrieval, Object Localization, Object Detection, Natural Language and Sequence Learning; Application of Recurrent Neural Networks: Application to Automatic Image Captioning, Time-Series Forecasting and Prediction, End-to-End Speech Recognition, Handwriting Recognition.

Text Books:

1. Deep Learning, Ian Goodfellow, Ian Goodfellow, and Aaron Courville, MIT Press.
2. Neural Networks and Deep Learning, Charu C. Aggarwal, Springer.

Reference Books:

1. Neural Networks: A Systematic Introduction, Raúl Rojas, Springer.
2. Introduction to Deep Learning, Eugene Charniak, MIT Press.

VII Sem	Social Networks and semantic web (**Elective – IV)**	Course Code: VI8CST35	L	T	P	C
			3	0	0	3

Syllabus Details

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

CO1: Demonstrate knowledge by explaining the three different ―named‖ generations of the web. **(K3)**
CO2: Construct a social network. **(K3)**
CO3: Relate knowledge representation methods for semantic web. **(K3)**
CO4: Explain the key aspects of Web Architecture. **(K2)**
CO5: Describe web services and its Applications. **(K2)**
CO6: Develop ―Linked Data‖ Applications using Semantic Web Technologies. **(K3)**

UNIT-I: The Semantic web: Limitations of the current Web, The semantic solution, Development of the Semantic Web, The emergence of the social web.

UNIT-II: Social Network Analysis: What is network analysis? Development of Social Network Analysis, Key concepts and measures in network analysis. Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities, Web-based networks.

UNIT-III: Knowledge Representation on the Semantic Web: Ontologies and their role in the Semantic Web, Ontology languages for the semantic Web.

UNIT-IV: Modeling and Aggregating Social Network Data: State of the art in network data representation, Ontological representation of Social individuals, Ontological representation of social relationships, Aggregating and reasoning with social network data.

UNIT-V: Developing social semantic applications: Building Semantic Web applications with social network features, Flink- the social networks of the Semantic Web community, Open academia: distributed, semantic-based publication management.

UNIT-VI: Evaluation of Web-Based Social Network Extraction: Differences between survey methods and electronic data extraction, context of the empirical study, Data collection, Preparing the data, optimizing goodness of fit, Comparison across methods and networks, Predicting the goodness of fit, Evaluation through analysis.

Text Books:

1. Social Networks and the Semantic Web, PeterMika, Springer,2007.
2. Semantic Web Technologies, Trends and Research in Ontology basedsystems, J.Davies,RudiStuder,PaulWarren,JohnWiley&Sons.

Reference Books:

1. Semantic Web and Semantic Web Services –Liyang Lu Chapman and Hall/CRC Publishers, (Taylor & Francis Group)
2. Information Sharing on the semantic Web – Heiner Stuckenschmidt; Frank Van Harmelen, Springer Publications

VII Sem	Advanced Java and Web Technologies Lab	Course Code: VI8CSL10	L	T	P	C
			0	0	2	1

Syllabus Details

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

CO1: Develop static web pages using HTML, CSS. **(K3)**
CO2: Demonstrate the concepts of JavaScript, DHTML and XML. **(K3)**
CO3: Develop Web Applications using JSP. **(K3)**
CO4: Develop dynamic Web Applications using PHP & MySQL. **(K3)**

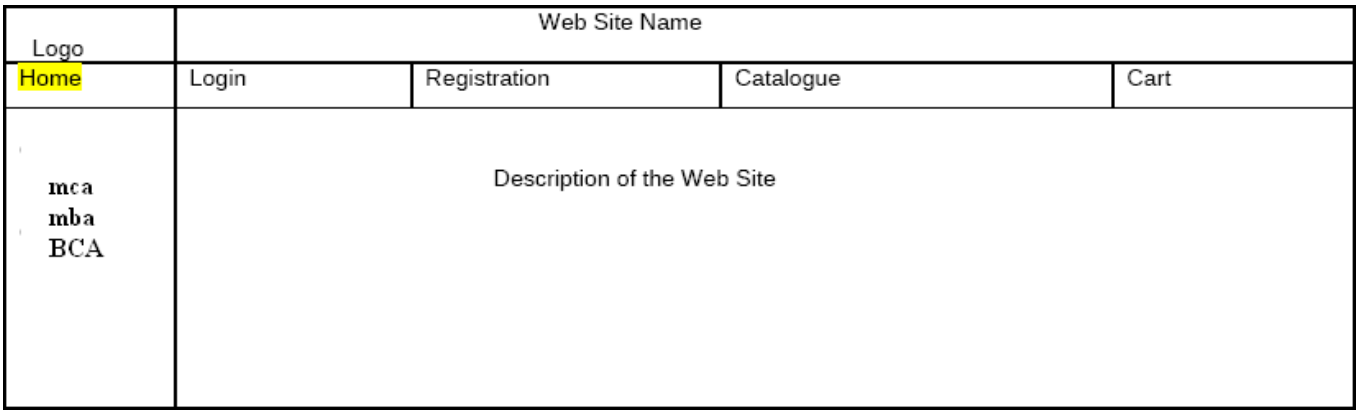
List of Experiments

1) Design the following static web pages required for an online book store web site:

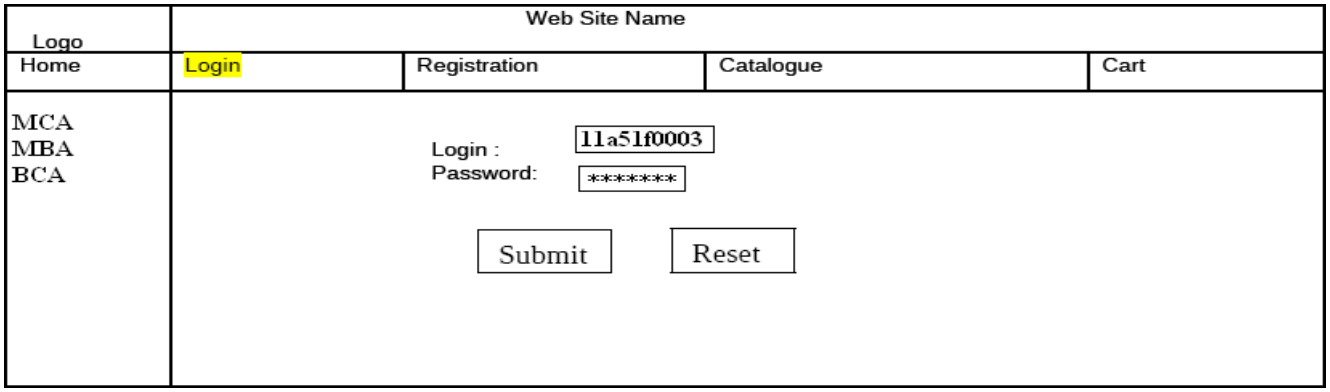
(a) HOME PAGE:

The static home page must contain three **frames**.

Top frame: Logo and the college name and links to Home page, Login page, Registration page, Catalogue page and Cart page (the description of these pages will be given below). Left frame: At least four links for navigation, which will display the catalogue of respective links. For e.g.: When you click the link **"MCA"** the catalogue for MCA Books should be displayed in the Right frame. Right frame: The *pages to the links in the left frame must be loaded here*. Initially this page contains description of the web site



(b) LOGIN PAGE:

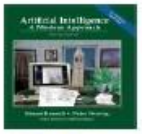


(c) CATOLOGUE PAGE:

The catalogue page should contain the details of all the books available in the web site in a table: The details should contain the following:

1. Snap shot of Cover Page.
2. Author Name.
3. Publisher.

4. Price.
5. Add to cart button.

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
MCA MBA		Book : XML Bible Author : Winston Publication : Wiely	$ 40.5	Add to cart
BCA		Book : AI Author : S.Russel Publication : Princeton hall	$ 63	Add to cart
		Book : Java 2 Author : Watson Publication : BPB publications	$ 35.5	Add to cart
		Book : HTML in 24 hours Author : Sam Peter Publication : Sam	$ 50	Add to cart

(d). **REGISTRATION PAGE:**
Create a *–registration form –*with the following fields
1) Name (Text field)
2) Password (password field)
3) E-mail id (text field)
4) Phone number (text field)
5) Sex (radio button)
6) Date of birth (3 select boxes) 7) Languages known (check boxes – English, Telugu, Hindi, Tamil)

2) Design a web page using **CSS (C**ascading **S**tyle **S**heets**)** which includes the following: Use different font, styles:
In the style definition you define how each selector should work (font, color etc.).

3) Design a login page and Make use of Events to perform validation using JavaScript.

4) Demonstrate a JavaScript program to perform On Mouse over event.

5) Demonstrate the concept of Mouse events (Ex:ng-click) with the help of Angular JS.

6) Design a simple Angular JS form.

7) Write an XML file which will display the Book information which includes the following:
1) Title of the book
2) Author Name
3) ISBN number
4) Publisher name
5) Edition
6) Price
a) Write a Document Type Definition (DTD) to validate the above XML file.
b) Write a XML Schema Definition (XSD)

8) Create a simple JSP to print the current Date and Time.

9)Create JSP to insert the details of 3 or 4 users using a registration form store these values in the data base and then check the authentication of the user by entering the name and password using a login form.
10) Assume four users user1, user2, user3 and user4 having the passwords pwd1, pwd2, pwd3 and pwd4 respectively. Write a PHP for doing the following.
A)
1. Create a Cookie and add these four user id‘s and passwords to this Cookie.
2. Read the user id and passwords entered in the Login form (week1) and authenticate with the values (user id and passwords) available in the cookies.
If he is a valid user (i.e., user-name and password match) you should welcome him by name (user-name) else you should display ―You are not an authenticated user ‘‘.
B) Use init-parameters to do the same.

11) Create a table which should contain at least the following fields: name, password, email id, phone number (these should hold the data from the registration form).
Write a PHP program to connect to that database and extract data from the tables and display them. Experiment with various SQL queries. Insert the details of the users who register with the web site, whenever a new user clicks the submit button in the registration page.
12) Insert the details of the 3 or 4 users who register with the web site by using registration form. Authenticate the user when he submits the login form using the user name and password from the database.

Reference Books:

1. Web Technologies: HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, Dream Tech.
2. An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage Learning
3. Web Technologies, 1st Edition 7th impression, Uttam K Roy, Oxford, 2012.

VIII Sem	Software Project Management (**Elective – V)**	Course Code: VI8CST36	L	T	P	C
			3	0	0	3

Syllabus Details

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

CO1: Describe Software Project Management Terminology. **(K2)**
CO2: Explain various Software development process Models and software Life cycle phases. **(K2)**
CO3: Illustrate various Effort Estimation Techniques and activity network models for Software Project Planning. **(K3)**
CO4: Demonstrate Risk Management Concepts and resource allocation. **(K3)**
CO5: Explain the importance of Project monitoring and control for accomplishing project goals. **(K2)**
CO6: Describe Software Quality models. **(K2)**

UNIT I: Introduction to Software Project Management: Software Project versus other types of projects, Activities covered by Software Project Management, Categorizing projects ,Stakeholders, Objectives& goals, what is management. **Project Planning:** Step-wise planning, Identify Project Scope and objectives, Infrastructure, Project Products &deliverables, Project activities, Effort estimation.

UNIT II: Project Approach: Build or buy, **process models**: waterfall model, Prototyping, Incremental delivery model, **Agile methods**: Extreme Programming, Atern method, selecting an appropriate process model. **Lifecycle phases:** Engineering and Production stages, Inception, Elaboration, Construction, Transition phases.

UNIT III: Software effort estimation and Activity planning: Overview of Effort Estimation techniques, Function Point analysis, COCOMO. **Activity planning:** Objectives, Network planning models, forward pass and backward pass, Identify Critical path and activities.

UNIT IV: Risk Management and Resource Allocation: Introduction, Risk and its categories, Identification, Assessment, Risk Planning and management, applying PERT technique. Resource Allocation: Types of Resources, Identifying resource requirements, Resource scheduling.

UNIT V: Project Monitoring and Control: Creating framework for monitoring& control, Collecting Data, Visualizing Progress, Cost monitoring, Earned value Analysis.

UNIT VI: Software Quality: Defining Quality, Importance of quality, ISO 9126, Product QualityVs Process Quality management. **Process Capability Models:** Capability Maturity Model, Enhancing software Quality.

Text Books:

1. SoftwareProjectManagement, Bob Hughes & Mike Cotterell, 6th edition, TATA Mcgraw-Hill
2. Software Project Management, WalkerRoyce 2nd edition, Pearson Education.

.

Reference Books:

1. Software Project Management in practice, PankajJalote, 9th edition, Pearson Education.
2. Software Project Management, Joel Henry, 3rd edition, Pearson Education.

VIII Sem	Big Data Analytics (**Elective – V)**	Course Code: VI8CST37	L	T	P	C
			3	0	0	3

Syllabus Details

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

CO1: Discuss the challenges of Big Data using Hadoop. **(K2)**
CO2: Interpret Hadoop's architecture and core components of Hadoop Distributed File System. **(K2)**
CO3: Apply data modelling techniques to large data sets using map reduce programs. **(K3)**
CO4: Describe the Hadoop I/O classes. **(K2)**
CO5: Examine the use of Pig Framework to work with big data. **(K3)**
CO6: Develop a data analytical system using HIVE. **(K3)**

UNIT I: Introduction to Big Data: What is Big Data, Why Big Data is Important, Data Storage and Analysis, Comparison with other systems, Grid Computing. **Introduction to Hadoop:** A brief history of Hadoop, Meet Hadoop Data, Apache Hadoop and the Hadoop Ecosystem.

UNIT II: Working with Big Data & HDFS: Google File System, Hadoop Distributed File System (HDFS) –Building blocks of Hadoop (Namenode, Datanode, Secondary Namenode, JobTracker, and TaskTracker). **Introducing and Configuring Hadoop cluster:** Local distributed mode, Pseudo-distributed mode, Fully Distributed mode, Configuring XML files.

UNIT III: Writing Map Reduce Programs: A Weather Dataset –Data Format, Analyzing Data with UNIX Tools, Analyzing the Data with Hadoop-Map Reduce. **Basic programs of Hadoop Map Reduce:** Driver code,Mapper code, Reducer code, RecordReader, Combiner functions. Map Reduce Types, Input Formatclass Hierarchy, other map reduce examples (word count).

UNIT IV: Hadoop I/O: The Writable Interface, Writable Comparable and Comparators. **Writable Classes:** Writable wrappers for Java primitives, Text & Bytes Writable, NullWritable, ObjectWritable and Generic Writable, Writable collections. **Implementing a Custom Writable:** Implementing a Raw Comparator for speed, Custom comparators

UNIT V: Pig - Hadoop Programming Made Easier: Admiring the Pig Architecture, Going with the Pig Latin Application Flow, Working through the ABCs of Pig Latin, Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin.

UNIT VI: Applying Structure to Hadoop Data with Hive: Saying Hello to Hive, Seeing How the Hive is Put Together, Getting Started with Apache Hive, Examining the Hive Clients, Working with Hive Data Types, Creating and Managing Databases and Tables, Seeing How the Hive Data Manipulation Language Works, Querying and Analyzing Data.

Text Books:

1. Hadoop: The Definitive Guide, Tom White, O_Reilly, 3rd Edition, 2012.
2. Hadoop in Action, Chuck Lam, MANNING Publ., 2016.
3. Hadoop for Dummies, Dirk deRoos, Paul C.Zikopoulos, Roman B.Melnyk, Bruce Brown, Rafael Coss, 2014.

.

Reference Books:

1. Hadoop in Practice, Alex Holmes, MANNING Publ., 2014.
2. Hadoop Map Reduce Cookbook, Srinath Perera, Thilina Gunarathne, PACKT, 2013.

VIII Sem	Soft Computing (**Elective – V)**	Course Code: VI8CST38	L	T	P	C
			3	0	0	3

Syllabus Details

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

CO1: Discuss about Soft Computing, Requirements and Applications of Soft Computing. **(K2)**
CO2: Discuss about various Supervised and Unsupervised Learning Networks. **(K2)**
CO3: Illustrate various Fuzzy Logic, Fuzzy Sets, Crisp sets, Fuzzification and De-fuzzification Principles. **(K2)**
CO4: Discuss about Fuzzy Arithmetic and Fuzzy measures. **(K2)**
CO5: Discuss about Genetic Algorithms and its Operators. **(K2)**
CO6: Discuss about Various Hybrid Soft Computing Techniques. **(K2)**

UNIT I: Introduction: What is Soft Computing? Difference between Hard and Soft computing, Requirements of Soft computing, Major Areas of Soft Computing, Applications of Soft Computing.

UNIT II: Associative Memory Networks: (Supervised Learning): Introduction, Training Algorithms for Pattern Association, Auto-associative Memory Network, Hetero-associative Memory Network, Bidirectional Associative Memory (BAM),Hopfield Networks, Iterative Auto-associative Memory Networks, Temporal Associative Memory Network. **Unsupervised Learning Networks:** Introduction, Fixed Weight Competitive Nets, Kohonen Self-Organizing Feature Maps, Learning Vector Quantization, Counter propagation Networks, Adaptive Resonance Theory Network.

UNIT III: Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets: Introduction to Fuzzy Logic, Classical Sets (Crisp Sets), Fuzzy Sets and Operations on Fuzzy sets- Compliment, Intersections, Unions. **Membership Function:** Introduction, Features of the Membership Functions, Fuzzification, Methods of Membership Value Assignments. **Defuzzification:** Introduction, Lambda-Cuts for Fuzzy Sets (Alpha-Cuts), Lambda-Cuts for Fuzzy Relations, Defuzzification Methods

UNIT IV: Fuzzy Arithmetic and Fuzzy Measures: Introduction, Fuzzy Arithmetic, Extension Principle, Fuzzy Measures, Measures of Fuzziness, Fuzzy Integrals.

UNIT V: Genetic Algorithm: Introduction to genetic algorithm, operators in genetic algorithm, stopping condition for genetic algorithm flow.

UNIT VI: Hybrid Soft Computing Techniques: Introduction, Neuro-Fuzzy Hybrid Systems, Genetic Neuro-Hybrid Systems.

Text Books:

1. Principles of Soft Computing, S.N. Sivanandam and S.N. Deepa, 3-edition, Wiley India, 2007.
2. ―Fuzzy Sets & Fuzzy Logic‖, G.J. Klir & B. Yuan, PHI, 1995.
3. ―An Introduction to Genetic Algorithm‖, Melanie Mitchell, PHI, 1998.

Reference Books:

1. Neural Networks, Fuzzy Logic and Genetic Algorithms, S. Rajasekaran and G.A.V.Pai, PHI, 2003.
2. Fuzzy Logic with Engineering Applications, Timothy J.Ross, McGraw-Hill, 1997.
3. Neuro-Fuzzy and Soft Computing, J.S.R.Jang, C.T.Sun and E.Mizutani, PHI, 2004, Pearson Education.

VIII Sem	Cloud Computing (**Elective – V)**	Course Code: VI8CST39	L	T	P	C
			3	0	0	3

Syllabus Details

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

CO1: Outline the concepts of cloud computing architecture. **(K2)**
CO2: Describe the Virtualization concepts in different scenarios. **(K2)**
CO3: Explain the best policies for cloud deployment. **(K2)**
CO4: Illustrate the design issues of Cloud computing. **(K2)**
CO5: Illustrate the security and privacy of the data in cloud computing. **(K2)**
CO6: Demonstrate cloud instances in Amazon Web Services. **(K3)**

UNIT I: Introduction to Cloud Computing: Trends in Computing - Distributed Computing, Grid Computing, Cluster Computing, Utility Computing, Cloud Computing, Definition of Cloud Computing, Characteristics, Service Models, Deployment Models, Cloud Service Models Providers, Advantages and Disadvantages of Cloud Computing, Cloud-based Services &Applications.

UNIT II: Cloud Concepts & Technologies: Virtualization and its types, Software Defined Networking, Network Function Virtualization (NFV). **Cloud Services:** Compute Services, Storage Services, Database Services, Application Services

UNIT III: Cloud Application Design: Design Considerations for Cloud Applications, Reference Architectures for Cloud Applications, Cloud Application Design Methodologies: SOA, Cloud Component Model and MVC, Data Storage Approaches.

UNIT IV: Cloud Security: Cloud Security Architecture (CSA), Authentication, Authorization, Identity & Access Management, Data Security, Key Management.

UNIT V: Migrating into a Cloud: Broad Approaches to Migrating into the Cloud, The Seven-Step Model of Migration into a Cloud, Migration Risks and mitigation, Phases of Migrating to Cloud, benefits and risks of Migrating to Cloud.

UNIT VI: SLA Management in Cloud Computing: Service Level Agreements (SLA), Considerations for SLA, SLA Requirements, Types of SLA, Life Cycle of SLA, SLA Management in Cloud. **Case Study:** Amazon AWS: EC2, Amazon Simple DB, Amazon S3, Amazon Cloud Front and Amazon SQS.

Text Books:

1. Cloud Computing: A Hands-on Approach, ArshdeepBahga, Vijay Madisetti,Universities Press.
2. Cloud Computing: Principles and Paradigms, Rajkumar Buyya, James Broberg, Andrzej Goscinski, Wiley Publication.

Reference Books:

1. Cloud Computing – Web-Based Applications That Change the way you Work and Collaborate Online, Michael Miller, Pearson Education.
2. Cloud Computing: A Practical Approach, Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, McGraw-Hill, (2010).

VIII Sem	Software Architecture & Design Patterns (**Elective – VI)**	Course Code: VI8CST40	L	T	P	C
			3	0	0	3

Syllabus Details

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

CO1: Describe Architectural Structures and Quality Attributes. (K2)
CO2: Explain the mechanism of Evaluating Architecture. (K2)
CO3: Demonstrate Creational Patterns. (K3)
CO4: Construct Structural Patterns for a given Scenario. (K3)
CO5. Construct Behavioural Patterns for a given Scenario. (K3)
CO6. Examine various Case Studies in utilizing Software Architectures. (K3)

UNIT-I: Envisioning Architecture The Architecture Business Cycle, What is Software Architecture, Architectural patterns, reference models, reference architectures, architectural structures and views. Creating and Architecture Quality Attributes, Achieving qualities, Designing the Architecture.

UNIT-II: Analyzing Architectures Architecture Evaluation, Architecture design decision making, ATAM, CBAM. Software Product Lines, Software architecture in future.

UNIT-III: Pattern Description, role in solving design problems, Selection and usage.**Creational Patterns**: Abstract factory, Builder, Factory method, Prototype, Singleton.

UNIT-IV: Structural Patterns: Adapter, Bridge, Composite, Decorator, Façade, Flyweight, PROXY.

UNIT-V: Behavioural Patterns: Chain of responsibility, command, Interpreter, iterator, mediator, memento, observer, state, strategy, template method, visitor.

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

Text Books:

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

Reference Books:

1. Beyond Software architecture, Luke Hohmann, Addison wesley, 2003.
2. Software architecture, David M. Dikel, David Kane and James R. Wilson, Prentice Hall PTR, 2001
3. Software Design, David Budgen, second edition, Pearson education, 2003
4. Head First Design patterns, Eric Freeman & Elisabeth Freeman, O'REILLY, 2007.
5. Design Patterns in Java, Steven John Metsker & William C. Wake, Pearson education, 2006.

VIII Sem	Middleware Technologies (**Elective – VI)**	Course Code: VI8CST41	L	T	P	C
			3	0	0	3

Syllabus Details

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

CO1: Illustrate Middleware, E- Business, IT architecture, RPC, RDC. **(K2)**
CO2: Demonstrate Internet Applications and Web services. **(K2)**
CO3: Summarize Technical issues in Middleware. **(K2)**
CO4: Demonstrate the Use of Middleware in Building Distributed Technologies. **(K2)**
CO5: Identify Security Issues with Distributed Applications. **(K3)**
CO6: Apply Appropriate Middleware Technology to Develop Real Time Applications. **(K3)**

UNIT I: Introduction: Moving to e-business, what is IT architecture? Why is this different from what we did before? Rewrite or evolve?, Who develops the architecture?, Early days, Preliminaries, Remote procedure calls, Remote database access, Distributed transaction processing, Message queuing, Message queuing versus distributed transaction processing, what happened to all this technology.

UNIT II: Objects, Components and the Web: Using object middleware, Transactional component middleware- COM+, EJB, Final comments on TCM, Internet Applications. WEB SERVICES: Service concepts, Web services, and Using Web services: A pragmatic approach.

UNIT III: A Technical Summary Of Middleware: Middleware elements- The communications link, The middleware protocol, The programmatic interface, Data presentation, Server control, Naming and directory services, Security, System management, Comments on Web services, Vendor architectures- Vendor platform architectures, Vendor-distributed architectures, Using vendor architectures, Positioning, Strawman for user target architecture, Marketing, Implicit architectures, Middleware interoperability.

UNIT IV: Using Middleware to Build Distributed Applications: What is middleware for? -Support for business processes, Information retrieval, Collaboration, Tiers- The presentation tier, The processing tier, The data tier, Services versus tiers, Architectural choices - Middleware bus architectures, Hub architectures, Web services architectures, Loosely coupled versus tightly coupled.

UNIT V: Security: What security is needed, Traditional distributed system security, Web services security, Architecture and security. **Application Design and It's Architecture :** Problems with today's design approaches, Design up front or as needed?- The role of business rules, Existing systems, Reuse, Silo and monolithic development, The role of architecture, Levels of design, Reconciling design approaches.

UNIT VI: Building an IT Architecture: Case Studies – Providing an integration infrastructure, creating a service-oriented architecture, Developing a new application. What does the future hold? , The key points to remember-Middleware technology alternatives, IT architecture guideline guidelines, Distribute systems technology principals and Distribute systems implementation design.

Text Books:

1. IT Architectures and Middleware: Strategies for Building Large, Integrated Systems, Chris Britton and Peter Eye, 2nd Edition, Pearson Education.

Reference Books:

1. Middleware for Communications, Qusay H. Mahmoud,1st Edition, John Wiley and Sons.
2. Middleware Networks: Concept, Design and Deployment of Internet Infrastructure, Michah Lerner, 1st Edition, Kluwer Academic Publishers.
3.Middleware and Enterprise Integration Technologies, G. Sudha Sadasivam and Radha Shankarmani, 1st edition, Wiley, 2009.

VIII Sem	Natural Language Processing (**Elective – VI)**	Course Code: VI8CST42	L	T	P	C
			3	0	0	3

Syllabus Details

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

CO1: Illustrate the Syntax and semantics and Language models of Natural Language Processors. **(K2)**
CO2: Classify Morphology and Finite State Transducers, Markov Models and Entropy Models. **(K2)**
CO3: Explain about Statistical parsing and probabilistic CFGs. **(K2)**
CO4: Demonstrate semantic analysis. **(K2)**
CO5: Explain Discourse Analysis and Lexical Resources. **(K2)**
CO6: DevelopaStatisticalMethodsforRealWorldApplicationsandexploredeeplearning-basedNLP. **(K3)**

UNIT I: Introduction: Natural Language Processing tasks in syntax,semantics,andpragmatics–Issues–Applications-Theroleofmachinelearning-ProbabilityBasics–Informationtheory–Collocations-N-gram Language Models - Estimating parameters and smoothing - Evaluating language models.

UNIT II: Morphology And Part Of Speech Tagging: Linguistic essentials - Lexical syntax-Morphology and Finite State Transducers - Part of speech Tagging - Rule-Based Part of Speech Tagging - Markov Models - Hidden Markov Models – Transformation based Models - Maximum Entropy Models. Conditional Random Fields.

UNIT III: Syntax Parsing: Syntax Parsing - Grammar formalisms and tree banks - Parsing with Context Free Grammars- Features and Unification-Statistical parsing and probabilisticCFGs(PCFGs)-LexicalizedPCFGs.

UNIT IV: Semantic Analysis: Representing Meaning – Semantic Analysis - Lexical semantics –Word-sense disambiguation- Supervised – Dictionary based and Unsupervised Approaches - Compositional semantics- Semantic Role Labeling and Semantic Parsing – Discourse Analysis.

UNIT V: Discourse Analysis and Lexical Resources: Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brills Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).

UNIT VI: NLP Applications: Named entity recognition and relation extraction- IE using sequence labeling-Machine Translation (MT) - Basic issues in MT-Statistical translation-word alignment- phrase-based translation – Question Answering.

Text Books:

1. Daniel Jurafsky and James H. Martin Speech and Language Processing (2nd Edition), Prentice Hall; 2nd edition,2008
2. FoundationsofStatisticalNaturalLanguageProcessingbyChristopherD.Manningand Hinrich Schuetze, MIT Press,1999
3. Steven Bird, Ewan Klein and Edward Loper Natural Language Processing with Python, O'Reilly Media; 1 edition,2009
4. Roland R. Hausser, Foundations of Computational Linguistics: Human-Computer Communication in Natural Language, Paperback, MIT Press,2011

References:

1. Pierre M. Nugues, An Introduction to Language Processing with Perl and Prolog: An Outline of Theories, Implementation, and Application with Special Consideration of English, French, and German (Cognitive Technologies) Softcover reprint,2010
2. James Allen, Natural Language Understanding, Addison Wesley; 2 edition 1994
   a. NLTK – Natural Language Tool Kit -http://www.nltk.org/

VIII Sem	Cyber Security (**Elective – VI)**	Course Code: VI8CST43	L	T	P	C
			3	0	0	3

Syllabus Details

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

CO1: Describe about Cybercrimes. **(K2)**
CO2: Explain Cyber criminals and their attacks. **(K2)**
CO3: Illustrate Cybercrimes and security in mobile devices **(K2)**
CO4: Discuss about the Tools and methods used to overcome Cybercrimes. **(K2)**
CO5: Discuss about Cyber Laws and IT Acts. **(K2)**
CO6: Explain about Computer Forensics. **(K2)**

UNIT I: Introduction to Cybercrime: Introduction, Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security Who are Cybercriminals? , Classifications of Cybercrimes, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes, Cybercrime Era: Survival Mantra for the Netizens.

UNIT II: Cyber offenses: How Criminals Plan Them –Introduction, How Criminals Plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack VectorCloud Computing.

UNIT III: Cybercrime Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/CellPhones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

UNIT IV: Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoSAttacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks. **Phishing and Identity Theft:** Introduction, Phishing, Identity Theft (ID Theft).

UNIT V: Cybercrimes and Cyber security: The Legal Perspectives, Introduction, Why Do We Need Cyber laws: The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Amendments to the Indian IT Act,· Cybercrime and Punishment.

UNIT VI: Understanding Computer Forensics: Introduction, Historical Background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber forensics and Digital Evidence, Forensics Analysis of E-Mail, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics Investigation, Computer Forensics and Steganography, Relevance of the OSI 7 Layer Model to Computer Forensics, Forensics and Social Networking Sites: The Security/Privacy Threats, Computer Forensics from Compliance Perspective, Challenges in Computer Forensics, Special Tools and Techniques, Forensics Auditing, Anti-forensics.

Text Books:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, NinaGodbole, SunitBelapure, 1st edition, Wiley.

Reference Books:

1. Principles of Information Security, MichealE.Whitman and Herbert J.Mattord, 4th edition, Cengage Learning.
2. Information Security the complete reference, Mark Rhodes, Ousley, 2nd edition, MGH.

Annexure-V

List of Open Elective Courses offered by CSE for Other Branches

SEM	Course Code	Course
Open Elective-II		
VII SEM	V18CSTOE04	1. Operating Systems
	V18CSTOE05	2. Artificial Intelligence
	V18CSTOE06	3. Java Programming
Open Elective-III		
VIII SEM	V18CSTOE07	1.Software Testing Methodologies
	V18CSTOE08	2. Cyber Security
	V18CSTOE09	3. Computer Graphics

VII Sem	Operating Systems **(Open Elective-II)**	Course Code: V18CSTOE04	L	T	P	C
			3	0	0	3

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 Management Main 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, Abraham Silberschatz, ,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

VII Sem	Artificial Intelligence **(Open Elective-II)**	Course Code: V18CSTOE05	L	T	P	C
			3	0	0	3

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

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

VII Sem	**JAVA PROGRAMMING (Open Elective-II)**	Course Code: **V18CSTOE06**	L	T	P	C
			3	0	0	3

Syllabus Details

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

CO1: Describe Java Virtual Machine and Type casting. (**K2**)
CO2: Demonstrate Concepts like Constructors, Arrays, Nested Classes and Command Line Arguments. (**K3**)
CO3: Implement Concepts of Inheritance and Exception Handling. (**K3**)
CO4: Develop programs on Multi-Threading and Files. (**K3**)
CO5: Demonstrate Applet Programming and AWT Components. (**K3**)
CO6: Describe Event Handling and Swings. (**K3**)

UNIT-I: Introduction to Java: Introduction to Object Oriented Paradigm, Concepts of OOP, Applications of OOP, History of Java, Java Features, JVM, Program Structure. Variables, Primitive Data Types, Constants, Operators, Expressions, Precedence rules and Associativity, Primitive type conversion and Casting, Control Structures.

UNIT-II: Classes and Objects: Classes and objects, Class declaration, Creating objects, Methods, Constructors and Constructor Overloading, Importance of Static Keyword and Examples, this Keyword, Arrays, Command Line Arguments, Nested Classes.

UNIT-III: Inheritance and Exception Handling: Inheritance, super Keyword, final Keyword, Method Overriding and Abstract Class. Interfaces, Creating Packages, Using Packages, Importance of Class path. Exception Handling, Importance of try, catch, throw, throws and finally Block.

UNIT-IV: Multithreading and Files: Introduction, Thread Lifecycle, Creation of Threads, Thread Priorities, Thread Synchronization, Communication between Threads. Reading Data from Files and Writing Data to Files, Random Access Files.

UNIT-V: Applet Programming and AWT: Applet Class, Applet Lifecycle, Applet Programs. Introduction to AWT, Components and Containers, Button, Label, Checkbox, Radio Buttons, List Boxes, Layouts, Menu and Scrollbar.

UNIT-VI: Event Handling and Swings: Event Handling : Event Delegation Model, Sources of Events, Event Listeners, Adapter Classes, InnerClasses. Introduction to Swings.

Text Books:

1. Java Proramming, E.Balagurusamy, 4th Edition , TMH.
2. The complete Reference Java, 8th Edition, Herbert Schildt, TMH.
3. Introduction to java programming ,Y Daniel Liang, 7th Edition, Pearson.

Reference books:

1. Core Java: An Integrated Approach , R Nageswara Rao, 7th Edition, Dream Tech
2. Head First Java , Kathy Sierra and Bert Bates, 2nd Edition O'reilly

VIII Sem	Software Testing Methodologies **(Open Elective-III)**	Course Code: V18CSTOE07	L	T	P	C
			3	0	0	3

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.

.

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.

VIII Sem	Cyber Security **(Open Elective – III)**	Course Code: VI8CSTOE08	L	T	P	C
			3	0	0	3

Syllabus Details

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

CO1: Describe about Cybercrimes. **(K2)**
CO2: Explain Cyber criminals and their attacks. **(K2)**
CO3: Illustrate Cybercrimes and security in mobile devices **(K2)**
CO4: Discuss about the Tools and methods used to overcome Cybercrimes. **(K2)**
CO5: Discuss about Cyber Laws and IT Acts. **(K2)**
CO6: Explain about Computer Forensics. **(K2)**

UNIT I: Introduction to Cybercrime: Introduction, Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security Who are Cybercriminals? , Classifications of Cybercrimes, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes, Cybercrime Era: Survival Mantra for the Netizens.

UNIT II: Cyber offenses: How Criminals Plan Them –Introduction, How Criminals Plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector Cloud Computing.

UNIT III: Cybercrime Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/CellPhones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

UNIT IV: Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks. **Phishing and Identity Theft:** Introduction, Phishing, Identity Theft (ID Theft).

UNIT V: Cybercrimes and Cyber security: The Legal Perspectives, Introduction, Why Do We Need Cyber laws: The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Amendments to the Indian IT Act,· Cybercrime and Punishment.

UNIT VI: Understanding Computer Forensics: Introduction, Historical Background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber forensics and Digital Evidence, Forensics Analysis of E-Mail, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics Investigation, Computer Forensics and Steganography, Relevance of the OSI 7 Layer Model to Computer Forensics, Forensics and Social Networking Sites: The Security/Privacy Threats, Computer Forensics from Compliance Perspective, Challenges in Computer Forensics, Special Tools and Techniques, Forensics Auditing, Anti-forensics.

Text Books:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, NinaGodbole, SunitBelapure, 1st edition, Wiley.

Reference Books:

1. Principles of Information Security, MichealE.Whitman and Herbert J.Mattord, 4th edition, Cengage Learning.
2. Information Security the complete reference, Mark Rhodes, Ousley, 2nd edition, MGH.

VII Sem	Computer Graphics **(Open Elective-III)**	Course Code: V18CSTOE09	L	T	P	C
			3	0	0	3

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, BSP tree 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. Computer Graphics, Schaum's outlines", Zhigand xiang,Roy Plastock, 2nd Edition,Tata Mc-Graw Hill Edition.
3. Principles of Computer Graphics, S. Govil-Pai, 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.

SRI VASAVI ENGINEERING COLLEGE (Autonomous)

(Permanent Affiliation to JNTUK, Kakinada), PEDATADEPALLI, TADEPALLIGUDEM-534 101

Department of Computer Science and Engineering

&

Department of Computer Science and Technology

Annexure-VI

Curricular Components (V20 Regulation)

S.No.	Course Work-Subject Area	Credits as per AICTE	% of Range as per UGC	APSCHE	Total No.of Credits	% of Credits
1	Humanities and Social Sciences **(HSS)**	12	10-15%	10.5	12	7.5%
2	Basic Sciences **(BSC)**	25	15-20%	21	19.5	12.187%
3	Engineering Sciences **(ESC)**	24	10-20%	24	24	15%
4	Professional Core **(PCC)**	48	25-35%	51	51	31.875%
5	Professional Electives **(PEC)**	18	8-12%	15	15	9.375%
6	Open Electives **(OEC)**	18	5-10%	12	12	7.5%
7	Other (Project, Internship etc.)	15	8-10%	16.5	16.5	10.312%
8	Mandatory Non-Credit Courses**(MNC)**	-	-	Non-Credit	-	
9	Skill Oriented Courses**(SO)**	-		10	10	6.25%
	Total :	**160**		**160**	**160**	

SEMESTER-III (SECOND YEAR)

S.No.	Code	Name of the Course		L	T	P	C
1		Managerial Economics and Financial Analysis	HSS	3	-	-	3
2		Mathematical Foundation Of Computer Science	ESC	3	-	-	3
3	V20CST03	OOPs Through C++	PCC	3	-	-	3
4	V20CST04	Data Structures	PCC	3	-	-	3
5	V20CST05	Computer Organization and Architecture	ESC	3	-	-	3
6	V20CSL03	OOPs Through C++ Lab	PCC	-	-	3	1.5
7	V20CSL04	Data Structures Lab	PCC	-	-	3	1.5
8	V20CSL05	Linux Shell Scripting Lab	PCC	-	-	3	1.5
9		**Skill Oriented Course - I**	**SO**	**1**	**0**	**2**	**2**
			Total:	**18**	**0**	**11**	**21.5**
10		Professional Communication Skills -I	MNC	2	-	-	0

SEMESTER - IV (SECOND YEAR)

S.No.	Code	Name of the Course		L	T	P	C
1	V20CST07	Design and Analysis of Algorithms	PCC	3	-	-	3
2	V20CST08	Software Engineering	PCC	3	-	-	3
3	V20CST09	Database Management Systems	PCC	3	-	-	3
4	V20CST10	Java Programming	PCC	3	-	-	3
5		Probability and Statistics	BSC	**3**	-	-	**3**
6	V20CSL06	Statistical Visualization using R Lab	BSC	-	-	3	1.5
7	V20CSL07	Database Management Systems Lab	PCC	-	-	3	1.5
8	V20CSL08	Java Programming Lab	PCC	-	-	3	1.5
9		**Skill Oriented Course - II**	SO	1	-	2	2
			Total:	**18**	**0**	**11**	**21.5**
10		Professional Communication Skills -II	**MNC**	**2**	**-**	**-**	**0**
Student have to do Mini Project / Internship (2 Months) during summer							

V SEMESTER (THIRD YEAR)

S.No.	Code	Name of the Course		L	T	P	C
1		Data Mining	PCC	3	-	-	3
2		Operating Systems	PCC	3	-	-	3
3		Artificial Intelligence	PCC	3	-	-	3
4		**Open Elective -I**	OEC /JOE	3	-	-	3
5		**Professional Elective-I** i) Automata and Compiler Design ii) Principles of Programming Languages iii) Information Retrieval Systems iv) Computer Graphics	PEC	**3**	-	-	**3**
6		Data Mining Lab &Artificial Intelligence Lab	PCC	-	-	3	1.5
7		Unified Modeling Language Lab	PCC	-	-	3	1.5
9		**Skill Oriented Course - III**	SO/SS	1	-	2	2
10		Mini Project / Internship*	Internship	-	-	3	1.5
			Total:	**16**	**0**	**11**	**21.5**
11			**MNC**	**2**	**-**	**-**	**0**

*Internship has to be done after IV SEM during summer

VI SEMESTER (THIRD YEAR)

S.No.	Code	Name of the Course		L	T	P	C
1		Computer Networks	PCC	3	-	-	3
2		Machine Learning	PCC	3	-	-	3
3		Web Technologies	PCC	3	-	-	3
4		**Professional Elective-II** i) Software Testing Methodologies ii) Advanced Data Structures iii) Data Science iv) Cloud Computing	PEC	3	-	-	3
5		**Open Elective -II**	OEC /JOE	3	-	-	3
6		Computer Networks Lab	PCC	-	-	3	1.5
7		Web Technologies Lab	PCC	-	-	3	1.5
8		Machine Learning Lab	PCC	-	-	3	1.5
9		**Skill Oriented Course - IV**	SO/SS	**1**	**0**	**2**	**2**
			Total:	**16**	**0**	**11**	**21.5**
Student have to do Mini Project / Internship (2 Months) during summer							

VII SEMESTER(FOURTH YEAR)

S.No.	Code	Name of the Course		L	T	P	C
1		**Professional Elective-III** i) Object Oriented Analysis and Design ii) BigData Analytics iii) Deep Learning iv) Human Computer Interaction	PEC	3	-	-	3
2		**Professional Elective-IV** i) Distributed Systems ii) NoSQL Databases iii) Soft Computing iv) Cryptography &Network Security	PEC	3	-	-	3
3		**Professional Elective-V** i) Software Project Management ii) Scripting Languages iii) Natural Language Processing iv) Social Networks and Semantic Web	PEC	3	-	-	3
4		**Open Elective -III**	OEC /JOE	3	-	-	3
5		**Open Elective -IV**	OEC /JOE	3	-	-	3
6			***HSS Elective**	3	-	-	3
7		**Skill Oriented Course - V**	SO/SS	1	-	1	2
8		Mini Project /Internship*	Internship	-	-	6	3
			Total:	**19**	-	1	**23**
9		Honors/Minors Courses		4	-	-	4
10		MOOCs/Lab related to Honors/Minors Course		-	-	2	2

*Internship has to be done after VI SEM during summer

VIII SEMESTER (FOURTH YEAR)

S.No.	Code	Name of the Course		L	T	P	C
1		Internship/ Industrial Training /Practical training	PRO	-	-	4	2
2		Major Project (6 Months)	PRO			20	10
			Total:	-	-	**24**	**12**

SKILL ORIENTED COURSES

S.No.	Code	Name of the Course
1	V20CSS01	Mobile Application Development
2	V20CSS02	Mean Stack Technologies
3	V20CSS03	Secure DevOps
4	V20CSS04	AWS Cloud Computing
5	V20CSS05	Web Development using Django
6	V20CSS06	Game Development using Buildbox
7	V20CSS07	Game Programming

PROFESSIONAL ELECTIVE STREAMS

	THREAD 1 Systems and Software Architecture	**THREAD 2 Programming / Databases**	**THREAD 3 Data Science and Machine Learning**	**THREAD 4 Applications and Networking**
Professional Elective-1	Automata and Compiler Design	Principles of Programming Languages	Information Retrieval Systems	Computer Graphics
Professional Elective-2	Software Testing Methodologies	Advanced Data Structures	Data Science	Cloud Computing
ProfessionalElective-3	Object Oriented Analysis and Design	Big Data Analytics	Deep Learning	Human Computer Interaction
ProfessionalElective-4	Distributed Systems	NoSQL Databases	Soft Computing	Cryptography &Network Security
ProfessionalElective-5	Software Project Management	Scripting Languages	Natural Language Processing	Social Networks and Semantic web

List of Open Elective Courses for other Branches

	Course Code	**Name of the Course**
Open Elective -I	V18CSTOE01 V18CSTOE02 V18CSTOE03	i) Python Programming ii) Operating Systems iii) Software Engineering
Open Elective -II	V18CSTOE04 V18CSTOE05 V18CSTOE06	i) Object Oriented Programming through Java ii) Computer Graphics iii) Software Testing Methodologies
Open Elective -III	V18CSTOE07 V18CSTOE08 V18CSTOE09	i) Linux Shell Scripting ii) Computer Networks iii) Cyber Security
Open Elective -IV	V18CSTOE10 V18CSTOE11 V18CSTOE12	i) Database Management Systems ii) Human Computer Interaction iii) Information Retrieval System

Annexure-VII

IIISem	**OOPs Through C++**	**Course Code:**V20CST03	L	T	P	C
			3	0	0	3

Syllabus Details

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

CO1: Differentiate Procedural Oriented Programming and Object-Oriented Programming. **(K2)**
CO2: Develop programs using Classes and Objects. **(K3)**
CO3: Demonstrate Constructors, destructors&Operator-Overloading. **(K3)**
CO4: Construct Classes using inheritanceand Exceptions. **(K3)**
CO5: Demonstrate Files and Generic Programming. **(K3)**

Syllabus

Unit-I:Introduction to Object-Oriented Programming – Programming Paradigms, Data Types, Variables, Constants, Operators,Decision Statements &Control Structures, Arrays, Namespace, Default Arguments, Constant Arguments, Parameter passing techniques, Features of Object-Oriented Programming.

Unit-II: Introduction to Classes and Objects :Defining Classes & Objects, Access specifiers, Scope Resolution Operator, Static Member variables, Static Member Functions, Array of Objects. Inline Functions, Overloading Member Functions, Objects as Function Arguments, Friend Functions, Friend Class, Local Class, Empty Class, Nested Classes, Return by Reference.

Unit-III: Introduction to Constructors: Characteristics, Constructor with Default Arguments, Parameterized Constructors, Overloading Constructors, Copy Constructor, Dynamic Constructors and Destructors, Anonymous Objects. Introduction to operator Overloading, Rules for Overloading Operators, Overloading Unary & Binary Operators, this keyword, Constraint on Increment and Decrement Operators, Overloading with Friend Functions, Type Conversions.

Unit-IV:Inheritance: Base class and Derived class, Single Inheritance, Multiple Inheritance, Multilevel Inheritance, Hierarchical Inheritance, Hybrid Inheritance, Virtual Base Classes, Constructor in Derived Classes. qualifier classes, Significance of Virtual Functions, Early Vs Late Binding, Pure Virtual Functions, Virtual Destructor.**Exception handling:** Principles of Exception Handling, Keywords, Exception Handling Mechanism, Multiple Catch Statements, Catching Multiple Exceptions, Re-throwing Exception.

Unit-V:Files: File Opening Modes, File Stream Classes, I/O manipulators, Classes for File Handling, Sequential Access Files, Random Access Files, Error Handling Functions.
Generic Programming with Templates: Need for Templates, Class Templates, Function Templates , overloading Template Functions.Introduction to Standard Template Library, Sequential Containers & Associative Containers.

Text Books:

1. Programming in C++, Ashok N Kamthane, 2nd Edition, Pearson.
2. C++ How to Program, Paul J. Deitel, Harvey Deitel, 6th edition, PHI publication.

.

Reference Books:

1. Object Oriented Programming C++, Joyce Farrell, Cengage.
2. Mastering C++, Venugopal, Raj Kumar, Ravi Kumar, TMH.
3. The Complete Reference C++, HerbertSchildt, 4th Edition, Mcgraw Hill.
4. Object Oriented Programming With C++, R. Subburaj, Vikas Publishing House.

III Sem	**Data Structures**	Course Code:V20CST04	L	T	P	C
			3	1	0	3

Syllabus Details

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

CO1: Illustrate the time and space complexities for searching and sorting algorithms. **(K2)**
CO2: Demonstrate linked lists and their applications. (**K3)**
CO3: Demonstrate Stacks and Queues. . **(K3)**
CO4: Illustrate basic operations on binary trees. (**K3)**
CO5: Demonstrate Graphs and their applications. **(K3)**

Syllabus

Unit-I: Introduction, searching and sorting: Introduction to Data Structures, Types of Data Structures, Performance Analysis: Space complexity, time complexity, asymptotic notation.**Searching:** Linear, Binary and Fibonacci search.**Sorting**: Bubble sort, Selection sort, Insertion sort, radix sort, quick sort, and merge sort.

Unit-II: Single linked list: Representation of node, operations on single linked list, **Double linked list:** Representation of node, operations on double linked list. **Circular linked List:** Representation of node and its operations.

Unit-III: Stacks: Definition, Stack ADT, array representation, linked list representation, Towers of Hanoi, infix to postfix conversion, expression evaluation.**Queues:**definition, Queue ADT, Array representation, linked list representation, operations on queues, Applications of Queues, Circular Queue.

Unit-IV: Trees:Introduction: Terminology, representation of trees, **Binary trees:** abstract data type, Properties of binary trees, binary tree representation,**Tree Traversals:**Inorder,Preorder,Postorder.**Binary search trees:** Definition, searching BST, insert into BST, delete from a BST, Height of a BST.

Unit-V: Graph: Introduction, definition, types of Graphs,GraphRepresentation, operations.**Graph Traversal Techniques:** Breadth First Search, Depth First Search**Spanning Trees:** minimum cost spanning tree, Prim's and Kruskal's algorithms, Single source shortest Path and all pair shortest path algorithms.

Text Books:

1. Data Structures, algorithms and applications in C, SartajSahni, Universities press, Second Edition.
2. Fundamentals of Data Structures in C, Ellis Horowitz, SartajSahni and Dinesh Mehta, 2nd Edition, Universities Press (India) Pvt. Ltd.

Reference Books:

1. An Introduction to Data Structures with Application, Jean-Paul Tremblay , Paul Sorenson, Second Edition.
2. Fundamentals of Data Structures and algorithms by C V Sastry, RakeshNayak, Ch. Raja Ramesh, IK Publications, new Delhi.
3. Data structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.
4. Problem solving with C++, The OOP, Fourth edition, W.Savitch, Pearson education.

III Sem	**Computer Organization and Architecture**	Course Code:V20CST05	L	T	P	C
			3	0	0	3

Syllabus Details

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

CO1: Illustrate Basic structure of Computers, Instruction types and their addressing modes. **(K2)**
CO2: Describe the different modes of Input / Output transfer. **(K2)**
CO3: Illustrate different types of Memory. **(K2)**
CO4: Describe the different types of Control Unit techniques. **(K2)**
CO5: Explain the Concepts of Pipelining and Parallel Processing **(K2)**

Syllabus

Unit-I: Introduction: Functional Units, Basic Operational Concepts, Bus Structures.
Instruction Sequencing and Addressing Modes: Instructions and Instruction Sequencing, Addressing modes, Basic Input/output Operations.

Unit-II:Input/output Organization: Accessing Input/output devices, Interrupts- Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices,Direct Memory Access, Buses- Synchronous and Asynchronous.

Unit-III:Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative memory, Cache Memory. (Morris Mano)

Unit-IV: Processing Unit: Fundamental Concepts,Execution of a Complete Instruction, Multiple-Bus Organization, Hardwired Control, Microprogrammed Control-Microinstructions, Microprogram Sequencing.

Unit-V: Pipelining: Basic Concepts, Data Hazards, Instruction Hazards
Parallelism: Parallel processing challenges – Flynn‘s classification – SISD, MIMD, SIMD, SPMD, and Vector Architectures - Hardware multithreading – Multi-core processors and other Shared Memory Multiprocessors - Introduction to Graphics Processing Units, Clusters, Warehouse Scale Computers and other Message-Passing Multiprocessors.

Text Books:

1. Computer Organization, Carl Hamacher, ZvonkoVranesic, SafwatZaky, 5th Edition, McGraw Hill Education.Computer System Architecture, M. Morris Mano, 3rd Edition, Pearson Education..
David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Fifth Edition, Morgan Kaufmann / Elsevier, 2014.

Reference Books:

1. Computer Organization and Architecture, William Stallings, 10th Edition, Pearson Education.
2. Computer Architecture and Organization, John P. Hayes, 3rd Edition, McGraw Hill Education.

III Sem	**OOPs Through C++ Lab**	Course Code:V20CSL03	L	T	P	C
			0	0	3	1.5

Syllabus Details

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

CO1: DevelopPrograms onClasses and Objects. (**K3**)
CO2: Demonstrate Constructors, Destructors and Operator-Overloading, Inheritance and Polymorphism. (**K3**)
CO3: Develop programs to handle Exceptions & Files. (**K3**)
CO4: Demonstrate Generic Programming**.** (**K3**)

LIST OF EXPERIMENTS:

1. Demonstrate how to debug basic programs using GDB compiler.
2. Develop programs oncontrol structures.
3. Construct programs for following concepts.
   a) Default Arguments b) Constant Arguments c) Reference Arguments
4. Construct programs for following concepts.
   a) Classes & Objects b) Inline functions
   c) Static Member functions d) Overloading of Member Functions
5. Develop programs for following concepts.
   a) Objects as Function Arguments b) Friend Functions, Friend class
   c) Local class d) Empty Class& Nested Classes
6. Develop programs for following concepts.
   a) Default constructor b) Constructor with arguments c) Copy constructor
7. Construct programs for following concepts.
   a) Binary b) Unary c) new d) delete
8. Construct programs for following concepts.
   a) Single b) Multilevel c) Hierarchical d) Hybrid
9. Demonstrate the use of Virtual Functions &Virtual Base class.
10. Develop programs to handle following Exceptions.
    a) Division-by-zero b) Overflow in an array
11. Develop programs for following file handling operations.
    a) Copying text files b) Displaying the contents of the file
12. Demonstrate Class template and Function Template.
13. Demonstrate Sequential Containers & Associative Containers.

Text Books:

1. Programming in C++, Ashok N Kamthane, 2nd Edition, Pearson.
2. C++ How to Program, Paul J. Deitel, Harvey Deitel, 6th Edition, PHI publication.

III Sem	**Data Structures Lab**	Course Code: V20CSL04	L	T	P	C
			0	0	3	1.5

Syllabus Details

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

CO1: Construct Programson Sortingand SearchingTechniques. **[K3]**
CO2: IllustrateVariousOperationsOnLinkedLists. **[K3]**
CO3: DevelopProgramsOnStacks,QueuesandTheirApplications. **[K3]**
CO4: DevelopVariousOperationsonTrees and Graphs **[K3]**

LIST OF EXPERIMENTS:

1. Practice followingSortingTechniques
   (A) SelectionSort (B)QuickSort (C)MergeSort
2. Practice followingSearchingMethods
   (A) LinearSearch (B)BinarySearch.
3. Develop program for
   SingleLinkedListandItsOperations.(Create,Insert,Delete,Display)
4. Develop program forDoubleLinkedListandItsOperations.
5. Construct Stack along with their operations using Arrays.
6. Construct Queue along with their operations using Arrays.
7. Develop Circular QueueusingArrays.
8. ConstructQueue along with their operationsusing SingleLinkedList.
9. Construct BinarySearchTree and Its Operations using double linked list.
10. Demonstrate Depth First Search and Breadth First Search Algorithm.
11. Develop Minimum Spanning Tree using Prim's Algorithm.
12. Develop Minimum Spanning Tree Kruskal's Algorithm.

Text books:

1. Data Structures, algorithms and applications in C++, SartajSahni, Universities press, Second Edition.
2. Fundamentals of Data Structures in C++, Ellis Horowitz, SartajSahni and Dinesh Mehta, 2nd Edition, Universities Press (India) Pvt. Ltd.

Reference Books:

1. An Introduction to Data Structures with Application, Jean-Paul Tremblay , Paul Sorenson, Second Edition.
2. Fundamentals of Data Structures and algorithms by C V Sastry, RakeshNayak, Ch. Raja Ramesh, IK Publications, new Delhi.
3. Data structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.
4. Problem solving with C++, The OOP, Fourth edition, W.Savitch, Pearson education.

III Sem	**Linux Shell Scripting Lab**	Course Code:V20CSL05	L	T	P	C
			0	0	3	1.5

Syllabus Details

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

CO1: Demonstrate the basic knowledge of Linux commands and utilities by using Linux shell environment **(K3)**
CO2: Experiment with the Concept of shell Programming on Files and Directories **(K3)**
CO3: Experiment with the Concept of shell Programming on File Permissions **(K3)**
CO4: Experiment with the Concept of shell Programming on Conditional Statements **(K3)**
CO5: Experiment with the Concept of shell Programming on Looping Statements **(K3)**

LIST OF EXPERIMENTS:

1. Experiment the following Unix Commands:
    a) **General Purpose Utilities:**cal, date,man,who.
    b) **Directory Handling Commands:**pwd,cd,mkdir,rmdir.
    c) **File Handling Utilities:**cat,cp,ls,rm,nl,wc
    d) **Displaying Commands:** head, tail
    e) **Filters:** cmp,comm.,diff,sort,uniq
    f) **Disk Utilities:**du,df
2. Develop a Shell Program to Display all the words which are entered as command line arguments.
3. Develop a shell script that Changes Permissions of files in PWD as rwx for users.
4. Develop a shell script to print the list of all sub directories in the current directory.
5. Develop a Shell Program which receives any year from the keyboard and determine whether the year is leap year or not. If no argument is supplied the current year should be assumed.
6. Develop a shell script which takes two file names as arguments-If their contents are same then delete the second file.
7. Develop a shell script to print the given number in the reversed order.
8. Develop a shell script to print first 25 Fibbonacci numbers.
9. Develop a shell script to print the Prime numbers between the specified range.
10. Develop a shell script to delete all lines containing the word 'unix' in the files supplied as arguments.
11. Develop a shell script Menu driven program which has the following options.
    i) contents of /etc/passwd
    ii) list of users who have currently logged in.
    iii) present working directory. iv) exit.

Text Books:

1. UNIX and Shell Programming: A Textbook, Behrouz A. Forouzan | Richard F. Gilberg, Cengage Learning
2. UNIX : Concepts and Applications, Sumithaba Das, 4th Edition, Tata McGrawHill.
3. Unix & Shell Programming, M.G.Venkatesh Murthy, Pearson Education
4. Unix shells by example,4th Edition Ellie Quigley, Pearson Education.

IV SEM	**Design and Analysis of Algorithms**	Course Code: V20CST06	L	T	P	C
			3	0	0	3

Syllabus Details

Course Outcomes: At the end of the Course student will be able to:

CO1: Demonstrate asymptotic notation and divide and conquer technique. **(K3)**
CO2: Use greedy technique to solve various problems. **(K3)**
CO3: Demonstrate dynamic programming technique to various problems. **(K3)**
CO4: Develop algorithms using backtracking technique. **(K3)**
CO5: Demonstrate branch and bound technique to various problems. **(K3)**

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

Divide and Conquer: General Method, Binary Search, Finding the Maximum and Minimum, Merge Sort, Quick Sort-Performance Measurement,

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

Unit-III: 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-IV: Backtracking: The General Method, 8-Queens Problem, Sum of Subsets, Graph Coloring, and Hamiltonian Cycles.

UNIT-V: 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.Basic Concepts of NP-hard and NP-complete problems.

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, Jeffrey D.Ullman.
3.Fundamentals of Data Structures and algorithms by C V Sastry, Rakesh Nayak, Ch. Raja Ramesh, Distributed by WILEY publications, New Delhi.
4. Algorithm Design, Jon Kleinberg, Pearson.

IV Sem	**Software Engineering**	Course Code: **V20CST07**	L	T	P	C
			3	0	0	3

Syllabus Details

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

CO1: Demonstrate the Software Development life cycle Models. **(K3)**
CO2: Illustrate the Requirements engineering process and SRS document. (**K3)**
CO3: Develop the Software Architecture and Design Modeling. **(K3)**
CO4: Apply the Coding & Testing techniques and Risk management strategies. **(K3)**
CO5: Describe Project estimation techniques and Quality Management& Metrics. **(K2)**

Unit-I:Software and Software Engineering: The Nature of Software, Software Engineering, Software Process, Software Engineering Practice, Software Myths.**Softwareprocess models:** Waterfall model, Prototyping, Iterative development, Unified process, RAD model, Spiral model, and agile process.

Unit-II: Software Requirements: Functional and non-functional requirements, User requirements, System requirements, Interface specification, SRS document.**Requirements engineering process:** Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management.

Unit-III: Software Architecture: Role of software architecture, Architecture views, components and connector view, Cohesion and Coupling, documenting architecture design.**Design:** Design concepts, Function-oriented design, object-oriented design, UML diagrams, and Data flow diagram.

Unit-IV: Coding and Testing: Programming principles and guidelines, incrementally developing code. Testing concepts, testing process, Black-box & White-box testing.**Risk management**: Reactive vs. Proactive Risk strategies, Software risks, Risk identification, Risk projection, Risk refinement, RMMM Plan.

Unit-V: Software Project Estimation& Maintenance: Decomposition techniques, Empirical Estimation Models, Maintenance Process, Reengineering, Configuration Management.Metrics for Products&Quality Management: Software Measurement, Metrics for software quality, Quality concepts, Software Reviews, Formal technical reviews, SEI-CMM Model, Six Sigma and ISO 9000 quality standards.

Text Books:

1. Software Engineering, A practitioner's Approach- Roger S.Pressman, 7th Edition, McGrawHill International Edition.
2. Software Engineering- Ian Sommerville, 9th Edition, Pearson education.Software Engineering, A Precise approach, PankajJalote, Wiley

Reference Books:

1. CMMI and Six Sigma: Partners in Process Improvement, Jeannine M. Siviy,M. Lynn Penn, Robert W. Stoddard, 1st edition, Addison Wesley;
2. SoftwareEngineeringprinciplesandpractice,WSJawadekar, 3rdEdition,TMH.

IVSem	**DatabaseManagementSystems**	Course Code: V20CST08	L	T	P	C
			3	0	0	3

CourseOutcomes: AfterSuccessfulcompletionoftheCourse,thestudentwillbeableto:

CO1: DescribeDatabasesystems, variousDatamodelsandDatabasearchitecture. (K2)
CO2: Develop variousreal timeapplications using Relational algebra and Relational calculus. (K3)
CO3: Apply various Normalizationtechniquestorefineschema. (K3)
CO4: ExplainTransactionmanagementandConcurrencycontrol. (K2)
CO5: IllustratevariousDatabaseindexingtechniques. (K2)

UNIT-I:An Overview of Database Systems: Managing data, File systems verses DBMS, Advantages of DBMS, Data models, Levels of abstraction in a DBMS, Data independence, Structure of a DBMS, Client/Server Architecture, E.F.Codd Rules.
Database Design: Database design and ER Diagrams, Entities, Attributes, Entity sets, Relationships and Relationship sets, Conceptual design with ER Models.

UNIT-II:Relational Model: Integrity constraints over relations, Key constraints, Foreign key constraints, General constraints, Enforcing integrity constraints, Querying relational data
Relational Algebra: Selection and Projection, set operation, renaming, Joins, Division, Introduction to Views, destroying/altering Tables and Views
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 data bases.
Schema Refinement (Normalization): Problems caused by redundancy, Decompositions, purpose of Normalizion, 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-IV: 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-V: 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. Database Management Systems, Raghu Ramakrishnan, Johannes Gehrke, 3rd Edition TATA McGraw Hill.
2. An Introduction to Database Systems, C.J Date,A.Kannan,S.JSwamynathan 8th Edition, Pearson Education

Reference Books:

1. Database Systems-Design, Implementation and Management, Peter Rob &Carlos Coronel 7th Edition, Course Technology Inc.
2. Fundamentals of Database Systems, RamezElmasri,Shamkant B. Navathe ,7th Edition, Pearson Education.

3. Database Systems - The Complete Book, Hector Garcia- Molina, Jeffry D Ullman, Jennifer Widom, 2nd Edition, Pearson.

IV Sem	**Java Programming**	Course Code: **V20CST09**	L	T	P	C
			3	0	0	3

Syllabus Details

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

CO1: Describe Java Virtual Machine and Type casting. [K2]
CO2: Demonstrate Concepts like Constructors,Arrays,Nested Classes and Command LineArguments. [K3]
CO3: Implement Concepts of Inheritance and Exception Handling [K3]
CO4: Develop programs on Multi-Threading and Files [K3]
CO5: Implement Event Handling and Swings. [K3]

Syllabus

UNIT-I:Introduction to Java: Introduction to Object Oriented Paradigm,Concepts ofOOP,ApplicationsofOOP,HistoryofJava,JavaFeatures,JVM,ProgramStructure. Variables,PrimitiveDataTypes,Constants,String class, Primitive type conversion and Casting, ControlStructures.

UNIT-II:ClassesandObjects: Classesandobjects,Classdeclaration,Creatingobjects, Methods, Constructors and Constructor Overloading, Importance of Static Keyword andExamples,thisKeyword,Arrays,CommandLineArguments,NestedClasses, Garbage Collector.

UNIT-III:InheritanceandExceptionHandling: Inheritance,superKeyword,final Keyword,MethodOverridingandAbstractClass.Interfaces,CreatingPackages,Using Packages, Importance of Class path. Exception Handling, Importance of try, catch, throw, throws and finallyBlock.

UNIT-IV:Multithreading and Files: Introduction, Thread Lifecycle, Creation of Threads,ThreadPriorities,ThreadSynchronization,CommunicationbetweenThreads. ReadingDatafromFilesandWritingDatato Files,RandomAccessFiles.

UNIT-V:EventHandlingandSwings: IntroductiontoAWT and Applets. Swings: Introduction,Components, Button,Label,Checkbox, List Boxes, Menu andScrollbar, Layout Managers. **EventHandling:**EventDelegationModel, Sources of Events, Event Listeners, Adapter Classes.

TextBooks:

1. Java Programming, E.Balagurusamy, 4th Edition, TMH.
2. The complete Reference Java, 8th Edition, Herbert Schildt,TMH.
3. Introduction to java programming, Y Daniel Liang, 7 Edition,Pearson.

Referencebooks:

1. Core Java: An Integrated Approach , R Nageswara Rao, 7thEdition, DreamTech
2. Head First Java , Kathy Sierra and Bert Bates, 2nd Edition O'reilly

IV Sem	**Statistical Visualization using R Lab**	Course Code: V20CSL06	L	T	P	C
			0	0	3	1.5

Syllabus Details

Course Outcomes: At the end of the Course student will be able to:

CO1: Employ math and simulation in R[**K2]**

CO2: Demonstrate various types of data structures in R**[K3]**

CO3: Apply appropriate control structures to solve a particular Programming problem**[K3]**

CO4: Use R to graphically visualize data and results of statistical calculations **[K3]**

LIST OF EXPERIMENTS:

1. Demonstrate the basic math functions in R
2. Demonstrate Vector operations in R
3. Demonstrate Matrix operations in R
4. Demonstrate Array operations in R
5. Demonstrate Dataframes in R
6. Demonstrate Lists in R
7. Illustrate the following controls statements in R
   a. if and else b. ifelse c. switch
8. Demonstrate for and while loops in R
9. Demonstrate importing and exporting data using R
10. Illustrate the descriptive statistics using summary() in R
11. Demonstrate the following statistical distribution functions in R:
    a. Normal Distribution
    b. Binomial Distribution
    c. Poisson Distribution
    d. Chi Square Distribution
12. Illustrate the following basic graphics in R:
    a. Bar plots
    b. Pie Charts
    c. Histograms
    d. Kernel density plots
    e. Boxplots
    f. Dotplots
13. Illustrate the Correlation and Covariance analysis using R
14. Illustrate the different types of t-tests using R
15. Illustrate the ANOVA test using R

Text Books:

1. R for Everyone, Jared P Lander, Pearson
2. R in Action,Rob I Kabacoff, Manning

Reference Book:

1. The Art of R Programming, Norman Matloff, No Starch Press

IV Sem	**DataBaseManagementSystemLab**	Course Code: V20CSL07	L	T	P	C
			0	0	3	1.5

CourseOutcomes: AfterSuccessfulcompletionoftheCourse,thestudentwill beableto:

CO1:	Construct SQLqueries to perform different database operations.	(K3)
CO2:	Experimentwithvarious constraints and DatabaseIndexingTechniques.	(K3)
CO3:	ConstructPL/SQLCursorsandExceptions	(K3)
CO4:	DevelopPL/SQLFunctions,Procedures and Packages	(K3)
CO5:	Applybasic operations oncollectionsofMongo DB database	(K3)

ListofExperiments

Part-A

1. Construct SQL queriestofacilitateacquaintanceofBuilt-In Functions,String Functions, NumericFunctions,DateFunctionsand ConversionFunctions.
2. Construct SQL queriesusingOperators.
3. Construct SQL queriestoRetrieveandChangeData:Select,Insert,Delete,andUpdate
4. Construct SQL queriesusingGroupBy,OrderBy,andHavingClauses.
5. Construct SQL queriesonControllingdata:commit,rollback,and savepoint
6. Construct reportusingSQL*PLUS
7. Construct SQL queriesforCreating,Dropping,and AlteringTables,Views,andConstraints
8. Construct SQL queriesonJoinsandCorrelatedSubqueries
9. DemonstrateIndex,Sequence and Synonym.
10. Demonstrate Controllingaccess,lockingrowsforupdate and securityfeatures.

PL/SQL

11. DemonstrateBasicVariables,AnchoredDeclarations,andUsageofAssignmentOperation Using PL SQL block
12. Demonstrate BindandSubstitutionVariables using PL SQL block
13. Demonstrate ControlStructures in PL SQL
14. Demonstrate Cursors,ExceptionsandCompositeDataTypes in PL SQL.
15. Demonstrate Procedures,Functions,and Packages in PLSQL.

Part-B

1. Demonstrate the installation of Mongo DB database.
2. Demonstrate Creatingand droppingdatabase, collection in Mongodb.
3. Demonstrate Insertion, updation and deletion operations in Mongodb database.
4. Construct queries for Projection,limitingrecords,sortingrecordsandaggregationinMongodb database.

TextBooks:

1. OracleDatabase11gTheCompleteReferencebyOraclePress,Kevin Loney
2. DatabaseSystemsUsingOracle,NileshShah,2ndEdition, PHI.
3. IntroductiontoSQL,RickFVan derLans,4thEdition,PearsonEducation.

ReferenceBooks:

1. OraclePL/SQLInteractiveWorkbook,B.RosenzweigandE.Silvestrova,2ndEdition,Pearsone ducation.
2. SQL&PL/SQLforOracle10 g,BlackBook, Dr.P.S.Deshpande, DreamTech.

IVSem	**Java ProgrammingLab**	Course Code: **V20CSL08**	L	T	P	C
			0	0	3	1.5

Syllabus Details

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

CO1: Demonstrate Programs on Classes, Objects, Constructors and Arrays. **(K3)**
CO2: Demonstrate Inheritance and Exception Handling. **(K3)**
CO3: Implement programs on Multi-Threading and File Handling. **(K3)**
CO4: Implement Event handling usingSwings. **(K3)**

List of Experiments

1. Develop programs on Control Structures and Type Conversions injava.
2. Develop programs using various String handling functions
3. Construct programs using the followingconcepts:
   a) Classes & Objects b) Usage of static c)Constructors
4. Construct programs usingthe followingconcepts.
   a) Arrays b) Nested Classes c) Command LineArguments
5. Construct programs using the followingconcepts.
   a) Inheritance b) Usageofsuper c)MethodOverriding
6. Construct programs using the followingconcepts.
   a) Usageoffinal b) Abstract class c)Interfaces
7. Implement the programs using the concepts
   a) Packages b) ExceptionHandling.
8. Implement the programs on Multi-Threading.
   a) Multiple Threads onSingleObject b) Thread Deadlock
9. Construct a program that shows Inter-threadCommunication
10. Construct programs to perform read and writeoperations on files.
    a) Sequential Files b) Random Access files
11. Develop GUI usingSwings.
12. Construct programs on Event Handling using ListenerInterfaces.

Text books:

1. The complete Reference Java, 8th Edition, Herbert Schildt,TMH.
2. Introduction to java programming, Y Daniel Liang, 7 Edition,Pearson.

Annexure-VIII

Proposed Courses and Syllabi for other Branches under V20 Regulation

S.No.	Course Code	Course Name
1	V20CSL31	Data Structures Lab
2	V20CSL32	Python Programming Lab
3	V20CSL33	Object-OrientedProgrammingThrough Java Lab

	DATA STRUCTURES LAB	Course Code: V20CSL31	L	T	P	C
			0	1	3	1.5
Branch	Common to ECE, EEE,ECT, CIVIL and MECH					

Syllabus Details

Course Outcomes:

CO1: ConstructSorting and searching methods. (K3)
CO2: Implement programs using Singly Linked Lists, Double Linked List. (K3)
CO3: Construct Basic Data Structures, Stacks, Queues and Applications. (K3)
CO4: construct Binary search tree (K3)
CO5: Implement various graph operations and shortest path algorithm. (K3)

List of Experiments

1. Bubble sort, Insertion sort, Selection sort, Quick sort, Merge sort.

   Programs to implement the following sorting techniques
   a) Selection sort b) Quick sort c) Merge sort

2. Linear search and Binary search.
   Programs to implement the following searching methods
   a) Linear search b) Binary search.

3. Basic Terminology, Classification of Data Structures, Operation on Data Structures. **Arrays**: Representation of arrays - Polynomial representation, Addition of two polynomials.

   A Program to implement addition of two polynomials. (using arrays).

4. single linked list Representation of node, operations on single linked list,
   A Program to implement single linked list and its operations. (create, insert, delete, display, reverse list)

5. **Double linked list**: operations like insert delete and display.
   A Program to implement double linked list and its operations.

6. **Stacks:** Introduction, Array representation, Operations, linked list representation, operation on linked stacks
   A Program to implement stack operations using arrays.
7. **Queues:** Introduction, Array representation, linked list representation, operation on queues, types of queues
   A Program to implement queue operations using arrays.
8. Applications of Stacks
   A Program to convert infix expression to postfix expression.

9. Introduction, Terminology, Representation of Trees, types of trees, **Binary Trees:** Properties of Binary Trees, Tree Traversals. **Binary Search Tree:** Introduction, Creation, insertion, delete, display.

   A Program to implement Binary search Tree and its operations.
10. **Graphs:** Introduction, Terminology, **Graph Traversal techniques**: Depth First Search, Breadth First Search
    A Program to implement graph traversal algorithms (BFS & DFS).

Text Books:

1. Data Structures, algorithms and applications in C++, Sartaj Sahni, Universities press, Second Edition.
2. Fundamentals of Data Structures in C++, Ellis Horowitz, Sartaj Sahni and Dinesh Mehta, 2nd Edition, Universities Press (India) Pvt. Ltd.

Reference Books:

1. An Introduction to Data Structures with Application, Jean-Paul Tremblay , Paul Sorenson, Second Edition.
2. Fundamentals of Data Structures and algorithms by C V Sastry, Rakesh Nayak, Ch. Raja Ramesh, IK Publications, new Delhi.
3. Data structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.
4. Problem solving with C++, The OOP, Fourth edition, W.Savitch, Pearson education.

	PYTHON PROGRAMMING LAB	Course Code: V20CSL32	L	T	P	C
			0	1	3	1.5
Branch	Common to ECE, EEE,ECT, CIVIL and MECH					

Syllabus Details

1. Course Outcomes:Upon completion of the course, students will be able to

CO1: Demonstrate Basic Python Programs (K3)
CO2: Constructcontrol structures in python (K3)
CO3: Demonstrate functions and packages. (K3)
CO4: Construct python programs using structured data types. (K3)
CO5: Demonstrate TextFiles (K3)

2. Syllabus

Basics of python programming: Features of python – History of Python - The Future of Python installation and execution - Data types – Identifiers - variables – type conversions- Literal Constants – Numbers – Strings. I/O statements.Operators and expressions, operator precedence – expression evaluation.

Exercise 1 - Basics
a) A sample Python Script using command prompt, Python Command Line and IDLE
b) A program to purposefully raise an Indentation Error and correct it

Exercise 2 - Operations
a) A program to compute distance between two points taking input from the user (Pythagorean Theorem)
b) A program on add.py that takes 2 numbers as command line arguments and prints its sum.

Decision Control statements: conditional (if), alternative (if-else), chained conditional (if-elif-else); **Iteration:** while loop, for loop, nested for loop, range function, break, continue and pass statements.

Exercise - 3 Control Flow
a) A Program to implement for checking whether the given number is a even number or not.
b) A program to construct reverse the digits of a given number and add it to the original, If the sum is not a palindrome repeat this procedure.
c) A program using a while loop that asks the user for a number, and prints a countdown from that number to zero.

Exercise 4 - Control Flow – Continued

a) A program to construct the following pattern, using a nested for loop.

```
*
* *
* * *
* * * *
* * * * *
* * * *
* * *
* *
*
```

b) By considering the terms in the Fibonacci sequence whose values do not exceed four million, find the sum of the even-valued terms.

Functions and modules : Introduction - Function Definition - Function Call – argument types- Scope and Lifetime - The return statement - More on Defining Functions - Lambda Functions or Anonymous Functions.

Exercise - 5 – Problem Solving using Functions
a) Find mean, median, mode for the given set of numbers passed as arguments to a function
b) Develop a function nearly_equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on b.
c) Develop a Recursive Function to find the Factorial of a given number .
d) Develop function to compute gcd, lcm of two numbers. Each function shouldn't exceed one line.

Lists: list operations, list slices, list methods, mutability, cloning lists, list parameters. **Tuples**: tuple assignment, tuple as return value. **Set:** Set Creation, Set Operations. **Dictionaries**: Creation, operations; comprehension, operations on strings.

Exercise - 6 Structured Data types
a) a program to count the number of strings where the string length is 2 or more and the first and last character are same from a given list of strings.
b) a program to develop unzip a list of tuples into individual lists and convert them into dictionary.

Exercise – 7 Structured Data types Continued
a) A program to count the numbers of characters in the string and store them in a dictionary data structure
b) a program to use split and join methods in the string and trace a birthday with a dictionary data structure.

Documentation Strings- Modules – Packages

Exercise - 8– Modules
a) Install packages requests, flask and explore them using (pip)
b) A program to implement a script that imports requests and fetch content from the page. Eg. (Wiki)
c) Develop a simple script that serves a simple HTTP Response and a simple HTML Page

Introduction - Types of files - Text files - reading and writing files

Exercise - 9 Files
a) a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?
b) a program to compute the number of characters, words and lines in a file.

Classes, Methods, Constructor, Inheritance, Overriding Methods, Data hiding

Exercise - 10 OOP
a) Class variables and instance variable and illustration of self variable
i) Robot
ii) ATM Machine

Text Books:

1. "Python Programming using problem solving Approach" ReemaThareja, Oxford University Press – 2017.
2. Python with Machine Learning by A.Krishna Mohan, Karunakar & T.Murali Mohan by S. Chand Publisher-2018.

	OBJECT-ORIENTED PROGRAMMING THROUGH JAVA LAB	Course Code: V20CSL33	L	T	P	C
			0	1	3	1.5
Branch	Common to ECE, EEE,ECT, CIVIL and MECH					

Syllabus Details

Course Outcomes: After the completion of this course, students will be able to

CO1: Use code editors and JDK tools to write, compile, and run Java programs.
CO2: Use control statements and arrays while programming.
CO3: Develop programs using classes and objects.
CO4: Use inheritance, interfaces and packages while developing programs in Java.
CO5: Apply exception-handling mechanism.
CO6: Develop multithreaded programs.

Syllabus:

CYCLE–I:Overview of Object-oriented Programming: Introduction to Object-oriented Programming, Principles of Object-oriented Programming Languages, and Applications of OOP.
Introduction to Java: History of Java, Java Features, Java Virtual Machine, Java Program Structure, Literals, Identifiers, Primitive Data types, Variables, Operators and Expressions, Operator Precedence and Associativity, Type Conversion and Casting.

Exercises

a) Develop a Java program to display the default values of all primitive data types of Java.
b) Construct a Java program that calculates the area of a triangle, given the lengths of all three sides.
Area =$\sqrt{(S\,(S-a)\,(S-b)\,(S-c))}$, where S = (a+b+c)/2.

CYCLE– II: Control Statements: Conditional Statements - if, switch; Iteration Statements - while, do-while, for, for-each version of for; Jump Statements - break, continue, return.
Arrays: Introduction to Arrays, Array Declaration and Initialization, One-Dimensional Arrays, Multi-Dimensional Arrays, Basic String Handling.

Exercises

a) Develop a Java program that displays
   i) The roots of a quadratic equation $ax^2+bx+c=0$
   ii) The nature of roots by calculating the discriminate D.
b) N bikers compete in a race such that they drive at a constant speed, which may or may not be the same as the other. To qualify the race, the speed of a racer must be more than the average speed of all N racers. Take as input, the speed of each racer and print back the speed of qualifying racers.
c) Develop a Java program that displays the name of the day, based on the value of day, using the switch statement.
d) Develop a Java program to search for an element in a given list of elements using Linear Search.
e) Develop a Java program to perform multiplication of two matrices.
f) Develop a Java program using StringBuffer to perform various operations on a string.

CYCLE– III: Introduction to Classes and Objects: General Form of a Class, Methods, Declaring Objects using new, Constructors, this Keyword, Understanding static, Method and Constructor Overloading, Using Command-Line Arguments, Garbage Collection.

Exercises

a) Construct a Java program to demonstrate class mechanism - Create a class that contains variables, methods, constructors and invoke those methods inside main().
b) Develop a Java program demonstrating the use of static variables, methods.
c) Develop a Java program demonstrating the use of this keyword.
d) Develop a Java program that implements method overloading.
e) Develop a Java program that implements constructor overloading.
f) Develop a Java program demonstrating the use of command-line arguments.

CYCLE– IV: Inheritance: Access Control, Introduction to Inheritance, Types of Inheritance, Using super, Method Overriding and Dynamic Method Dispatch, Using final, Abstract Classes.
Interfaces: Defining and Implementing Interfaces.**Packages:** Creating Packages, Importing Packages, Importance of CLASSPATH.

Exercises

a) Construct a Java program to demonstrate single inheritance.
b) Construct a Java program to demonstrate multi-level inheritance.
c) Construct a Java program that illustrates the use of super.
d) Develop a Java program that illustrates runtime polymorphism.
e) Develop a Java program that uses an abstract class to find areas of different shapes.
f) Develop a Java program using interfaces. In addition, use interfaces to achieve multiple inheritance.
g) Construct a Java program that creates a user-defined package. Use the package by importing it in another Java program.

CYCLE– V: Exception Handling: Exception-Handling Fundamentals, Using try and catch, Using throw, Using throws and finally, User-defined Exceptions.

Exercises

a) Develop a Java program to demonstrate exception-handling mechanism using try/catch. Use multiple catch clauses.
b) Construct a Java program for illustrating the use of throw.
c) Construct a Java program for illustrating the use of finally.
d) Construct a java program for demonstrating the creation and use of user-defined exceptions.

CYCLE– VI: Multithreading: Introduction to Multithreading, Creation of Threads, Thread Life Cycle, isAlive() and join(), Thread Synchronization, and Interthread Communication.

Exercises

a) Construct a Java program that creates threads by extending Thread class. The first thread displays “Good Morning” every 1 second, the second thread displays “Hello” every 2 seconds and thethird displays “Welcome” every 3 seconds.
b) Use Runnable to develop a Java program for the above problem.
c) Construct a java program illustrating isAlive() and join().
d) Develop a Java program to solve producer consumer problem using thread synchronization.

TEXT BOOKS:

1. Java: The Complete Reference; 8th edition; Herbert Schildt; TMH.

2. Programming in Java;2nd edition; SachinMalhotra, SaurabhChoudhary; Oxford University Press.

3. Core JAVA, An Integrated Approach; Dr. R. Nageswara Rao; Dreamtech Press.