

# VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI.



Scheme of Teaching and Examinations and Syllabus  
**Master of Computer Applications (MCA)**  
(Effective from Academic year 2020 - 21)

**VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI**

**Master of Computer Applications**

Scheme of Teaching and Examinations – 2020 - 21

Choice Based Credit System (CBCS) and Outcome Based Education(OBE)

**SEMESTER-I**

Sl. No.	Course Type	Course Code	Course Title	Teaching Hours/Week			Examination				Credits
				Lecture	Practical	Tutorial / Skill Development Activities	Duration in hours	SEE Marks	CIE Marks	Total Marks	
1	PCC	20MCA11	Object Oriented Programming with Java	04	-	-	03	60	40	100	04
2	PCC	20MCA12	Operating System with Unix	04	-	-	03	60	40	100	04
3	PCC	20MCA13	Computer Networks	04	-	-	03	60	40	100	04
4	PCC	20MCA14	Mathematical Foundation for Computer Applications	03	-	02	03	60	40	100	04
5	PCC	20MCA15	Research Methodology & IPR	02	-	02	03	60	40	100	02
6	PCC	20MCA17	Java Programming Lab	-	04		03	60	40	100	02
7	PCC	20MCA18	Unix Programming Lab	-	04		03	60	40	100	02
8	PCC	20MCA19	Computer Networks Lab	-	04		03	60	40	100	02
9	20MCA19A		Basics of Programming Language	03			03	60	40	100	0
10			Total	20	12	04	27	540	360	900	24

**Note: PCC- Professional Core Course; PCE- Professional Elective Course**

Each Course (PCC/PCE) shall have case study discussion and may be considered as a part of assignment.

Theory courses internal assessment shall be based on internal test (70% weightage), 30% weightage may be given to open ended questions or higher order cognitive level questions as assignment, quiz and case study questions/ any other assignment useful for learning, minimum at the application level.

Laboratory courses internal assessment shall be based on internal test (70% weightage), 30% weightage may be given to open ended questions or higher order cognitive level questions as assignment, quiz and continues evaluation of practical execution/ assignment of virtual lab may be considered .

**Skill development activities (SDA):**

Students and course instructor/s to involve either individually or in groups to interact together to enhance the learning and application skills.

The students should interact with industry (small, medium and large), understand their problems or foresee what can be undertaken for study in the form of research/ testing / projects, and for creative and innovative methods to solve the identified problem.

The students shall

- (1) Gain confidence in modeling of systems and algorithms.
- (2) Work on different software/s (tools) to Simulate, analyses and authenticate the output to interpret and conclude. Operate the simulated system under changed parameter conditions to study the system with respect to thermal study, transient and steady state operations, etc.
- (3) Handle advanced instruments to enhance technical talent.
- (4) Involve in case studies and field visits/ field work.
- (5) Accustom with the use of standards/codes etc., to narrow the gap between academia and industry.

All activities should enhance student's abilities to employment and/or self-employment opportunities, management skills, Statistical analysis, fiscal expertise, etc.

**Tutorial:**

Tutorial sessions may be conducted using cooperative Learning techniques. Tutorial sheets maintained should indicate date, problem (statement) addressed, and cooperative learning technique employed, solution to the problem. Course coordinator shall maintain document in specific format for tutorial / SDA.

In order to promote reinforcement of TLP, course coordinator to analyze the performance of the student after the execution of particular test item and conduct remedial/ tutorial classes. It is recommended to make changes in delivery methods wherever required and give appropriate assignments/ study materials to fast/slow learners.

**Note:**

- (i) Four credit courses are designed for 50 hours of teaching and learning process
- (ii) Three credit courses are designed for 40hours Teaching – Learning process.
- (iii) Two credit courses are designed for 30hours Teaching – Learning process.

**Bridge Course:**

No credit course, student has to obtain eligibility both in CIE and SEE.

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**SEMESTER-II**

Sl.No	Course Type	Course Code	Title	Teaching Hours/Week			Examination				Credits
				Lecture	Practical	Tutorial / Skill Development Activities	Duration in hours	SEE Marks	CIE Marks	Total Marks	
1	PCC	20MCA21	Database Management System	-	03	-	03	60	40	100	03
2	PCC	20MCA22	Data Structures with Algorithms	-	03	-	03	60	40	100	03
3	PCC	20MCA23	Web Technologies		04	-	03	60	40	100	04
4	PCC	20MCA24	Software Engineering and Design Patterns	02	03	-	03	60	40	100	04
5	PEC	20MCA25X	Elective-1	02	02	-	03	60	40	100	03
6	PEC	20MCA26X	Elective-2	02	02	-	03	60	40	100	03
7	PCC	20MCA27	DBMS Lab with Mini-project		-	04	03	60	40	100	02
8	PCC	20MCA28	Data Structures Lab		-	04	03	60	40	100	02
9	PCC	20MCA29	Web Technologies Lab		-	04	03	60	40	100	02
10			Total	06	17	12	27	540	360	900	26

Elective-1		Elective-2	
20MCA251	Cyber Security	20MCA261	Cryptography and Network Security
20MCA252	Data Mining and Business Intelligence	20MCA262	Artificial Intelligence
20MCA253	Enterprise Resource Planning	20MCA263	Supply Chain Management
20MCA254	User Interface Design	20MCA264	Distributed Operating Systems
20MCA255	Optimization Techniques	20MCA265	Natural Language Processing

**Note:**    **PCC:** Professional Core Course    **PEC:** Professional Elective Course

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**SEMESTER-III**

SLNo	Course Type	Course Code	Title	Teaching Hours/Week			Examination				Credits
				Lecture	Practical	Tutorial / Skill Development Activities	Duration in hours	SEE Marks	CIE Marks	Total Marks	
				L	P	T/SDA					
1	PCC	20MCA31	Machine Learning & Data Analytics using Python	-	04	-	03	60	40	100	04
2	PCC	20MCA32	IOT	-	04	-	03	60	40	100	04
3	PCC	20MCA33	Advances in Java	-	04	-	03	60	40	100	04
4	PEC	20MCA34X	Elective-II	-	04	-	03	60	40	100	04
5	PEC	20MCA35X	Elective-III	-	04	-	03	60	40	100	04
6	PCC	20MCA36	Data Analytics Lab		-	04	03	60	40	100	02
7	PCC	20MCA37	Mini Project with IoT Lab		-	04	03	60	40	100	02
8	PCC	20MCA38	Advances in Java Lab		-	04	03	60	40	100	02
9	<b>Total</b>				<b>20</b>	<b>12</b>	<b>24</b>	<b>480</b>	<b>320</b>	<b>800</b>	<b>26</b>

Elective-III		Elective-IV	
20MCA341	Blockchain Technology	20MCA351	Deep Learning
20MCA342	Cloud Computing	20MCA352	Big data Analytics
20MCA343	Digital Marketing	20MCA353	Programming using C#
20MCA344	Software Testing	20MCA354	Software Project Management
20MCA345	NOSQL	20MCA355	Software Defined Networks

**Internship:**

All the students have to undergo mandatory internship of 4 weeks during the vacation of III semester. Internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take-up/complete the internship shall be declared as fail in internship course and have to complete the same during the subsequent semester. After satisfying the internship requirements the degree will be awarded. However, student can carry out 6<sup>th</sup> semester project without completing the internship.

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**SEMESTER-IV**

Sl.No	Course Type	Course Code	Title	Teaching Hours/Week			Examination				Credits
				Lecture	Tutorial	Practical / Seminar	Duration in hours	SEE Marks	CIE Marks	Total Marks	
				L	T	P/S					
1	PCC	20MCA41	Research/Technical Seminar	-	-	02	02	-	100	100	02
2	PCC	20MCA42	Industry Internship ( 4 weeks)	-	-	--	-	-	100	100	02
3	PCC	20MCA44	Project (during 6 <sup>th</sup> Semester- 16 weeks)	-	-	-	-	40	60	100	20
4	Total			-	-	02	02	40	260	300	24

**Research/Technical Seminar:**

CIE marks shall be awarded by a committee comprising of HoD as Chairman, Guide/co-guide, if any, and a senior faculty of the department. Participation in the seminar by all postgraduate students of the programme shall be mandatory. The CIE marks awarded for Technical Seminar shall be based on the evaluation of Seminar Report, Presentation skill and performance in Question and Answer session in the ratio 50:25:25.

Students may be assigned to do literature survey of existing work on contemporary topics and present in front of the research committee (compulsory). Student shall highlight on the research gap and propose solution. Seminar presentation and report have to be evaluated using rubrics.

**Paper publication:**

Student has to publish a research paper in indexed journal / conference. The publications follows the thesis. 20% weightage is given in CIE as well as in SEE.

**Project:**

The candidate should carry out the project in any industry or R&D institution or educational institution under a guide/co-guide. The candidate has to present the work carried out before the examiners during the University examination. The work out carried out should be free from plagiarism. The literature study may be clearly written which may be summary of existing project and highlight of what are the functionalities that are proposed to this project. Student shall indicate the different research papers, documents refereed as a part of the literature study. This is an individual project for a duration of minimum of 4 months or duration of the semester. Rubrics have to be used for evaluation of projects which makes the evaluation transparent and valid. Paper publication in an indexed journal/conference is compulsory as part of the project work.

<b>Object Oriented Programming with Java</b> Choice Based Credit System(CBCS)	
Semester: I	CIE Marks:40
Course Code:20MCA11	SEE Marks:60
Contact Periods (L:T:P):4-0-0	Exam Hours:03
<b>Course Out Comes:</b> CO1: Demonstrate the basic programming constructs of Java and OOP concepts to develop Java programs for a given scenario. CO2: Illustrate the concepts of generalization and run time polymorphism applications to develop reusable components. CO3: Exemplify the usage of Packages, Interfaces, Exceptions and Multithreading in building efficient applications. CO4: Apply Enumerations, Wrappers, Auto boxing, Collection framework and I/O operations for effective coding. CO5: Implement the concepts of Applets, and networking using Java network classes for distributed applications	
Module-1	
<b>Java Programming Fundamentals</b> The Java Language, The Key Attributes of Object-Oriented Programming, The Java Development Kit, A First Simple Program, The Java Keywords, Identifiers in Java, The Java Class Libraries. <b>Introducing Data Types and Operators</b> Java's Primitive Types, Literals, A Closer Look at Variables, The Scope and Lifetime of Variables, operators, Shorthand Assignments, Type conversion in Assignments, Using Cast. <b>Program Control Statements</b> Input characters from the Keyboard, if statement, Nested ifs, if-else-if Ladder, Switch Statement, Nested switch statements, for Loop, Enhanced for Loop, While Loop, do-while Loop, Use break, Use continue, Nested Loops. <b>Introducing Classes, Objects and Methods</b> Class Fundamentals, How Objects are Created, Reference Variables and Assignment, Methods, Returning from a Method, Returning Value, Using Parameters, Constructors, Parameterized Constructors, The new operator Revisited, Garbage Collection and Finalizers, The this Keyword. <b>More Data Types and Operators</b> Arrays, Multidimensional Arrays, Alternative Array Declaration Syntax, Assigning Array References, Using the Length Member, The For-Each Style for Loop, Strings, <b>String Handling</b> String Fundamentals, The String Constructors, Three String-Related Language Features, The Length() Method, Obtaining the characters within a string, String comparison, using indexOf() and lastIndexOf(), Changing the case of characters within a string, String Buffer and String Builder.	
Module-2	
<b>A Closer Look at Methods and Classes:</b> Controlling Access to Class Members, Pass Objects to Methods, How Arguments are passed, Returning Objects, Method Overloading, Overloading Constructors, Recursion, Understanding Static, Introducing Nested and Inner Classes, Varargs: Variable-Length Arguments. <b>Inheritance:</b> Inheritance Basics, Member Access and Inheritance, Constructors and Inheritance, Using super to Call Superclass constructors, Using super to Access Superclass Members, Creating a Multilevel Hierarchy, When are Constructors Executed, Superclass References and Subclass Objects, Method Overriding, Overridden Methods support polymorphism, Why Overridden Methods, Using Abstract Classes, Using final, The Object Class.	

<b>Module-3</b>
<p><b>Interfaces</b> Interface Fundamentals, Creating an Interface, Implementing an Interface, Using Interface References, Implementing Multiple Interfaces, Constants in Interfaces, Interfaces can be extended, Nested Interfaces, Final Thoughts on Interfaces.</p> <p><b>Packages</b> Package Fundamentals, Packages and Member Access, Importing Packages, Static Import</p> <p><b>Exception Handling</b> The Exception Hierarchy, Exception Handling Fundamentals, The Consequences of an Uncaught Exception, Exceptions Enable you to handle errors gracefully, using Multiple catch clauses, Catching subclass Exceptions, try blocks can be nested, Throwing an Exception, A Closer look at Throwable, using finally, using throws, Java's Built-in Exceptions, New Exception features added by JDK7, Creating Exception Subclasses.</p>
<b>Module-4</b>
<p><b>Multithreaded Programming</b> Multithreading fundamentals, The Thread Class and Runnable Interface, Creating Thread, Creating Multiple Threads, Determining When a Thread Ends, Thread Priorities, Synchronization, using Synchronization Methods, The Synchronized Statement, Thread Communication using notify(), wait() and notifyAll(), suspending, Resuming and stopping Threads.</p> <p><b>Enumerations, Autoboxing and Annotations</b> Enumerations, Java Enumeration are class types, The Values() and ValueOf() Methods, Constructors, methods, instance variables and enumerations, Auto boxing, Annotations (metadata)</p>
<b>Module-5</b>
<p><b>Networking with Java.net</b> Networking fundamentals, The Networking classes and Interfaces, The InetAddress class, The Socket Class, The URL class, The URL Connection Class, The Http URL Connection Class.</p> <p><b>The collections Framework:</b> Collections Overview, Recent Changes to Collections, The Collection Interfaces, The Collection Classes, Accessing a collection Via an Iterator, Storing User Defined Classes in Collections, The Random Access Interface, Working With Maps, Comparators, The Collection Algorithms, Why Generic Collections?, The legacy Classes and Interfaces, Parting Thoughts on Collections.</p>
<b>Textbooks</b>
<p>1. Java Fundamentals, A comprehensive Introduction by Herbert Schildt, Dale Skrien. Tata McGraw Hill Edition 2013. (Chapters: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 22, 23, 24, 25, 26)</p> <p>2. Herbert Schildt: JAVA the Complete Reference, 7th/9th Edition, Tata McGraw Hill, 2007. (Chapter 17)</p>
<b>References</b>
<p>1. Java Programming by Hari Mohan Pandey, Pearson Education, 2012.</p> <p>2. Java 6 Programming, Black Book, KoGenT, Dreamtech Press, 2012.</p> <p>3. Java 2 Essentials, Cay Horstmann, second edition, Wiley</p>



Operating System with UNIX Choice Based Credit System(CBCS)	
Semester: I	CIE Marks:40
Course Code:20MCA11	SEE Marks:60
Contact Periods (L:T:P):4-0-0	Exam Hours:03
<b>Course Outcomes:</b> <b>CO1: Apply the fundamental concepts of the operating systems (OS) for a given problem and discuss its performance issues.</b> <b>CO2: Apply graph theory concepts to model OS problem and give valid conclusions.</b> <b>CO3: Analyse the given problem and solve using OS management techniques.</b> <b>CO4: Design algorithms for the given problem &amp; compare its performance with existing ones.</b> <b>CO5: Demonstrate the working of basic commands of Unix environment including file processing</b> <b>CO6: : Demonstrate the usage of different shell commands, variable and AWK filtering to the given problem</b>	
Module-1	
Introduction to Operating Systems, System Structure What operating systems do; Computer System Organization; Computer System Architecture; Operating System Operations; Computing Environments; Operating System Services; System Calls; Types of System Calls; System Programs; Operating System Structure; Virtual Machines; System boot. Overview of Process Process Concept; Process Scheduling; Operations on Processes; Inter – Process Communication; Multi – Threaded Programming: Overview: Multithreading Models.	
Module-2	
<b>Process Management Process Scheduling:</b> Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Multiple Processor Scheduling. Process Synchronization Synchronization: The Critical Section Problem: Peterson’s Solution; Semaphores; Classical Problems of Synchronization.	
Module-3	
<b>Deadlocks:</b> System model; Deadlock Characterization, Methods for handling deadlocks; Deadlock Prevention; Deadlock Avoidance; Deadlock Detection and Recovery from deadlock. Memory Management Memory Management Strategies: Background, Swapping; Contiguous Memory Allocation; Paging; Segmentation; Virtual Memory Management; Background; Demand Paging; Page Replacement; Allocation of Frames; Thrashing.	
Module-4	
<b>The File System:</b> The File, What’s in a File name? The Parent-Child Relationship, The HOME Variable: The Home Directory, pwd, cd, mkdir, rmdir, Absolute Pathnames, Relative Pathnames, The Unix File System. The vi Editor: vi Basics, Input Mode, ex Mode and Command Mode. <b>Basic File Attributes:</b> ls options, File Ownership, File Permissions, chmod, Directory Permissions, Changing the File Ownership More File Attributes: File Systems and Inodes, Hard Links, Symbolic Links, The Directory, umask, Modification and Access Times, find. <b>The Shell:</b> The Shell’s Interpretive Cycle, Shell Offerings, Pattern Matching-The Wild-cards, Escaping and Quoting, Redirection: The Three Standard Files, Two Special Files: /dev/null and /dev/tty, pipes, tee: Creating a Tee, Command Substitution.	
Module-5	
<b>The Process:</b> Process Basics, ps: Process Status, System Processes, Mechanism of Process Creation, Internal and External Commands, Running Jobs in Background, Killing Processes with Signals, Job Control, at and batch, cron. <b>Essential Shell Programming:</b> Shell Variables, Environment Variables, Shell Scripts, read, Using Command Line Arguments, exit and exit status of command, 16 The Logical Operators, The if Conditional, using test and [] to Evaluate Expression, The case	

Conditional, expr, while: looping, for: looping with a list, set and shift, trap, Debugging Shell Scripts with set – x Laboratory Students shall implement programs which supplement the theory concepts.
Text books
<ol style="list-style-type: none"> <li>1. Sumitabha Das: UNIX Concepts and Applications, 4th Edition, Tata McGraw Hill, 2006.</li> <li>2. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne: Operating Systems Principles, 8th Edition, Wiley – India.</li> </ol>
References
<ol style="list-style-type: none"> <li>1. UNIX: The Complete Reference: Kenneth Roson et al, Osborne/McGraw Hill, 2000.</li> <li>2. Using UNIX: Steve Montsugu, 2ndEdition, Prentice Hall India, 1999.</li> <li>3. UNIX and Shell Programming: M G Venkateshmurthy, Pearson Education Asia, 2005 Behrouz A Forouzan and Richard F Gilberg</li> <li>4.D M Dhamdhare: Operating Systems – A Concept Based Approach, 2nd Edition, Tata McGraw – Hill, 2002.</li> <li>5. P C P Bhatt: Operating Systems, 2ndEdition, PHI, 2006.</li> <li>6. Harvey M Deital: Operating Systems, 3rdEdition, Addison Wesley, 1990.</li> </ol>

<b>Computer Networks Choice Based Credit System</b>	
Semester: I	CIE Marks:40
Course code:20MCA13	SEE Marks:60
Contact Hours (L: T:P):4-0-0	Exam Hours:03
<b>Course Outcomes:</b> At the end of the course, the student will be able to  CO1: Apply the basic concepts of networking and to analyse different parameters such as bandwidth, delay, throughput of the networks for the given problem. CO2: Apply different techniques to ensure the reliable and secured communication in wired and wireless communication CO3: Analyse the networking concepts of TCP/IP for wired and wireless components CO4: Identify the issues of Transport layer to analyse the congestion control mechanism CO5: Design network topology with different protocols and analyse the performance using NS2	
<b>Module-1</b>	
Applications, Requirements, Network Architecture, Implementing Network Software, Performance.	
<b>Module-2</b>	
Perspectives on Connecting, Encoding (NRZ, NRZI, Manchester, 4B/5B), Framing, Error Detection, Reliable Transmission, Ethernet and Multiple Access Networks (802.3), Wireless.	
<b>Module-3</b>	
Internetworking and Advanced Internetworking Switching and Bridging, Basic Internetworking (IP), Routing, The Global Internet, Routing among Mobile Devices.	
<b>Module-4</b>	
End-to-End Protocols and Congestion Control Simple Demultiplexer (UDP), Reliable Byte Stream (TCP), Queuing Disciplines, TCP Congestion Control, Congestion-Avoidance Mechanisms.	
<b>Module-5</b>	
Network Security and Applications Cryptographic Building Blocks, Key Pre-distribution, Firewalls, Traditional Applications, Infrastructure Services.	
<b>Text books</b>	
1. “ Computer Networks A Systems Approach” by Larry L Peterson and Bruce S Davie, 5th Edition, MKP – 2012 – (1, 2 ,3.1,3.2,3.3, 3.4,4.1, 5.1,5.2 , 6.2,6.3,6.4, 8.1,8.2,8.5, 9.1,9.3)	
<b>References</b>	
1. James F. Kurose, Keith W. Ross, “Computer Networking – A Top-Down Approach Featuring the Internet”, Fifth Edition, Pearson Education, 2009. 2. Nader. F. Mir, “Computer and Communication Networks”, Pearson Prentice Hall Publishers, 2010. 3. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, “Computer Networks: An Open Source Approach”, Mc Graw Hill Publisher, 2011. 4. Behrouz A. Forouzan, “Data Communication and Networking”, Fourth Edition, Tata McGraw – Hill, 2011.	

Mathematical Foundation for Computer Applications Choice Based Credit System	
Semester: I	CIE Marks:40
Course Code:20MCA14	SEE Marks:60
Contact Hours:3-2-0	Exam Hours:03
<p>Course Outcomes: at the end of the course student will be to</p> <p>CO1: Apply the fundamentals of set theory and matrices for the given problem.</p> <p>CO2: Realize different types of distribution, evaluate the mean and variance for the given case study.</p> <p>CO3: Formulate the problem using linear programming and apply decision making concept for the given case study.</p> <p>CO4: Model the given problem by applying the concepts of graph theory.</p> <p>CO5: Design strategy using gaming theory concepts for the given problem.</p> <p>CO6: Identify and list the different applications of discrete mathematical concepts in computer science.</p>	
Module-1	
<p><b>Set Theory and Matrices</b></p> <p>Sets, Operations on sets, Cardinality of sets, inclusion-exclusion principle, pigeonhole principle, matrices, finding Eigen values and Eigen vectors.</p>	
Module-2	
<p><b>Mathematical Logic</b></p> <p>Propositional Logic, Applications of Propositional Logic, Propositional Equivalences Predicates and Quantifiers, Nested Quantifiers, Rules of Inference Introduction to Proofs</p>	
Module-3	
<p><b>Relations</b></p> <p>Relations and Their Properties, n-ary Relations and Their Application, Representing Relations, Closures of Relations, Equivalence Relations, Partial Orderings</p>	
Module-4	
<p><b>Random variable and probability distribution</b></p> <p>Concept of random variable, discrete probability distributions, continuous probability distributions, Mean, variance and co-variance and co-variance of random variables. Binomial and normal distribution, Exponential and normal distribution with mean and variables and problems</p>	
Module-5	
<p><b>Graph Theory</b></p> <p>Graphs and Graphs models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Coloring</p>	
Text book	
<ol style="list-style-type: none"> <li>1. Kenneth H Rosen, "Discrete Mathematics and its Applications", McGraw Hill publications, 7th edition. (Chapters 2.1,2.2,2.5, 2.6,6.2,8.5,8.6,10.1 to 10.8)</li> <li>2. Wolpole Myers Ye "Probability and Statistics for engineers and Scientist" Pearson Education, 8th edition.</li> </ol>	
References	
<ol style="list-style-type: none"> <li>1. Richard A Johnson and C.B Gupta "Probability and statistics for engineers" Pearson Education.</li> <li>2. J.K Sharma "Discrete Mathematics", Mac Millian Publishers India, 3rd edition, 2011.</li> </ol>	

<b>Research Methodology and IPR Choice Based Credit System</b>	
Semester: I	CIE Marks:40
Course Code:20MCA15	SEE Marks:60
Contact Hours (L: T:P):02:2:0	Exam Hours:03
Course Outcomes: At the end of the course students will be able to	
CO1: Identify the suitable research methods and articulate the research steps in a proper sequence for the given problem.	
CO2: Carry out literature survey, define the problem statement and suggest suitable solution for the given problem.	
CO3: Analyse the problem and conduct experimental design with the samplings.	
CO4: Perform the data collection from various sources segregate the primary and secondary data	
CO5: Apply some concepts/section of Copy Right Act /Patent Act /Cyber Law/ Trademark to the given case and develop –conclusions	
<b>Module-1</b>	
<b>Research Methodology:</b> Introduction, Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Importance of Knowing How Research is Done, Research Process, Criteria of Good Research, and Problems Encountered by Researchers in India.	
<b>Module-2</b>	
<b>Defining the Research Problem:</b> Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, An Illustration. <b>Reviewing the literature:</b> Place of the literature review in research, Bringing clarity and focus to your research problem, Improving research methodology, Broadening knowledge base in research area, Enabling contextual findings, How to review the literature, searching the existing literature, reviewing the selected literature, Developing a theoretical framework, Developing a conceptual framework, Writing about the literature reviewed.	
<b>Module-3</b>	
<b>Research Design:</b> Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, Important Experimental Designs. <b>Design of Sample Surveys:</b> Introduction, Sample Design, Sampling and Non-sampling Errors, Sample Survey versus Census Survey, Types of Sampling Designs	
<b>Module-4</b>	
<b>Data Collection:</b> Experimental and Surveys, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method. <b>Interpretation and Report Writing:</b> Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout.	
<b>Module-5</b>	
<b>Interpretation and Report Writing (continued):</b> of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports.	
Intellectual Property (IP) Acts: Introduction to IP: Introduction to Intellectual Property (IP), different types of IPs and its importance in the present scenario, Patent Acts: Indian patent acts 1970. Design Act: Industrial Design act 2000. SICLD act: The Semi-Conductor Integrated Circuits Layout Design (SICLD) Act, 2000. Copy right acts: Copyright Act	

1957. Trade Mark Act, 1999
Text books
<ol style="list-style-type: none"> <li>1. Research Methodology: Methods and Techniques, C.R. Kothari, Gaurav Garg New Age International 4th Edition, 2018.</li> <li>2. Research Methodology a step-by- step guide for beginners. (For the topic Reviewing the literature under module 2) Ranjit Kumar SAGE Publications Ltd 3rd Edition, 2011 Study Material.</li> <li>3. Intellectual property, Debirag E. Bouchoux, Cengage learning, 2013.</li> </ol>
References
<ol style="list-style-type: none"> <li>1. Research Methods: the concise knowledge base Trochim, Atomic Dog Publishing, 2005.</li> <li>2. Conducting Research Literature Reviews: From the Internet to Paper Fink A Sage Publications, 2009.</li> </ol>

<b>Java Programming Lab</b> <b>Choice Based Credit System</b>	
Semester:I	CIE Marks:40
Course Code:20MCA17	SEE Marks:60
Contact Hours (L: T:P):0:0:4	Exam Hours:03
<p>Course Outcomes: at the end of the course the students will be able to</p> <p>CO1: Demonstrate the fundamental data types and constructs of Java Programming by writing executable/interpretable programs.</p> <p>CO2: Illustrate the object oriented principles with the help of java programs.</p> <p>CO3: Develop reusable and efficient applications using inheritance and multi-threading concepts of java.</p> <p>CO4: Apply client-side programming and networking concepts to develop distributed applications.</p> <p>CO5: Write java programs to demonstrate the concepts of interfaces, inner classes and I/O streams.</p>	
1. Write a JAVA program to demonstrate Constructor Overloading and Method Overloading.	
2. Write a JAVA program to implement Inner class and demonstrate its Access protection.	
3. Write a program in Java for String handling which performs the following: <ul style="list-style-type: none"> <li>a. Checks the capacity of String Buffer objects.</li> <li>b. Reverses the contents of a string given on console and converts the resultant string in upper case.</li> <li>c. Reads a string from console and appends it to the resultant string of (ii).</li> </ul>	
4. Write a JAVA program to demonstrate Inheritance. Simple Program on Java for the implementation of Multiple inheritance using interfaces to calculate the area of a rectangle and triangle.	
5. Write a JAVA program which has: <ul style="list-style-type: none"> <li>a. A Class called Account that creates account with Rs. 500 minimum balance, a deposit() method to deposit amount, a withdraw() method to withdraw amount and also throws LessBalanceException if an account holder tries to withdraw money which makes the balance become less than Rs. 500.</li> <li>b. A Class called Less_Balance_Exception which returns the statement that says withdraw amount (Rs.) is not valid.</li> <li>c. A Class which creates 2 accounts, both account deposit money and one account tries to withdraw more money which generates a Less Balance Exception take appropriate action for the same.</li> </ul>	
6. Write a JAVA program using Synchronized Threads, which demonstrates Producer Consumer concept.	
7. Write a JAVA program to implement a Queue using user defined Exception Handling (also make use of throw, throws). <ul style="list-style-type: none"> <li>a. Complete the following:</li> <li>b. Create a package named shape.</li> <li>c. Create some classes in the package representing some common shapes like Square, Triangle, and Circle.</li> <li>d. Import and compile these classes in other program.</li> </ul>	
8. Write a JAVA program to create an enumeration Day of Week with seven values SUNDAY through SATURDAY. Add a method isWorkday() to the DayOfWeek class that returns true if the value on which it is called is MONDAY through FRIDAY. For example, the call DayOfWeek.SUNDAY.isWorkDay () returns false.	
9. Write a JAVA program which has: <ul style="list-style-type: none"> <li>a. An Interface class for Stack Operations</li> </ul>	

<ul style="list-style-type: none"> <li>b. A Class that implements the Stack Interface and creates a fixed length Stack.</li> <li>c. A Class that implements the Stack Interface and creates a Dynamic length Stack.</li> <li>d. A Class that uses both the above Stacks through Interface reference and does the Stack</li> <li>e. operations that demonstrates the runtime binding.</li> </ul>
10. Write a JAVA program which uses FileInputStream / FileOutputStream Classes.
11. Write JAVA programs which demonstrate utilities of Linked List Class.



<b>Unix Programming Lab</b> <b>Choice Based Credit System</b>	
Semester:I	CIE Marks:40
Course Code: 20MCA18	SEE Marks:60
Contact Hours (L: T:P): 0:0:4	Exam Hours:03
<p>Course Outcomes: at the end of the course students will be able to</p> <p>CO1:Demonstrate the working of basic commands of Unix environment including file processing</p> <p>CO2: Apply Regular expression to perform pattern matching using utilities like grep,sed and awk.</p> <p>CO3: Implement unix commands/ system calls to demonstrate process management</p> <p>CO4: Demonstrate the usage of different shell commands, variable and AWK filtering to the given problem.</p> <p>CO5:Develop shell scripts for developing the simple applications to the given problem.</p>	
<p>Laboratory Experiments:</p> <p>a) Explore Unix Environment.</p> <p>b) Explore vi- editor with Vim tutor. Perform the following operations using vi editor, but not limited to:</p> <ol style="list-style-type: none"> <li>1. Insert character, delete character, replace character.</li> <li>2. Save File and continue working.</li> <li>3. Save File and exit editor.</li> <li>4. Quit the editor.</li> <li>5. Quit without saving the file.</li> <li>6. Rename a file.</li> <li>7. Insert lines, delete line.</li> <li>8. Setline numbers.</li> <li>9. Search for a pattern.</li> <li>10. Move forward and backward.</li> </ol>	
<p>1a. Write a shell script that takes a valid directory name as a argument recursively descend all the sub-directors, find the maximum length of any file in that hierarchy and writ the maximum value to the standard output.</p> <p>1b. Write a shell script that accepts a path name and creates all the components in that path name as directories. For example, if the script is named as mpc, then the command mpc a/b/c/d should create sub-directories a, a/b, a/b/c, a/b/c/d.</p>	
<p>2a. Write a shell script that accepts two filenames as arguments, checks if the permissions for these files are identical and if the permissions are identical, output common permissions otherwise output each filename followed by its permissions.</p> <p>2b. Write a shell script which accepts valid log-in names as arguments and prints their corresponding home directories, if no arguments are specified, print a suitable error message.</p>	
<p>3a. Create a script file called file properties that reads a filename entered and outputs it properties.</p> <p>3b. Write a shell script to implement terminal locking (Similar to the lock command). It should prompt for the user for a password. After accepting the password entered by the user, it must prompt again for the matching password as confirmation and if match occurs, it must lock the keyword until a matching password is entered again by the user. Note the Script must be written to disregard BREAK, control-D. No time limit need be implemented for the lock duration.</p>	
<p>4a. Write a shell script that accept one or more file names as argument and convert all of them to uppercase, provided they exists in current directory.</p> <p>4b. Write a shell script that displays all the links to a file specified as the first argument to the script. The second argument, which is optional, can be used to specify in which the search is to begin. If this second argument is not present, the search is to begin in the current working</p>	

directory. In either case, the starting directory as well as its subdirectories at all levels must be searched. The script need not include error checking.

5a. Write a shell script that accepts filename as argument and display its creation time if file exist and if does not send output error message.

5b. Write a shell script to display the calendar for the current month with current date replaced by \* or \*\* depending whether the date is one digit or two digit.

6a. Write s a shell script to find a file/s that matches a pattern given as command line argument in the home directory, display the contents of the file and copy the file into the directory ~/mydir.

6b. Write a shell script to list all the files in a directory whose filename is at least 10 characters. (use expr command to check the length).

7a. Write a shell script that gets executed and displays the message either “Good Morning” or “Good Afternoon” or “Good Evening” depending upon time at which the user logs in.

7b. Write a shell script that accepts a list of filenames as its argument, count and report occurrence of each word that is present in the first argument file on other argument files.

8a. Write a shell script that determine the period for which as specified user is working on a system and display appropriate message.

8b. Write a shell script that reports the logging on of as specified user within one minute after he/she login. The script automatically terminates if specified user does not login during specified in period of time.

9a. Write a shell script that accepts the filename, starting and ending line number as an argument and display all the lines between the given line number.

9b. Write a shell script that folds long lines into 40 columns. Thus any line that exceeds 40 characters must be broken after 40th, a “/” is to be appended as the indication of folding and processing is to be continued with the residue. The input is to be supplied through a text file created by the user.

10a. Write an awkscript that accepts date argument in the form of dd-mm-yy and display it in the form month, day and year. The script should check the validity of the argument and in the case of error, display a suitable message.

10b. Write an awkscript to delete duplicated line from a text file. The order of the original lines must remain unchanged.

11a. Write an awkscript to find out total number of books sold in each discipline as well as total book sold using associate array down table as given below.

Electrical	34
Mechanical	67
Electrical	80
Computer Science	43
Civil	98
Mechanical	65
Computer Science	64

11b. Write an awkscript to compute gross salary of an employee accordingly to rule given below.

If basic salary < 10000 then HRA=15% of basic & DA=45% of basic.

If basic salary is >=1000 then HRA=20% of basic & DA=50% of basic.

<b>Computer Networks Lab Choice Based Credit System</b>	
Semester:I	CIE Marks:40
Course Code:20MCA19	SEE Marks:60
Contact Hours(L:T:P):0:0:4	Exam Hours:03
<p>Course Outcomes: at the end of the course, the students will be able to</p> <p>CO1:Apply the basic concepts of networking and to analyse different parameters such as bandwidth, delay, throughput of the networks for the given problem.</p> <p>CO2:Apply different techniques to ensure the reliable and secured communication in wired and wireless communication</p> <p>CO3:Analyse the networking concepts of TCP/IP for wired and wireless components</p> <p>CO4:Identify the issues of Transport layer to analyse the congestion control mechanism</p> <p>CO5:Design network topology with different protocols and analyse the performance using NS2</p>	
<b>PART-A</b>	
<b>Implement the following Computer Networks concepts using C/C++</b>	
1. Write a program for distance vector algorithm to find suitable path for transmission.	
2. Using TCP/IP sockets, write a client-server program to make the client send the file name and to make the server send back the contents of the requested file if present.	
3. Write a program for Hamming code generation for error detection and correction.	
4. Write a program for congestion control using leaky bucket algorithm.	
<b>PART-B</b>	
<b>(Simulate the following Computer Networks concepts using any network simulators)</b>	
1.Simulate a three nodes point — to — point network with duplex links between them. Set the queue size and vary the bandwidth and find the number of packets dropped.	
2.Simulate the network with five nodes n0, n1, n2, n3, n4, forming a star topology. The node n4 is at the center. Node n0 is a TCP source, which transmits packets to node n3 (a TCP sink) through the node n4. Node n1 is another traffic source, and sends UDP packets to node n2 through n4. The duration of the simulation time is 10 seconds.	
3.Simulate to study transmission of packets over Ethernet LAN and determine the number of packets drop destination.	
4.Write a TCL Script to simulate working of multicasting routing protocol and analyze the throughput of the network	
5.Simulate the different types of internet traffic such as FTP and TELNET over a wired network and analyze the packet drop and packet delivery ratio in the network.	
6.Simulate the different types of internet traffic such as FTP and TELNET over a wired network and analyze the packet drop and packet delivery ratio in the network.	
<b>Note 1: In the practical exam student has to execute one program from part-A and one from part-B.</b>	

<b>Bridge Course Choice Based Credit System</b>	
Semester: I	CIE Marks:40
Course Code: 20MCA20	SEE Marks:60
Contact Hours(L:T:P):3:0:0	Exam Hours:03
<p>Course Outcomes: At the end of the course students will be able to</p> <p>CO1: Identify special features introduced in C++ when compared to C and illustrate the difference between structure and class using C++ program.</p> <p>CO2: Apply the Concepts of inheritance, polymorphism for the given problem and develop c++ program.</p> <p>CO3: Implement the concept of overloading, default parameters, Constructors and destructors in a c++ program.</p> <p>CO4: Analyse the working of I/O operations with C++ files.</p> <p>CO5: Demonstrate the Exception handling and template for a given problem.</p> <p>CO6: Demonstrate the concepts of data abstraction, information hiding and encapsulation by writing c++ program</p>	
<b>Module-1</b>	
<p><b>C Programming: decision making, control structures and arrays</b></p> <p>Decision making with if statement, simple if statement, the if..else statement, nesting of if..else statements, the else..if ladder, the switch statement, the ?: operator, the goto statement, the break statement, programming examples. The while statement, the do...while statement, the for statement, nested loops, jumps in loops, the continue statement, programming examples. one dimensional and two dimensional arrays, declaration and initialization of arrays, reading , writing and manipulation of above types of arrays.</p>	
<b>Module-2</b>	
<p><b>Structures</b></p> <p>Defining a structure, declaring structure variables, accessing structure members, structure initialization, copying and comparing structure variables, operations on individual members, array of structures, structures within structures, structures and functions, Unions, size of structures.</p>	
<b>Module-3</b>	
<p><b>Pointers</b></p> <p>Pointers in C, Declaring and accessing pointers in C, pointers in C++, Pointer as function arguments, Dynamic Allocation Operators new and delete, Initializing Allocated Memory, Allocating Arrays, Allocating Objects. Overloading, overloading operators.</p>	
<b>Module-4</b>	
<p><b>Classes &amp; Objects:</b> Introduction, Class Specification, Class Objects, access members, defining member functions, data hiding, constructors, destructors, parameterized constructors, static data members, static member functions, scope resolution operator, Passing Objects to Functions, Returning Objects, Object Assignment.</p> <p><b>Pointers and dynamic memory allocation:</b> Pointers, Pointer as function arguments, Dynamic Allocation Operators new and delete, Initializing Allocated Memory, Allocating Arrays, Allocating Objects</p> <p><b>Operator overloading:</b> Operator overloading as member functions and using friend functions. Overloading of binary operators like +, -, *. Creating Prefix and Postfix forms of ++, -- Operators, Operator Overloading Restrictions, Operator Overloading Using a Friend Function to Overload ++ or --, Overloading ( ).</p> <p><b>Inheritance:</b> Base Class, Inheritance &amp; protected members, protected base class inheritance, inheriting multiple base classes, Constructors, Destructors &amp; Inheritance. Passing parameters</p>	

to base Class Constructors, Granting access, Virtual base classes.
<b>Module-5</b>
<p><b>Standard C++ I/O Classes:</b> Old vs. Modern C++ I/O, C++ Streams, The C++ Stream Classes, C++'s Predefined Streams, Formatted I/O, Formatting Using the ios Members, Setting the Format Flags, Clearing Format Flags, Overloading &lt;&lt; and &gt;&gt;, manipulators.</p> <p><b>Exception Handling:</b> Exception Handling, Fundamentals, Catching Class Types, Using Multiple catch Statements, Handling Derived- Class Exceptions, Exception Handling Options, Catching All Exceptions, Restricting Exceptions, Rethrowing an Exception, Understanding terminate( ) and unexpected( ), uncaught_exception( ) Function, The exception and bad_exception Classes, Applying Exception Handling.</p>
<b>Textbooks</b>
<ol style="list-style-type: none"> <li>1. Object oriented programming with C++, E. Balaguruswamy, Tata McGraw Hill.</li> <li>2. Herbert Schildt: C++ The Complete Reference, 4th Edition, Tata McGraw Hill, 2014.</li> <li>3. K R Venugopal, RajkumarBuyya,TRavishanker: Mastering</li> <li>4.Programming in ANSI C, E Balaguruswamy, 7<sup>th</sup> Edition, McGraw Hill.</li> <li>5. C The Complete Reference, Herbert Schild,4<sup>th</sup> Edition,McGraw Hill.</li> </ol>

<b>Data Base Management System Choice Based Credit System</b>	
Semester: II	CIE Marks:40
Course Code: 20MCA21	SEE Marks: 60
Contact Hours(L:T:P): 3:0:0	Exam Hours:03
<p>Course Outcomes: at the end students will be able to</p> <p>CO1: Apply the basic concepts of database management in designing the database for the given problem.</p> <p>CO2: Design entity-relationship diagrams to the given problem to develop database application with appropriate fields and validations.</p> <p>CO3: Implement a database schema for a given problem domain.</p> <p>CO4: Formulate SQL queries in Oracle to the given problem.</p> <p>CO5: Apply normalization techniques to improve the database design to the given problem.</p>	
<b>Module-1</b>	
Characteristics of Database approach, Actors on the Scene, Workers behind the scene, Advantages of using DBMS approach, A Brief History of Database Applications, Data models, schemas and instances, Three-schema architecture and data independence, Database languages and interfaces, the database system environment, Centralized and client-server architectures, Classification of Database Management systems.	
<b>Module-2</b>	
Structure of Relational Databases, Database Schema, Keys, Relational Query Languages, Relational Operations. Entity-Relationship Model: Conceptual Database using high level conceptual data models for Database Design, A Sample Database Application, Entity types, Entity sets Attributes and Keys Relationship types, Relationship Sets Functional Dependencies, Normal Forms based on Primary	
<b>Module-3</b>	
SQL data definition and data types, specifying constraints in SQL, basic retrieval queries in SQL, Insert, update and delete statements in SQL, aggregate functions in SQL, group by and having clauses.	
<b>Module-4</b>	
Introduction to triggers in SQL, views in SQL, schema change statements in SQL, stored procedures and functions.	
<b>Module-5</b>	
Introduction to transaction processing, transaction and system concepts, desirable properties of transactions, transaction support in SQL. Concurrency control techniques: two-phase locking techniques, concurrency control based on timestamp ordering, multiversion concurrency control techniques, validation concurrency control techniques. Recovery techniques: recovery concepts, recovery in multidatabase systems, database backup and recovery from catastrophic failures.	
<b>Text Books</b>	
1. Elmasri and Navathe: Fundamentals of Database Systems, 5 <sup>th</sup> Edition, Addison -Wesley, 2011. 2. Silberschatz, Korth and Sudharshan Data base System Concepts, 6 <sup>th</sup> Edition, Tata McGraw Hill, 2011.	
<b>References</b>	
1. C.J. Date, A. Kannan, S. Swamynatham: An Introduction to Database Systems, 8 <sup>th</sup> Edition,	

Pearson education, 2009.

2. Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, 3rd Edition, McGraw-Hill, 2003.

<b>Data Structures with Algorithms Choice Based Credit System</b>	
Semester: II	CIE Marks:40
Course Code:20MCA22	SEE Marks:60
Contact Hours (L:T:P): 3:0:0	Exam Hours:03
<p>Course Outcomes: student will be able to</p> <p>CO1: Demonstrate different data structures, its operations using C programming.</p> <p>CO2: Analyse the performance of Stack, Queue, Lists, Trees, Hashing, Searching and Sorting techniques.</p> <p>CO3: Implement some applications of data structures in a high-level language such as C/C++</p> <p>CO4: Design and apply appropriate data structures for solving computing problems.</p> <p>CO5: Compute the efficiency of algorithms in terms of asymptotic notations for the given problem.</p>	
<b>Module-1</b>	
<p>Classification of Data Structures: Primitive and Non- Primitive, Linear and Nonlinear; Data structure Operations, Stack: Definition, Representation, Operations and Applications: Polish and reverse polish expressions, Infix to postfix conversion, evaluation of postfix expression, infix to prefix, postfix to infix conversion.</p>	
<b>Module-2</b>	
<p>Recursion - Factorial, GCD, Fibonacci Sequence, Tower of Hanoi. Queue: Definition, Representation, Queue Variants: Circular Queue, Priority Queue, Double Ended Queue; Applications of Queues. Programming Examples.</p>	
<b>Module-3</b>	
<p>Linked List: Limitations of array implementation, Memory Management: Static (Stack) and Dynamic (Heap) Memory Allocation, Memory management functions. Definition, Representation, Operations: getnode() and Freenode() operations, Types: Singly Linked List. Linked list as a data Structure, Inserting and removing nodes from a list, Linked implementations of stacks, Header nodes, Array implementation of lists.</p>	
<b>Module-4</b>	
<p>Introduction, Fundamentals of the Analysis of Algorithm Efficiency Notion of Algorithm, Fundamentals of Algorithmic Problem Solving, Important Problem Types, Analysis Framework, Asymptotic Notations and Basic efficiency classes, Mathematical analysis of Recursive and Non-recursive algorithms.</p>	
<b>Module-5</b>	
<p>Brute Force: Selection Sort and Bubble Sort, Sequential Search, Exhaustive search and String Matching. Divide-and-Conquer Mergesort, Quicksort, Binary Search, Binary tree Traversals and related properties. Decrease-and-Conquer Insertion Sort, Depth First and Breadth First Search, Topological sorting. Greedy Technique Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm.</p>	
<b>Textbooks</b>	
<ol style="list-style-type: none"> <li>1. Introduction to the Design and Analysis of Algorithms. AnanyLevitin, Pearson Education, 2nd Edition.</li> <li>2. Programming in ANSI C, Balaguruswamy, McGraw Hill Education .</li> <li>3. Data Structures Using C and C++ by YedidyahLangsam and Moshe J. Augenstein and Aaron M Tenanbanum, 2nd Edition, Pearson Education Asia, 2002.</li> <li>4. Introduction to Data Structure and Algorithms with C++ by Glenn W. Rowe.</li> </ol>	



<b>Web Technologies Choice Based Credit System</b>	
Semester: II	CIE Marks:40
Course Code:20MCA13	SEE Marks:60
Contact Hours(L:T:P): 4:0:0	Exam Hours:03
CO1: Apply the concept and usages web based programming techniques. CO2: Demonstrate the development of XHTML documents using JavaScript and CSS. CO3: Illustrate the use of CGI and Perl programs for different types of server side applications. CO4: Design and implement user interactive dynamic web based applications. CO5:Demonstrate applications of Angular JS and JQuery for the given problem	
<b>Module-1</b>	
Web browsers, web servers, MIME, URL, HTTP Introduction to XHTML5 tags, Basic syntax and structure, text markups, images,, lists , tables , Media tags-audio and video ,forms, frames.	
<b>Module-2</b>	
Introduction to CSS, Levels of CSS, Selectors, Font, color and Text Properties, BOX Model, Span and Div tags. Introduction to Javascript, controls statements, Arrays and functions, pattern matching, Element Access, Event Handling.	
<b>Module-3</b>	
Introduction to Bootstrap, First example, containers, Bootstrap elements: colors, tables, images, buttons, button groups, progress bars, Forms, utilities, Classes, alerts, custom forms, Grid System.	
<b>Module-4</b>	
Introduction to JQuery, Syntax, selectors, events, JQuery HTML, JQuery Effects, JQuery CSS.	
<b>Module-5</b>	
Introduction to Angular JS, Directives, Expressions, Directives, Controllers, Filters, Services, Events, Forms, Validations, Examples.	
<b>Textbooks</b>	
1. Web Programming By Chris Bates , Wiley Publications 2. HTML5 Black Book by Dreamtech 3. Angular JS By Krishna Rungta 4. Bootstrap essentials by Snig by Packt-open source	

Software Engineering and Design Patterns Choice Based Credit System	
Semester:II	CIE Marks:40
Course Code:20MCA24	SEE Marks:60
Contact Hours(L:T:P): 3:0:2	Exam Hours:03
<p>Course outcomes: Students will be able to</p> <p>CO1: Identify and define different requirements for the given problem and present in the IEEE format.</p> <p>CO2: Use modern tool to create UML diagrams to create the design for the given problem.</p> <p>CO3: Draw class diagram , analyse the different types of association that exists as per the given problem and represent them using UML notations.</p> <p>CO4: Analyse the given system to identify actors, use cases to design use case diagrams for the given problem using RSA/open source tool.</p> <p>CO5: Design the static/dynamic models to meet application requirements of the given system.</p>	
<b>Module-1</b>	
<p>Introduction: Professional Software Development Attributes of good software, software engineering diversity, IEEE/ACM code of software engineering ethics, case studies.</p> <p>Software Process and Agile Software Development</p> <p>Software Process models: waterfall, incremental development, reuses oriented, Process activities; coping with change, The Rational Unified Process. Agile Methods, Plan-Driven and Agile Development, Extreme Programming, Agile Project Management, scaling agile methods.</p>	
<b>Module-2</b>	
Requirement Engineering: Functional and non-functional requirements, The Software requirements document, Requirements specification, Requirements engineering processes, Requirement elicitation and analysis, Requirement validation, Requirement management.	
<b>Module-3</b>	
<p>What is object orientation? What is OO development? OO themes; Evidence for usefulness of OO development; OO modelling history, modeling as design Technique: Modelling; abstraction; the three models. Object and class concepts; Link and associations concepts; Generalization and inheritance; A sample class model; Navigation of class models; Practical tips. Advanced objects and class concepts; Associations ends; N-array association; Aggregation, Abstract class; Multiple inheritance; Metadata; Reification; Constraints; Derived data; packages; practical tips.</p>	
<b>Module-4</b>	
<p>State modelling: Events, States, Transitions and Conditions; State Diagram; State diagram behaviour; Practical tips. Advanced State Modeling: Nested state diagram; Nested states; Signal generalization; Concurrency; A sample state model, Relation of class and state models; practical. Interaction modelling: Use Case models, Sequence models, Activity models, Use case relationships; Procedural sequence models, special constructs for activity models.</p>	
<b>Module-5</b>	
<p>Project Design and planning:</p> <p>Process planning, Effort estimation, project scheduling and staffing, Software configuration Management plan, Quality plan, Risk Management, Project Monitoring plan</p> <p>Design: Design concepts, Function oriented design, detailed design, verification, matrix.</p>	
<b>Textbooks</b>	
1. Ian Sommerville: Software Engineering, 9 <sup>th</sup> Edition, Pearson Education Ltd, 2011	

<p>2. Pankaj Jalote, Software Engineering, Wiley India Pvt Ltd (2010) Paul C Jorgensen Software Testing A CraftMan's Approach, 2<sup>nd</sup> edition, CRC Press.</p> <p>3. MichelBlaha, James Rumbaugh: Object-Oriented Modelling and Design with UML, 2<sup>nd</sup> edition, Pearson, 2007.</p>
References
<ol style="list-style-type: none"> <li>1. Stephan R. Schach, "Object oriented software engineering", Tata McGrawHill,2008</li> <li>2. Craig Larman, Applying UML and Patterns, 3rd ed, Pearson Education,2005.</li> </ol>

<b>Cyber Security Choice Based Credit System</b>	
Semester:II	CIE Marks:40
Course Code:20MCA251	SEE Marks:60
Contact Hours(L:T:P):2:2:0	Exam Hours:03
<p>Course Outcomes: at the end students will be able to</p> <p>CO1: Apply IT ACT (Cyber law) to the given case/problem and infer from the given case and analyze the gap if exists.</p> <p>CO2: Analyze the working of cyber security principles in designing the system.</p> <p>CO3: Analyze the given problem (cybercrime, vulnerability, threat), develop a strategy (physical, logical or administrative controls) to mitigate the problem and articulate consequences on Society and National Economy.</p> <p>CO4: Examine relevant network defence / web application tool to solve given cyber security problem evaluate its suitability.</p> <p>CO5: Investigate the influence of Block chain technology for the cyber security problem and evaluate its role.</p> <p>CO6: Evaluate provisions available in Indian cyber law to handle infringement of intellectual property rights that happens on the cyber platform.</p>	
<b>Module-1</b>	
<p>Introduction to Cybercrime and Laws</p> <p>Introduction, Cybercrime: Definition and Origins of the word, Cybercrime and information Security, Who are Cybercriminals? Classifications of Cybercrimes. How Criminals Plan Them – Introduction, How Criminals Plan the Attacks, Cybercafé and Cybercrimes, Botnets, Attack Vector, The Indian IT ACT 2000 and amendments.</p>	
<b>Module-2</b>	
<p>Tools and Methods used in Cybercrime</p> <p>Introduction, Proxy Server and Anonymizers, Password Cracking, Key loggers and Spyware, Virus and Worms, Trojan and backdoors, Steganography, DOS and DDOS attack, SQLInjection, Buffer Overflow.</p>	
<b>Module-3</b>	
<p>Phishing and Identity Theft</p> <p>Introduction, Phishing – Methods of Phishing, Phishing Techniques, Phishing Toolkits and Spy Phishing. Identity Theft – PII, Types of Identity Theft, Techniques of ID Theft. Digital Forensics Science, Need for Computer Cyber forensics and Digital Evidence, Digital Forensics Life Cycle.</p>	
<b>Module-4</b>	
<p>Introduction to Intellectual Property Law – The Evolutionary Past - The IPR Tool Kit- Para -Legal Tasks in Intellectual Property Law – Ethical obligations in Para Legal Tasks in Intellectual Property Law –types of intellectual property rights– Innovations and Inventions ,Trade related Intellectual Property Right.</p>	
<b>Module-5</b>	
<p>Network Defense tools and block chain technology</p> <p>Firewalls and Packet Filters: Firewall Basics, Packet Filter Vs Firewall, How a Firewall Protects a Network, Packet Characteristic to Filter, Stateless Vs Stateful Firewalls, Network Address Translation (NAT) and Port Forwarding, the basic of Virtual Private Networks, Linux Firewall, Windows Firewall, Snort: Intrusion Detection System, introduction to block chain technology (definition, tools used for implementation ) and its applications.</p>	
<b>Textbooks</b>	
<p>1.Anti-Hacker Tool Kit (Indian Edition) by Mike Shema, Publication McGraw Hill. (Chapters: 2, 7, 8, 11)</p> <p>2. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal</p>	

Perspectives by Nina Godbole and SunitBelpure, Publication Wiley. (Chapters: 1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.5, 2.6, 2.7, 6.4, 5.2.1, 5.2.2, 5.2.5, 5.3.1, 5.3.2, 5.3.3)

3. DebiragE.Bouchoux: “Intellectual Property”. Cengage learning, New Delhi

### **References**

1.Marjie T. Britz - Computer Forensics and Cyber Crime: An Introduction - Pearson

2. Chwan-Hwa (John) Wu,J. David Irwin - Introduction to Computer Networks and Cyber security - CRC Press

3. Bill Nelson, Amelia Phillips, Christopher Steuart - Guide to Computer Forensics and Investigations - Cengage Learning

<b>Data Mining with Business Intelligence Choice Based Credit System</b>	
Semester:II	CIE Marks:40
Course Code:20MCA252	SEE Marks:60
Contact Hours(L:T:P):2:2:0	Exam Hours:03
<p>Course Outcomes: at the end of the course, students will be able to</p> <p>CO1: Analyse the concept of data warehouse, Business Intelligence and OLAP</p> <p>CO2: Demonstrate data pre-processing techniques and application of association rule mining algorithms</p> <p>CO3: Apply various classification algorithms and evaluation of classifiers for the given problem</p> <p>CO4: Analyse data mining for various business intelligence applications for the given problem</p> <p>CO5: Apply classification and regression techniques for the given problem.</p>	
<b>Module-1</b>	
<p>Overview and concepts Data Warehousing and Business Intelligence:</p> <p>Why reporting and Analysing data, Raw data to valuable information-Lifecycle of Data - What is Business Intelligence - BI and DW in today's perspective - What is data warehousing - The building Blocks: Defining Features - Data warehouses and data marts - Overview of the components - Metadata in the data warehouse - Need for data warehousing - Basic elements of data warehousing - trends in data warehousing.</p> <p><b>The Architecture of BI and DW</b></p> <p>BI and DW architectures and its types - Relation between BI and DW - OLAP (Online analytical processing) definitions - Difference between OLAP and OLTP - Dimensional analysis - What are cubes? Drill-down and roll-up - slice and dice or rotation - OLAP models - ROLAP versus MOLAP - defining schemas: Stars, snowflakes and fact constellations.</p>	
<b>Module-2</b>	
<p>Introduction to data mining (DM):</p> <p>Motivation for Data Mining - Data Mining-Definition and Functionalities – Classification of DM Systems - DM task primitives - Integration of a Data Mining system with a Database or a Data Warehouse - Issues in DM – KDD Process</p> <p>Data Pre-processing: Why to pre-process data? - Data cleaning: Missing Values, Noisy Data - Data Integration and transformation - Data Reduction: Data cube aggregation, Dimensionality reduction - Data Compression - Numerosity Reduction - Data Mining Primitives - Languages and System Architectures: Task relevant data - Kind of Knowledge to be mined - Discretization and Concept Hierarchy.</p>	
<b>Module-3</b>	
<p>Concept Description and Association Rule Mining</p> <p>What is concept description? - Data Generalization and summarization-based characterization - Attribute relevance - class comparisons Association Rule Mining: Market basket analysis - basic concepts - Finding frequent item sets: Apriori algorithm - generating rules – Improved Apriori algorithm – Incremental ARM – Associative Classification – Rule Mining.</p>	
<b>Module-4</b>	
<p>Classification and prediction:</p> <p>What is classification and prediction? – Issues regarding Classification and prediction: Classification methods: Decision tree, Bayesian Classification, Rule based, CART, Neural Network Prediction methods: Linear and nonlinear regression, Logistic Regression. Introduction of tools such as DB Miner /WEKA/DTREG DM Tools.</p>	
<b>Module-5</b>	
<p><b>Data Mining for Business Intelligence Applications:</b></p> <p>Data mining for business Applications like Balanced Scorecard, Fraud Detection,</p>	

Clickstream Mining, Market Segmentation, retail industry, telecommunications industry, banking & finance and CRM etc., Data Analytics Life Cycle: Introduction to Big data Business Analytics - State of the practice in analytics role of data scientists Key roles for successful analytic project - Main phases of life cycle - Developing core deliverables for stakeholders.

**Textbook**

1. J. Han, M. Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann
2. M. Kantardzic, "Data mining: Concepts, models, methods and algorithms, John Wiley & Sons Inc.
3. Paulraj Ponnian, "Data Warehousing Fundamentals", John Willey.
4. M. Dunham, "Data Mining: Introductory and Advanced Topics", Pearson Education.
5. G. Shmueli, N.R. Patel, P.C. Bruce, "Data Mining for Business Intelligence: Concepts, Techniques, and Applications in Microsoft Office Excel with XLMiner", Wiley India

<b>Enterprise Resource Planning Choice Based Credit System</b>	
Semester: II	CIE Marks:40
Course Code:20MCA253	SEE Marks:60
Contact Hours (L: T:P): 2:2:0	Exam Hours:03
<p>Course Outcomes: At the end students will be able to</p> <p>CO1: Analyse the pros and cons of ERP, Data warehousing/Mining and OLAP for the given problem/application.</p> <p>CO2: Analyse the implementation of ERP in the context of business of the different organization.</p> <p>CO3: Analyse and apply ERP for different business modules.</p> <p>CO4: With the help of a case study explain ERP marketing</p> <p>CO5: Analyze the design ERP with future E-commerce and internet.</p>	
<b>Module-1</b>	
Introduction To ERP Overview, Benefits of ERP, ERP and Related Technologies, Business Process Reengineering, Data Warehousing, Data Mining, On-line Analytical Processing, Supply Chain Management	
<b>Module-2</b>	
ERP Implementation: Implementation of Life Cycle, Implementation Methodology, Hidden Costs, Organizing Implementation, Vendors, Consultants and Users, Contracts, Project Management and Monitoring	
<b>Module-3</b>	
Business Modules: Business Modules in an ERP Package, Finance, Manufacturing, Human Resource, Plant Maintenance, Materials Management, Quality Management, Sales and Distribution	
<b>Module-4</b>	
ERP Market : ERP Market Place, SAP AG, People Soft, Baan Company, JD Edwards World Solutions Company, Oracle Corporation, QAD , System Software Associates.	
<b>Module-5</b>	
ERP–Present And Future : Turbo Charge the ERP System, EIA, ERP and E–Commerce, ERP and Internet, Future Directions in ERP.	
Textbooks	
1. Alexis Leon, “ERP Demystified”, Tata McGraw Hill, 1999. 2. Joseph A. Brady, Ellen F. Monk, Bret J. Wangner, “Concepts in Enterprise Resource Planning”, Thomson Learning, 2001.	
Reference	
1.Vinod Kumar Garg and N.K .Venkata Krishnan, “Enterprise Resource Planning concepts and Planning”, Prentice Hall, 1998. 2. Jose Antonio Fernandz, “ The SAP R /3 Hand book”, Tata McGraw Hill	



User Interface Design Choice Based Credit System	
Semester: II	CIE Marks:40
Course code:20MCA254	SEE Marks:60
Contact Hours (L:T:P): 2:2:0	Exam Hours:3
<p>Course Outcomes: at the students will be able to</p> <p>Course Outcomes: At the of the course, students will be able to</p> <p>CO1:Analyse the new technologies that provide interactive devices and interfaces.</p> <p>CO2: Apply the guidelines to develop the UID and evaluate</p> <p>CO3: Apply the development methodologies with an analysis of the social impact and legal issues</p> <p>Understand Direct Manipulation and Virtual Environment</p> <p>CO4: Discuss the command, natural languages and issues in design for maintaining QoS</p> <p>CO5: Persuade user documentations and information search.</p>	
Module-1	
<p><b>Introduction</b></p> <p>Usability of Interactive Systems: Introduction, Usability Goals and Measures, Usability Motivation, Universal Usability, Goals for our profession. Guideline, principles, and theories: Introduction, Guidelines, principles, Theories.</p>	
Module-2	
<p><b>Development Processes</b></p> <p>Managing Design Processes: Introduction, Organizational Design to support Usability, The Four Pillars of Design, Development methodologies: Ethnographic Observation, Participatory Design, Scenario Development, Social Impact statement for Early Design Review, Legal Issues.</p> <p><b>Evaluating Interface Design</b></p> <p>Introduction, Expert Reviews, Usability Testing and Laboratories, Survey Instruments, Acceptance tests, Evaluation during Active Use, Controlled Psychologically Oriented Experiments</p>	
Module-3	
<p><b>Direct Manipulation and Virtual Environments:</b></p> <p>Introduction, Examples of Direct Manipulation, Discussion of direct manipulation, 3D Interfaces, Tele-operation, Virtual and Augmented Reality Menu Selection, Form Filling and Dialog Boxes: Introduction, Task-Related Menu Organization, Single Menus, Combination of Multiple Menus, Content Organization, Fast Movement Through Menus, Data Entry With Menus, Form Filling, Dialog Boxes and Alternatives, Audio Menus and Menus for Small Displays</p>	
Module-4	
<p><b>Command and Natural Languages</b></p> <p>Introduction, Command-organization functionality strategies and structure, Naming and Abbreviations, Natural Language in computing. Interaction Devices: Introduction, Keyboards and Keypads, Pointing Devices, Speech and Auditory interfaces, Displays-Small and Large</p> <p><b>Design Issues</b></p> <p>Quality of Service: Introduction, Models of Response-Time Impacts, Expectations and Attitudes, User Productivity, Variability in Response time, Frustrating Experiences</p> <p>Balancing Function and Fashion: Introduction, Error Messages, Nonanthropomorphic Design, Display design, web page design, Window Design, Color</p>	
Module-5	
<p><b>User Documentation and Online Help :</b></p> <p>Introduction, Online versus paper documentation, Reading from paper versus Displays, Shaping the content of the Manuals, Accessing the Documentation, Online Tutorials</p>	

and animated demonstrations, Online Communities for User Assistance, The Development Process.

### **Information Search and Visualization**

Introduction, Search in Textual Documents and Database Querying, Multimedia document searches, Advanced filtering and Search Interfaces, Information Visualization: Introduction, Data type by task taxonomy, Challenges for information visualization.

### **Textbooks**

1. Ben Shneiderman, Plaisant, Cohen, Jacobs: Designing the User Interface, 5th Edition, Pearson Education, 2010.

### **References**

1 Alan Dix, Janet Finlay, Gregory D. Abowd, Russel Beale: Human-Computer Interaction, III Edition, Pearson Education, 2008.

2 Eberts: User Interface Design, Prentice Hall, 1994

3 Wilber O Galitz: The Essential Guide to User Interface Design- An Introduction to GUI Design, Principles and Techniques, Wiley-Dreamtech India Pvt Ltd, 2011

<b>Optimization Techniques</b> <b>Choice Based Credit System</b>	
Semester: II	CIE Marks:40
Course Code: 20MCA255	SEE Marks:60
Contact Hours (L:T:P):2:2:0	Exam Hours:03
Course Outcomes: at the end of the course, students will be able to CO1: Apply problem solving techniques through OR approaches. CO2: Formulate the problem using linear programming. CO3: Analyze the optimal solution for the given problem by applying Transportation problems. CO4: Analyze the strategies with different players through game theory approach. CO5: Analyze the sequence of jobs to be executed by machines.	
<b>Module-1</b>	
Introduction, operations research, quantitative approach, features of OR, problem solving, methodology of OR. Linear programming- introduction, structure of linear programming model, advantages, general model of LPP, examples of LP formulation, graphical solutions of LP problem	
<b>Module-2</b>	
Linear programming- Simplex method, two-phase method, Big M method.	
<b>Module-3</b>	
Duality in linear programming, formulation of dual linear programming and examples. Assignment problem- Mathematical model of assignment problem, Hungarian method for solving assignment problem.	
<b>Module-4</b>	
Transportation problem: Mathematical model of transportation problem, methods of finding initial solution (Northwest corner rule, Least cost method, Vogel's approximation method), test for optimality in TP using MODI Method.	
<b>Module-5</b>	
Theory of games- introduction, two-person zero sum games, pure strategies (MinMax and MaxMin principles), mixed strategies. The rules of principles of dominance, algebraic method to solve games without saddle point, graphical methods to solve games. Sequencing problems: processing n-jobs through two machines (Johnson's procedure).	
<b>Text books</b>	
1. Operations Theory and Applications, J.K. Sharma, 5 <sup>th</sup> edition, MacMillan publisher India(Chapter 1,2,3,4,5,9,10,11,12,20).	
<b>References</b>	
1. Operations Research S.D Sharma, Kedarnath, Ramnath and Co, 2002. 2. Operations Research – An Introduction Taha H A- Low price edition 7 <sup>th</sup> edition,2006. 3. Introduction to operation Research, Hiller and Liberman, Mc GrawHill , 5 <sup>th</sup> edition ,2001. 4. Operation Research, Prem Kumar Gupta, D S Heera, S Chand Pub., New Delhi, 2007.	

<b>Cryptography and Network Security</b> <b>Choice Based Credit System</b>	
Semester: II	CIE Marks:40
Course Code:20MCA261	SEE Marks:60
Contact Hours(L:T:P): 2:2:0	Exam Hours:03
Course Outcomes: at the of the course students will be able to CO1: Apply encryption techniques for the given problem and analyse the results. CO2: Design the Cipher technique and analyse the functioning of Cipher for the given problem. CO3: Implement the Public and Private key based cryptography algorithms and investigate the results of algorithm based on output. CO4: Design and implement the cryptographic algorithms using programming languages/ tools for the given problem/context. CO5: Design the security planning for the given case study for data classification, access control and propose technical solution, and submit the detailed report with plagiarism check.	
<b>Module-1</b>	
<b>Introduction:</b> OSI Security Architecture, Security Attacks, Security Services, Security Mechanism, model for Network Security. <b>Classical Encryption Technique:</b> Symmetric Cipher Model, Substitution Techniques, Transposition Techniques.	
<b>Module-2</b>	
<b>Data Encryption and advanced encryption techniques:</b> Block Ciphers, Data Encryption Standard and Advanced Encryption Standard Block Cipher Principles, The Data Encryption Standard, Block Cipher Design Principles and Modes of operation, Evaluation Criteria for AES, AES Cipher-Encryption and Decryption, Data Structure, Encryption Round. <b>Public Key Cryptography and Key Management:</b> Principles of Public Key Cryptosystem, RSA algorithm, Key management, Diffie Hellman Key exchange.	
<b>Module-3</b>	
<b>Message Authentication and Hash Function:</b> Authentication Requirement, Authentication Functions, Message Authentication Code, Hash Functions, Digital Signatures, Digital Signature Standard. <b>Authentication Applications:</b> Kerberos, X.509 Authentication Service	
<b>Module-4</b>	
<b>Electronic Mail Security:</b> Pretty Good Privacy (PGP), S/MIME <b>IP Security:</b> IP Security Overview;IP Security Architecture; Authentication Header; Encapsulating SecurityPayload; Combining Security Associations; Key Management.	
<b>Module-5</b>	
<b>Web Security:</b> Web security Considerations; Secure Socket layer (SSL) and Transport layer Security (TLS); Secure Electronic Transaction (SET). <b>System Security:</b> Intruders, Intrusion Detection, Firewall Design Principles- Characteristics, Types of Firewall and Firewall Configuration.	
<b>Text books</b>	
1. William Stallings, “Cryptography and Network Security – Principles and Practices”, 4th Edition, Pearson Education, 2009. (Chapters: 1, 2.1-2.3, 3.1,3.2,3.5, 5.1,5.2, 6.2, 9.1,9.2, 10.1,10.2, 11.1- 11.4, 13.1, 13.3, 14.1, 4.2, 15.1, 15.2, 16.1-16.6, 17.1-17.3, 18.1, 18.2, 20.1; Exclude the topic not mentioned in the syllabus)	
<b>References</b>	
1. Behrouz A. Forouzan and DebdeepMukhopadhyay: “Cryptography and Network Security”, 2nd Edition, Tata McGraw-Hill, 2010. 2. AtulKahate, “Cryptography and Network Security” 2nd Edition TMH.	

<b>Artificial Intelligence Choice Based Credit System</b>	
Semester: II	CIE Marks:40
Course Code:20MCA262	SEE Marks:60
Contact Hours (L: T:P): 2: 2:0	Exam Hours:03
Course Outcomes: at the end of the course students will be able to: <ul style="list-style-type: none"> <li>Identify problems that are amenable to solution by AI methods.</li> <li>Identify appropriate AI methods to solve a given problem.</li> <li>Formalise a given problem in the language/framework of different AI methods.</li> <li>Implement basic AI algorithms.</li> <li>Design and carry out an empirical evaluation of different algorithms on a problem formalisation, and state the conclusions that the evaluation supports.</li> </ul>	
<b>Module-1</b>	
<b>INTRODUCTION TO AI AND PRODUCTION SYSTEMS</b> Introduction to AI-Problem formulation, Problem Definition -Production systems, Control strategies, Search strategies. Problem characteristics, Production system characteristics -Specialized productions system- Problem solving methods – Problem graphs, Matching, Indexing and Heuristic functions -Hill Climbing-Depth first and Breadth first, Constraints satisfaction – Related algorithms, Measure of performance and analysis of search algorithms.	
<b>Module-2</b>	
<b>REPRESENTATION OF KNOWLEDGE</b> Game playing – Knowledge representation, Knowledge representation using Predicate logic, Introduction to predicate calculus, Resolution, Use of predicate calculus, Knowledge representation using other logic-Structured representation of knowledge.	
<b>Module-3</b>	
<b>KNOWLEDGE INFERENCE</b> Knowledge representation -Production based system, Frame based system. Inference – Backward chaining, Forward chaining, Rule value approach, Fuzzy reasoning – Certainty factors, Bayesian Theory-Bayesian Network-Dempster – Shafer theory.	
<b>Module-4</b>	
<b>PLANNING AND MACHINE LEARNING</b> Basic plan generation systems – Strips -Advanced plan generation systems – K strips - Strategic explanations -Why, Why not and how explanations. Learning- Machine learning, adaptive Learning.	
<b>Module-5</b>	
<b>EXPERT SYSTEMS</b> Expert systems – Architecture of expert systems, Roles of expert systems – Knowledge Acquisition – Meta knowledge, Heuristics. Typical expert systems – MYCIN, DART, XOON, Expert systems shells.	
<b>Text books</b>	
1. Kevin Night and Elaine Rich, Nair B., “Artificial Intelligence (SIE)”, Mc Graw Hill-2008. (Units-I,II,VI & V) 2. Dan W. Patterson, “Introduction to AI and ES”, Pearson Education, 2007. (Unit-III).	
<b>Reference books</b>	
1. Peter Jackson, “Introduction to Expert Systems”, 3rd Edition, Pearson Education, 2007. 2. Stuart Russel and Peter Norvig “AI – A Modern Approach”, 2nd Edition, Pearson Education 2007. 3. Deepak Khemani “Artificial Intelligence”, Tata Mc Graw Hill Education 2013. 4. <a href="http://nptel.ac.in">http://nptel.ac.in</a>	

<b>Supply Chain Management Choice Based Credit System</b>	
Semester: II	CIE Marks:40
Course Code:20MCA263	SEE Marks:60
Contact Hours(L:T:P):2:2:0	Exam Hours:03
<p>Course Outcomes:</p> <p>CO1: Demonstrate knowledge of the functions of logistics and supply chain management.</p> <p>CO2: Illustrate the concepts and activities of the supply chain to actual organizations.</p> <p>CO3: Analyse the role of technology in logistics and supply chain management.</p> <p>CO4: Evaluate cases for effective supply chain management and its implementation.</p> <p>CO5:Analyse the role information technology in bringing transparency and execute smart contracts to maintain relationship management.</p>	
<b>Module-1</b>	
Introduction to Supply Chain Management: Supply chain – objectives – importance – decision phases – process view – competitive and supply chain strategies – achieving strategic fit – supply chain drivers – obstacles – framework – facilities – inventory – transportation – information – sourcing – pricing.	
<b>Module-2</b>	
Designing the supply chain network: Designing the distribution network – role of distribution – factors influencing distribution – design options – e-business and its impact – distribution networks in practice – network design in the supply chain – role of network – factors affecting the network design decisions – modeling for supply chain.	
<b>Module-3</b>	
Designing and Planning Transportation Networks.: Role of transportation - modes and their performance - transportation infrastructure and policies - design options and their trade- offs - Tailored transportation.	
<b>Module-4</b>	
Sourcing and Pricing: Sourcing – In-house or Outsource – 3rd and 4th PLs – supplier scoring and assessment, selection – design collaboration – procurement process – sourcing planning and analysis. Pricing and revenue management for multiple customers, perishable products, seasonal demand, bulk and spot contracts.	
<b>Module-5</b>	
Information Technology in the supply chain: IT Framework – customer relationship management – internal supply chain management – supplier relationship management – transaction management – future of IT.	
Text books	
1.Sunil Chopra and Peter Meindl, Supply Chain Management – Strategy, Planning and Operation, Pearson/PHI, 3rd Edition, 2007. 2.Coyle, Bardi, Longley, The management of Business Logistics – A supply Chain Perspective, Thomson Press, 2006. 3.Supply Chain Management by Janat Shah Pearson Publication 2008.	
References	
1.Donald J Bowersox, Dand J Closs, M Bixby Coluper, Supply Chain Logistics Management, TMH, Second Edition, 2008. 2.Wisner, Keong Leong and Keah-Choon Tan, Principles of Supply Chain Management A Balanced Approach, Thomson Press, 2005. 3.David Simchi-Levi et al, Designing and Managing the Supply Chain – Concepts, ISBN-13: 978-0072357561.	



<b>Distributed Operating System Choice Based Credit System</b>	
Semester: II	CIE Marks:40
Course Code:20MCA264	SEE Marks:60
Contact Hours(L:T:P):2:2:0	Exam Hours:03
Course Outcomes: At the end of the course, students will be able to:	
<p>CO1: Analyse design issues and different message passing techniques in DOS, distributed systems</p> <p>CO2: Analyse RPC implementation and its performance in DOS</p> <p>CO3: Analyse the major security issues associated with distributed systems and evaluate techniques available for increasing system security</p> <p>CO3: Apply the concepts of distributed shared memory and resource management for the given problem/ case study.</p> <p>CO4: Analyse distributed file systems and evaluate the performance in terms of fault tolerance, file replication as major factors</p> <p>CO5:Apply modification to the existing algorithms to improve the performance of DOS.</p>	
<b>Module-1</b>	
<p><b>Fundamentals:</b> What is Distributed Computing Systems? Evolution of Distributed Computing System; Distributed Computing System Models; What is Distributed Operating System? Issues in Designing a Distributed Operating System; Introduction to Distributed Computing Environment(DCE).<b>Message Passing:</b> Introduction, Desirable features of a Good Message Passing System, Issues in PC by Message Passing, Synchronization, Buffering, Multi-datagram Messages, Encoding and Decoding of Message Data, Process Addressing, Failure Handling, Group Communication, Case Study: 4.3 BSD UNIX IPC Mechanism.</p>	
<b>Module-2</b>	
<p><b>Remote Procedure Calls:</b> Introduction, The RPC Model, Transparency of RPC, Implementing RPC Mechanism, Stub Generation, RPC Messages, Marshaling Arguments and Results, Server Management, Parameter-Passing Semantics, Call Semantics, Communication Protocols for RPCs, Complicated RPCs, Client-Server Binding, Exception Handling, Security, Some Special Types of RPCs, RPC in Heterogeneous Environments, Lightweight RPC, Optimization for Better Performance, Case Studies: Sun RPC.</p>	
<b>Module-3</b>	
<p><b>Distributed Shared Memory:</b> Introduction, General Architecture of DSM systems, Design and Implementation Issues of DSM, Granularity, Structure of Shared Memory Space, Consistency Models, Replacement Strategy, Thrashing, Other approaches to DSM, Heterogeneous DSM, Advantages of DSM. Synchronization: Introduction, Clock Synchronization, Event Ordering, Mutual Exclusion, Dead Lock, Election Algorithms</p>	
<b>Module-4</b>	
<p><b>Resource Management:</b> Introduction, Desirable Features of a Good Global Scheduling Algorithm, Task Assignment Approach, Load – Balancing Approach, Load – Sharing Approach <b>Process Management:</b> Introduction, Process Migration, Threads.</p>	
<b>Module-5</b>	
<p><b>Distributed File Systems:</b> Introduction, Desirable Features of a Good Distributed File System, File models, File–Accessing Models, File – Sharing Semantics, File – Caching Schemes, File Replication, Fault Tolerance, Atomic Transactions and Design Principles.</p>	

<b>Text books</b>
1. Pradeep. K. Sinha: Distributed Operating Systems: Concepts and Design, PHI, 2007.
<b>References</b>
1. Andrew S. Tanenbaum: Distributed Operating Systems, Pearson Education, 2013.



<b>Natural Language Processing Choice Based Credit System</b>	
Semester:II	CIE Marks:40
Course Code:20MCA265	SEE Marks:60
Contact Hours(L:T:P):2:2:0	Exam Hours:03
<b>Course Outcomes:</b> CO1: Apply parsing technique to the given problem and verify the output and give valid conclusions	
<b>Module-1</b>	
Introduction, Morphology: Knowledge in Speech & Lang Processing, Ambiguity, Models & Algorithms, Language, Thought & Understanding, Some Brief History, The State of the Art & Near-Term Future, Summary Morphology and Finite State Transducers: Survey of English Morphology, Finite state Morphological Parsing, Lexicon-Free FST: The Porter Stemmer, Human Morphological Parsing, Summary, Combining FST Lexicon and Rules.	
<b>Module-2</b>	
N-Grams: Counting Words in Corpora, Simple N-Grams, Smoothing, Back off, Deleted Interpolation, N-Grams for Spelling and Pronunciation, Entropy, Summary. Word Classes and Part-of- Speech Tagging: English Word Classes, Tag sets for English, Part-of-Speech Tagging.	
<b>Module-3</b>	
Context-Free Grammars and Predicate Calculus for English: Constituency, Context-Free Rules and Trees, Sentence Level Constructions, Coordination, Agreement, The Verb Phrase Sub Categorization, Auxiliaries, Spoken Language Syntax, Grammar Equivalence and Normal Form, Finite –State and Context- Free Grammars, Grammars and Human Processing, The Early Algorithm, Finite-State Parsing Method, Summary Representing Meaning:	
<b>Module-4</b>	
Semantic Analysis: Syntax-Driven Semantic Analysis, Attachments for a Fragment of English, Integrating Semantic Analysis into the Earley Parser, Idioms and Compositionality, Robust Semantic Analysis, Summary. Lexical Semantics: Relations Among Lexemes and Their Senses, WordNet: A Database of Lexical Relations, The Internal Structure of Words, Creativity and the Lexicon, Summary Word Sense Disambiguation and Information	
<b>Module-5</b>	
Retrieval: Selection Restriction Based Disambiguation, Robust Word Sense Disambiguation, Information Retrieval, Other Retrieval Tasks, and Summary. Case Study of Simple Text Recognition or Content Based Text Extraction System. Evolving Explanatory Novel Patterns for Semantically-Based Text Mining: Related Work, A Semantically Guided Model for Effective Text Mining.	
<b>Text books</b>	
1.Daniel Jurafsky and James H Martin, “Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition”, 2nd Edition, Prentice Hall, 2009.	
<b>References</b>	
1. Christopher D.Manning and Hinrich Schutze, “Foundations of Statistical Natural Language Processing”, MIT Press, 1999. 2.Tanveer Siddiqui, U.S. Tiwary, “Natural Language Processing and Information Retrieval”, Oxford University Press, 2008. 3.Anne Kao and Stephen R. Poteet (Eds), “Natural Language Processing and Text Mining”, Springer Verlag London Limited 2007.	

<b>DataBase Management Systems Laboratory with Mini Project</b> <b>Choice Based Credit System</b>	
Semester: II	CIE Marks:40
Course Code:20MCA27	SEE Marks :60
Contact Hours (L:T:P):0:0:4	Exam Hours:03
Course Outcomes: at the end of the course students will be able to CO1: Design entity-relationship diagrams to solve simple database applications CO2: Implement a database schema for a given problem domain. CO3: Formulate SQL queries in Oracle CO4: Apply normalization techniques to improve the database design CO5: Build database for any given problem	
<b>Instructions for the Exercises:</b> <b>1. Draw ER diagram based on given scenario with various Constraints.</b> <b>2. Create Relational Database Schema based on the scenario using Mapping Rules.</b> <b>3. Perform the given queries using any RDBMS Environment.</b> <b>4. Suitable tuples have to be entered so that queries are executed correctly.</b> <b>5. The results of the queries may be displayed directly.</b>	
1. Create the following tables with properly specifying Primary keys, Foreign keys and solve the following queries. BRANCH (Branchid, Branchname, HOD) STUDENT (USN, Name, Address, Branchid, sem) BOOK (Bookid, Bookname, Authorid, Publisher, Branchid) AUTHOR (Authorid, Authorname, Country, age) BORROW (USN, Bookid, Borrowed_Date) Execute the following Queries: i. List the details of Students who are all studying in 2nd sem MCA. ii. List the students who are not borrowed any books. iii. Display the USN, Student name, Branch_name, Book_name, Author_name, Books_Borrowed_Date of 2nd sem MCA Students who borrowed books. iv. Display the number of books written by each Author. v. Display the student details who borrowed more than two books. vi. Display the student details who borrowed books of more than one Author. vii. Display the Book names in descending order of their names. viii. List the details of students who borrowed the books which are all published by the same publisher.	
2. Consider the following schema: STUDENT (USN, name, date_of_birth, branch, mark1, mark2, mark3, total, GPA) Execute the following queries: i. Update the column total by adding the columns mark1, mark2, mark3. ii. Find the GPA score of all the students. iii. Find the students who born on a particular year of birth from the date_of_birth column. iv. List the students who are studying in a particular branch of study. v. Find the maximum GPA score of the student branch-wise. vi. Find the students whose name starts with the alphabet "S". vii. Find the students whose name ends with the alphabets "AR". viii. Delete the student details whose USN is given as 1001.	
. Design an ER-diagram for the following scenario, Convert the same into a relational model and then solve the following queries. Consider a Cricket Tournament "ABC CUP" organized by an organization. In the	

tournament there are many teams are contesting each having a Teamid,Team\_Name, City, a coach. Each team is uniquely identified by using Teamid. A team can have many Players and a captain. Each player is uniquely identified by Playerid, having a Name, and multiple phone numbers,age. A player represents only one team. There are many Stadiums to conduct matches. Each stadium is identified using Stadiumid, having a stadium\_name,Address ( involves city,area\_name,pincode). A team can play many matches. Each match played between the two teams in the scheduled date and time in the predefined Stadium. Each match is identified uniquely by using Matchid. Each match won by any of the one team that also wants to record in the database. For each match man\_of\_the match award given to a player.

Execute the following Queries:

- i. Display the youngest player (in terms of age) Name, Team name, age in which he belongs of the tournament.
- ii. List the details of the stadium where the maximum number of matches were played.
- iii. List the details of the player who is not a captain but got the man\_of \_match award at least in two matches.
- iv. Display the Team details who won the maximum matches.
- v. Display the team name where all its won matches played in the same stadium.

### **Part-B**

Students consisting 2 or 3 in a group has to develop a mini-project where they need to implement SQL queries for inserting, deleting and searching the required record.

<b>Data Structures Laboratory Choice Based Credit System</b>	
Semester: II	CIE Marks: 40
Course Code:20MCA28	SEE Marks:60
Contact Hours (L:T:P): 0:0:4	Exam Hours:03
<p>Course Outcome: at the end of the course, Students will be able to</p> <p>CO1: Perform various sorting and searching techniques.</p> <p>CO2: Implement various types of data structures, operations and algorithms.</p> <p>CO3: Work with Stacks, Queues, Circular Queues, Linked Lists, and Trees.</p> <p>CO4: Design and apply appropriate data structures for solving computing problems</p>	
1. Write a C program to Implement the following searching techniques a. Linear Search b. Binary Search.	
2. Write a C program to implement the following sorting algorithms using user defined functions: a. Bubble sort (Ascending order) b. Selection sort (Descending order).	
3. Write a C Program implement STACK with the following operations a. Push an Element on to Stack b. Pop an Element from Stack	
4. Implement a Program in C for converting an Infix Expression to Postfix Expression.	
5. Implement a Program in C for evaluating an Postfix Expression.	
6. Write a program to simulate the working of a singly linked list providing the following operations: a. Display & Insert b. Delete from the beginning/end c. Delete a given element	
7. Obtain the Topological ordering of vertices in a given graph	
8. Check whether a given graph is connected or not using DFS method	
9. From a given vertex in a weighted connected graph, find shortest paths to other vertices Using Dijkstra's algorithm	
10. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.	

Web Technologies Laboratory Choice Based Credit System	
Semester: II	CIE Marks:40
Course Code:20MCA29	SEE Mark :60
Contact Hours(L:T:P) 0:0:4	Exam Hours:03
<p>Course Outcomes: at the end of the course students will be able to</p> <p>CO1: Apply the concept and usages web based programming techniques.</p> <p>CO2: Learning and Developing XHTML documents using JavaScript and CSS.</p> <p>CO3: To be familiar in the use of CGI and Perl programs for different types of server side applications.</p> <p>CO4: Design and implement user interactive dynamic web based applications.</p>	
<p>1.Create an XHTML page that provides information about your department. Your XHTML page must use the following tags:</p> <p>a) Text Formatting tags</p> <p>b) Horizontal rule</p> <p>c) Meta element</p> <p>d) Links</p> <p>e) Images</p> <p>f) Tables (Use of additional tags encouraged).</p>	
<p>2.Develop and demonstrate the usage of inline, external and internal style sheet using CSS. Use XHTML page that contains at least three paragraphs of text, listed elements and a table with four rows and four columns.</p>	
<p>3.Develop and demonstrate a XHTML file that includes Javascript script for the following problems: a) Input : A number n obtained using prompt Output : The first n Fibonacci numbers</p> <p>b) Input : A number n obtained using prompt Output : A table of numbers from 1 to n and their squares using alert</p>	
<p>4.Write a JavaScript program to generate n number of random numbers and store them in an array. Sort the generated numbers in ascending order using array sort method. Develop separate functions to find mean and median of numbers that are in the array. Display the results with appropriate messages.</p>	
<p>5.Create a XHTML document that describes the form for taking orders for popcorn. Text boxes are used at the top of the form to collect the buyer's name and address. These are placed in a borderless table to force the text box align vertically. A second table to collect actual order. Each row of this table names a product, displays the price, and uses text box with size 2 to collect the quantity ordered using tag. The payment method is input by the user through one of four radio buttons. Provide provision for submission of order and clear the order form.</p>	
<p>6.Develop, test and validate an XHTML document that has checkboxes for apple (59 cents each), orange (49 cents each), and banana (39 cents each) along with submit button. Each check boxes should have its own onclick event handler. These handlers must add the cost of their fruit to a total cost. An event handler for the submit button must produce an alert window with the message 'your total cost is \$xxx', where xxx is the total cost of the chose fruit, including 5 percent sales tax. This handler must return 'false' (to avoid actual submission of the form data). Modify the document to accept quantity for each item using textboxes.</p>	
<p>7. a) Develop and demonstrate, a HTML document that collects the USN (the valid format is : A digit from 1 to 4 followed by two upper-case characters followed by two digits followed by three upper-case characters followed by two digits; (no embedded</p>	

spaces are allowed) from the user. Use JavaScript that validate the content of the document. Suitable messages should be display in the alert if errors are detected in the input data. Use CSS and event handlers to make your document appealing.
b) Modify the above program to get the current semester also(restricted to be a number from 1 to 6)
8. Develop and demonstrate a HTML file which includes JavaScript that uses functions for the following problems: a. Parameter: A string Output: The position in the string of the left-most vowel. b. Parameter: A number Output: The number with its digits in the reverse order.
9. Develop and demonstrate a HTML5 page which contains a) Dynamic Progressive bar. b) Display Video file using HTML5 video tag.
10. Develop and demonstrate, using JavaScript script, a XHTML document that contains three short paragraphs of text, stacked on top of each other, with only enough of each showing so that the mouse cursor can be placed over some part of them. When the cursor is placed over the exposed part of any paragraph, it should rise to the top to become completely visible. Modify the above document so that when a text is moved from the top stacking position, it returns to its original position rather than to the bottom.
11. Develop a simple calculator to perform arithmetic (addition, subtraction, multiplication and division) operations on given two numbers. Use an HTML tag that allows the user to input two numbers and to display the result of arithmetic operation. Write suitable HTML and JavaScript and CSS to your simple calculator. The following figure show sample document display.
12. Develop a simple calculator to perform arithmetic (addition, subtraction, multiplication and division) operations on given two numbers. Use an HTML tag that allows the user to input two numbers and to display the result of arithmetic operation. Write suitable HTML and JavaScript and CSS to your simple calculator. The following figure show sample document display.
13. Develop and demonstrate using jQuery to solve the following: a) Limit character input in the text area including count. b) Based on check box, disable/enable the form submit button.
14. Develop and demonstrate using jQuery to solve the following: a) Fade in and fade out all division elements. b) Animate an element, by changing its height and width.