VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI.



Master of Computer Applications (MCA)

Scheme of Teaching and Examinations and Syllabus

(Effective from Academic year 2020 - 21)

VISVESVARAYA TECHNOLOGICAL UNIVERSITY

Master of Computer Applications

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

Scheme of Teaching and Examination

SEMESTER-I

S.No	Course Type	Course Code	Title	Teaching Hours/ Week			Examination				Credits
				L	P	T/S DA	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	20MCA16	Java Programming Lab	-	04		03	60	40	100	02
7	PCC	20MCA17	Unix Programming Lab	-	04		03	60	40	100	02
8	PCC	20MCA18	Computer Networks Lab	-	04		03	60	40	100	02
9	20MCA19BC		Basics of Programming Languages	03	-		03	60	40	100	0
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 (CIE) shall be based on internal test (50% weightage), 50% weightage may be given to other continues assessment carried out during the teaching learning processes. Course coordinator may select suitable assessment techniques/tools for continues evaluation such as weekly MCQ quiz, higher order cognitive level questions as assignment, and case study questions/ any other assignment useful for learning with a minimum cognitive level at the application level. Average marks of three internal tests have to be considered for CIE along with other continues evaluations.

Laboratory courses internal assessment shall be based on internal test (**25**% weightage), remaining 75% weightage shall be given to continues evaluation of practical execution during regular laboratory hours. During regular laboratory hours students may be asked to solve the extended versions of the laboratory program/problem, and demonstrate higher order cognitive level such as analysis and design programming assignment. During the laboratory hours after the program execution, technical quiz may be conducted. Wherever laboratory is also having project work students may be asked to solve novel problems in their projects work.

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 modelling of systems and algorithms.

(2) Work on different software/s (tools) to Simulate, analyse 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 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.
(ii) Two credit courses are designed for 30hours Teaching – Learning process.

Bridge Course:
Basics of Programming Languages with course code 20MCA19A is a NON-CREDIT COURSE (NCC) to be offered only for non-computer science background students. However such students have to obtain eligibility both in CIE and SEE.

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Scheme of Teaching and Examination

SEMESTER-II

S.No	Course Type	Course Code	Title	Teaching Hours/Week			Examination				Credits
				L	P	T/SDA	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	03	-	02	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
Total				**17**	**12**	**06**	**27**	**540**	**360**	**900**	**26**

Elective-I		**Elective-II**	
20MCA251	Cybersecurity	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

S.No	Course Type	Course Code	Title	Teaching Hours/Week			Examination				Credits
				L	P	T/SDA	Duration in hours	SEE Marks	CIE Marks	Total Marks	
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	03	-	-	03	60	40	100	04
5	PEC	20MCA35X	Elective-III	03	-	-	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	**Total**			**18**	**12**	**-**	**24**	**480**	**320**	**800**	**26**

Elective-III		**Elective-IV**	
20MCA341	Block chain 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 4th 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(L)	Tutorial(T)	Practical(P)/ Seminar	Duration in hours	SEE Marks	CIE Marks	Total Marks	
1	PCC	20MCA41	Research/Technical Seminar	-	-	02	02	-	100	100	02
2	PCC	20MCA42	Industry Internship (4 weeks)	-	-	-	-	-	100	100	02
3	PCC	20MCA43	Project (During 4th Semester- 16 weeks)	-	-	-	03	40	60	100	20
Total				**-**	**-**	**02**	**05**	**40**	**260**	**300**	**24**

Research/Technical Seminar:

CIE marks shall be awarded by a committee comprising of HoD as Chairman, Guide/co-guide, ifany, and a senior faculty of the department. Participation in the seminar by all postgraduate students of the programmeshall be mandatory. The CIE marks awarded for Technical Seminar, shall be based on the evaluation of Seminar Report, Presentation skills 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. Publications follow the Thesis. 25% 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.

Project report contents may be similar to project report content of 2018 scheme/syllabus .

Object Oriented Programming with Java

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**

Course Out Comes:

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

Java Programming Fundamentals

The Java Language, The Key Attributes of Object-Oriented Programming, The Java Development Kit, A First Simple Program, The Java Keywords, Identifies in Java, The Java Class Libraries.

Introducing Data Types and Operators

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.

Program Control Statements

Input characters from the Keyword, 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.

Introducing Classes, Objects and Methods

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.

More Data Types and Operators

Arrays, Multidimensional Arrays, Alternative Array Declaration Syntax, Assigning Array References, Using the Length Member, The For-Each Style for Loop, Strings,

String Handling

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, StringBuffer and String Builder.

Module-2

A Closer Look at Methods and Classes:

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.

Inheritance:

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.

Module-3

Interfaces

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.

Packages

Package Fundamentals, Packages and Member Access, Importing Packages, Static Import

Exception Handling

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 JDK 7, Creating Exception Subclasses.

Module-4

Multithreaded Programming

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 notify All(), suspending, Resuming and stopping Threads.

Enumerations, Auto boxing and Annotations

Enumerations, Java Enumeration are class types, The Values() and Valueof() Methods, Constructors, methods, instance variables and enumerations, Auto boxing, Annotations (metadata)

Module-5

Networking with Java.net

Networking fundamentals, The Networking classes and Interfaces, The InetAddress class, The Socket Class, The URL class, The URLConnection Class, The HttpURL Connection Class.

The collections Framework: 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.

Textbooks

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)
2. Herbert Schildt: JAVA the Complete Reference, 7th/9th Edition, Tata McGraw Hill, 2007. (Chapter 17)

References

1. Java Programming by Hari Mohan Pandey, Pearson Education, 2012.
2. Java 6 Programming, Black Book, KoGenT, Dreamtech Press, 2012.
3. Java 2 Essentials, Cay Hortsmann, second edition, Wiley

Operating System with UNIX Choice Based Credit System(CBCS)	
Semester: I	**CIE Marks:40**
Course Code:20MCA12	**SEE Marks:60**
Contact Periods (L:T:P):4-0-0	**Exam Hours:03**

Course Outcomes:

CO1: Apply the fundamental concepts of the operating systems (OS) for a given problem and discuss its performance issues.

CO2: Apply graph theory concepts to model OS problem and give valid conclusions.

CO3: Analyse the given problem and solve using OS management techniques.

CO4: Design algorithms for the given problem & compare its performance with existing ones.

CO5: Demonstrate the working of basic commands of Unix environment including file processing

CO6: : **Demonstrate the usage of different shell commands, variable and AWK filtering to the given problem**

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

Process Management Process Scheduling: 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

Deadlocks: 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

The File System: 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.

Basic File Attributes: 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.

The Shell: 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

The Process: 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.

Essential Shell Programming: 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

1. Sumitabha Das: UNIX Concepts and Applications, 4th Edition, Tata McGraw Hill, 2006.
2. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne: Operating Systems Principles, 8th Edition, Wiley – India.

References

1. UNIX: The Complete Reference: Kenneth Roson et al, Osborne/McGraw Hill, 2000.
2. Using UNIX: Steve Montsugu, 2ndEdition, Prentice Hall India, 1999.
3. UNIX and Shell Programming: M G Venkateshmurthy, Pearson Education Asia, 2005
Behrouz A Forouzan and Richard F Gilberg
4.D M Dhamdhere: Operating Systems – A Concept Based Approach, 2nd Edition, Tata McGraw – Hill, 2002.
5. P C P Bhatt: Operating Systems, 2ndEdition, PHI, 2006.
6. Harvey M Deital: Operating Systems, 3rdEdition, Addison Wesley, 1990.

Computer Networks Choice Based Credit System	
Semester: I	CIE Marks:40
Course code:20MCA13	SEE Marks:60
Contact Hours (L: T:P):4-0-0	Exam Hours:03

Course Outcomes: 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

Module-1

Applications, Requirements, Network Architecture, Implementing Network Software, Performance.

Module-2

Perspectives on Connecting, Encoding (NRZ, NRZI, Manchester, 4B/5B), Framing, Error Detection, Reliable Transmission, Ethernet and Multiple Access Networks (802.3), Wireless.

Module-3

Internetworking and Advanced Internetworking Switching and Bridging, Basic Internetworking (IP), Routing, The Global Internet, Routing among Mobile Devices.

Module-4

End-to-End Protocols and Congestion Control Simple Demultiplexer (UDP), Reliable Byte Stream (TCP), Queuing Disciplines, TCP Congestion Control, Congestion-Avoidance Mechanisms.

Module-5

Network Security and Applications
Cryptographic Building Blocks, Key Pre-distribution, Firewalls, Traditional Applications, Infrastructure Services.

Text books

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 , 6.2,6.36.4, 8.1,8.2,8.5, 9.1,9.3)

References

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
Course Outcomes: at the end of the course student will be to CO1: Apply the fundamentals of set theory and matrices for the given problem. CO2: Realize different types of distribution, evaluate the mean and variance for the given case study. CO3: Formulate the problem using linear programming and apply decision making concept for the given case study. CO4: Model the given problem by applying the concepts of graph theory. CO5: Design strategy using gaming theory concepts for the given problem. CO6: Identify and list the different applications of discrete mathematical concepts in computer science.	
Module-1	
Set Theory and Matrices Sets, Operations on sets, Cardinality of sets, inclusion-exclusion principle, pigeonhole principle, matrices, finding Eigen values and Eigen vectors.	
Module-2	
Mathematical Logic Propositional Logic, Applications of Propositional Logic, Propositional Equivalences Predicates and Quantifiers, Nested Quantifiers, Rules of Inference Introduction to Proofs	
Module-3	
Relations Relations and Their Properties, n-ary Relations and Their Application, Representing Relations, Closures of Relations, Equivalence Relations, Partial Orderings	
Module-4	
Random variable and probability distribution 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	
Module-5	
Graph Theory 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	
Text book	
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) 2. Wolpole Myers Ye “Probability and Statistics for engineers and Scientist” Pearson	

Education, 8th edition.
References
1.Richard A Johnson and C.B Gupta “Probability and statistics for engineers” Pearson Education. 2.J.K Sharma “Discrete Mathematics”, Mac Millian Publishers India, 3rd edition,2011.

Research Methodology and IPR **Choice Based Credit System**	
Semester: I	CIE Marks:40
Course Code:20MCA15	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: 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	
Module-1	
Research Methodology: 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.	
Module-2	
Defining the Research Problem: Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, An Illustration. Reviewing the literature: 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.	
Module-3	
Research Design: 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. Design of Sample Surveys: Introduction, Sample Design, Sampling and Non-sampling Errors, Sample Survey versus Census Survey, Types of Sampling Designs	
Module-4	
Data Collection: Experimental and Surveys, Collection of Primary Data, Collection of	

Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method. Interpretation and Report Writing: Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation,
Significance of Report Writing, Different Steps in Writing Report, Layout.
Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports.

Module-5

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. Copy right acts: Copyright Act 1957. Trade Mark Act, 1999

Text books

1. Research Methodology: Methods and Techniques, C.R. Kothari, Gaurav Garg New Age International 4th Edition, 2018.
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.
3. Intelectual property, Debirag E. Bouchoux, Cengage learning, 2013.

References

1.Research Methods: the concise knowledge base Trochim, Atomic Dog Publishing, 2005.
2.Conducting Research Literature Reviews: From the Internet to Paper Fink A Sage Publications, 2009.

Java Programming Lab **Choice Based Credit System**	
Semester:I	CIE Marks:40
Course Code:20MCA16	SEE Marks:60
Contact Hours (L: T:P):0:0:4	Exam Hours:03

Course Outcomes: at the end of the course the students will be able to

CO1: Demonstrate the fundamental data types and constructs of Java Programming by writing executable/interpretable programs.

CO2: Illustrate the object oriented principles with the help of java programs.

CO3: Develop reusable and efficient applications using inheritance and multi-threading concepts of java.

CO4: Apply client-side programming and networking concepts to develop distributed applications.

CO5: Write java programs to demonstrate the concepts of interfaces, inner classes and I/O streams.

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:
   a. Checks the capacity of String Buffer objects.
   b. Reverses the contents of a string given on console and converts the resultant string in upper case.
   c. Reads a string from console and appends it to the resultant string of (ii).

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:
   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.
   b. A Class called Less_Balance_Exception which returns the statement that says withdraw amount (Rs.) is not valid.
   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.

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).
   a. Complete the following:
   b. Create a package named shape.
   c. Create some classes in the package representing some common shapes like Square, Triangle, and Circle.
   d. Import and compile these classes in other program.

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:
   a. An Interface class for Stack Operations
   b. A Class that implements the Stack Interface and creates a fixed length Stack.
   c. A Class that implements the Stack Interface and creates a Dynamic length Stack.
   d. A Class that uses both the above Stacks through Interface reference and does the Stack
   e. operations that demonstrates the runtime binding.

10. Write a JAVA program which uses FileInputStream / FileOutPutStream Classes.

11. Write JAVA programs which demonstrate utilities of Linked List Class.

Unix Programming Lab **Choice Based Credit System**	
Semester:I	CIE Marks:40
Course Code: 20MCA17	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:Demonstrate the working of basic commands of Unix environment including file processing CO2: Apply Regular expression to perform pattern matching using utilities like grep,sed and awk. CO3: Implement unix commands/ system calls to demonstrate process management CO4: Demonstrate the usage of different shell commands, variable and AWK filtering to the given problem. CO5:Develop shell scripts for developing the simple applications to the given problem.	
Laboratory Experiments: a) Explore Unix Environment. b) Explore vi- editor with Vim tutor. Perform the following operations using vi editor, but not limited to: 1. Insert character, delete character, replace character. 2. Save File and continue working. 3. Save File and exit editor. 4. Quit the editor. 5. Quit without saving the file. 6. Rename a file. 7. Insert lines, delete line. 8. Setline numbers. 9. Search for a pattern. 10. Move forward and backward.	
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. 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.	
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. 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.	
3a. Create a script file called file properties that reads a filename entered and outputs it	

properties.
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.

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.
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 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.

Computer Networks Lab **Choice Based Credit System**	
Semester:I	CIE Marks:40
Course Code:20MCA18	SEE Marks:60
Contact Hours(L:T:P):0:0:4	Exam Hours:03
Course Outcomes: at the end of the course, the students 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	
PART-A **Implement the following Computer Networks concepts using C/C++**	
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.	
PART-B **(Simulate the following Computer Networks concepts using any network simulators)**	
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.	

Note 1: In the practical exam student has to execute one program from part-A and one from part-B.

Bridge Course **Choice Based Credit System**	
Semester: I	CIE Marks:40
Course Code: 20MCA19-BC	SEE Marks:60
Contact Hours(L:T:P):3:0:0	Exam Hours:03

Course Outcomes: At the end of the course students will be able to

CO1: Identify special features introduced in C++ when compared to C and illustrate the difference between structure and class using C++ program.

CO2: Apply the Concepts of inheritance, polymorphism for the given problem and develop c++ program.

CO3: Implement the concept of overloading, default parameters, Constructors and destructors in a c++ program.

CO4: Analyse the working of I/O operations with C++ files.

CO5: Demonstrate the Exception handling and template for a given problem.

CO6: Demonstrate the concepts of data abstraction, information hiding and encapsulation by writing c++ program

Module-1

C Programming: decision making, control structures and arrays

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.

Module-2

Structures

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.

Module-3

Pointers

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.

Module-4

Classes & Objects: 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.

Pointers and dynamic memory allocation: Pointers, Pointer as function arguments, Dynamic Allocation Operators new and delete, Initializing Allocated Memory, Allocating Arrays, Allocating Objects

Operator overloading: 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 ( ).

Inheritance: Base Class, Inheritance & protected members, protected base class inheritance, inheriting multiple base classes, Constructors, Destructors & Inheritance. Passing parameters to base Class Constructors, Granting access, Virtual base classes.

Module-5

Standard C++ I/O Classes: 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 << and >>, manipulators.

Exception Handling: 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.

Textbooks

1. Object oriented programming with C++, E. Balaguruswamy, Tata McGraw Hill.
2. Herbert Schildt: C++ The Complete Reference, 4th Edition, Tata McGraw Hill, 2014.
3. K R Venugopal, RajkumarBuyya,TRavishanker: Mastering
4.Programming in ANSI C, E Balaguruswamy, 7th Edition, McGraw Hill.
5. C The Complete Reference, Herbert Schild,4th Edition, McGraw Hill.

Database Management System Choice Based Credit System	
Semester: II	CIE Marks:40
Course Code: 20MCA21	SEE Marks: 60
Contact Hours(L:T:P): 3:0:0	Exam Hours:03

Course Outcomes: at the end students will be able to

CO1: Apply the basic concepts of database management in designing the database for the given problem.

CO2: Design entity-relationship diagrams to the given problem to develop database application with appropriate fields and validations.

CO3: Implement a database schema for a given problem domain.

CO4: Formulate SQL queries in Oracle to the given problem.

CO5: Apply normalization techniques to improve the database design to the given problem.

Module-1

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.

Module-2

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

Module-3

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.

Module-4

Introduction to triggers in SQL, views in SQL, schema change statements in SQL, stored procedures and functions.

Module-5

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.

Text Books

1. Elmasri and Navathe: Fundamentals of Database Systems, 5th Edition, Addison -Wesley, 2011.

2. Silberschatz, Korth and Sudharshan Data base System Concepts, 6th Edition, Tata McGraw Hill, 2011.

References

1. C.J. Date, A. Kannan, S. Swamynatham: An Introduction to Database Systems, 8th Edition, Pearson education, 2009.
2. Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, 3rd Edition, McGraw-Hill, 2003.

Data Structures with Algorithms **Choice Based Credit System**	
Semester: II	CIE Marks:40
Course Code:20MCA22	SEE Marks:60
Contact Hours (L:T:P): 3:0:0	Exam Hours:03

Course Outcomes: student will be able to

CO1: Demonstrate different data structures, its operations using C programming.

CO2: Analyse the performance of Stack, Queue, Lists, Trees, Hashing, Searching and Sorting techniques.

CO3: Implement some applications of data structures in a high-level language such as C/C++

CO4: Design and apply appropriate data structures for solving computing problems.

CO5: Compute the efficiency of algorithms in terms of asymptotic notations for the given problem.

Module-1

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.

Module-2

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.

Module-3

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.

Module-4

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.

Module-5

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.

Textbooks

1. Introduction to the Design and Analysis of Algorithms. AnanyLevitin, Pearson Education,

2nd Edition.
2. Programming in ANSI C, Balaguruswamy, McGraw Hill Education .
3. Data Structures Using C and C++ by YedidyahLangsam and Moshe J. Augenstein and Aaron M Tenanbanum, 2nd Edition, Pearson Education Asia, 2002.
4. Introduction to Data Structure and Algorithms with C++ by Glenn W. Rowe.

Web Technologies **Choice Based Credit System**	
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:Demonsrtae applications of Angular JS and JQuery for the given problem	
Module-1	
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.	
Module-2	
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.	
Module-3	
Introduction to Bootstrap, First example, containers, Bootstrap elements: colors, tables, images, buttons, button groups, progress bars, Forms, utilities, Classes, alerts, custom forms, Grid System.	
Module-4	
Introduction to JQuery, Syntax, selectors, events, JQuery HTML, JQuery Effects, JQuery CSS.	
Module-5	
Introduction to Angular JS, Directives, Expressions, Directives, Controllers, Filters, Services, Events, Forms, Validations, Examples.	
Textbooks	
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
Course outcomes: Students will be able to CO1: Identify and define different requirements for the given problem and present in the IEEE format. CO2: Use modern tool to create UML diagrams to create the design for the given problem. CO3: Draw class diagram , analyse the different types of association that exists as per the given problem and represent them using UML notations. CO4: Analyse the given system to identify actors, use cases to design use case diagrams for the given problem using RSA/open source tool. CO5: Design the static/dynamic models to meet application requirements of the given system.	
Module-1	
Introduction: Professional Software Development Attributes of good software, software engineering diversity, IEEE/ACM code of software engineering ethics, case studies. Software Process and Agile Software Development 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.	
Module-2	
Requirement Engineering: Functional and non-functional requirements, The Software requirements document, Requirements specification, Requirements engineering processes, Requirement elicitation and analysis, Requirement validation, Requirement management.	
Module-3	
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.

Module-4

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.

Module-5

Project Design and planning:
Process planning, Effort estimation, project scheduling and staffing, Software configuration Management plan, Quality plan, Risk Management, Project Monitoring plan Design: Design concepts, Function oriented design, detailed design, verification, matrix.

Textbooks

1. Ian Sommerville: Software Engineering, 9th Edition, Pearson Education Ltd, 2011
2. Pankaj Jalote, Software Engineering, Wiley India Pvt Ltd (2010) Paul C Jorgensen Software Testing A CraftMan's Approach, 2nd edition, CRC Press.
3. MichelBlaha, James Rumbaugh: Object-Oriented Modelling and Design with UML, 2nd edition, Pearson, 2007.

References

1. Stephan R. Schach, "Object oriented software engineering", Tata McGraw Hill,2008
2. Craig Larman, Applying UML and Patterns, 3rd ed, Pearson Education, 2005.

Cyber Security Choice Based Credit System	
Semester:II	CIE Marks:40
Course Code:20MCA251	SEE Marks:60
Contact Hours(L:T:P):2:2:0	Exam Hours:03

Course Outcomes: at the end students will be able to

CO1: Apply IT ACT (Cyber law) to the given case/problem and infer from the given case and analyze the gap if exists.

CO2: Analyze the working of cyber security principles in designing the system.

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.

CO4: Examine relevant network defence / web application tool to solve given cyber security problem evaluate its suitability.

CO5: Investigate the influence of Block chain technology for the cyber security problem and evaluate its role.

CO6: Evaluate provisions available in Indian cyber law to handle infringement of intellectual property rights that happens on the cyber platform.

Module-1

Introduction to Cybercrime and Laws

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.

Module-2

Tools and Methods used in Cybercrime

Introduction, Proxy Server and Anonymizers, Password Cracking, Key loggers and Spyware, Virus and Warms, Trojan and backdoors, Steganography, DOS and DDOS attack, SQL injection, Buffer Overflow.

Module-3

Phishing and Identity Theft

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.

Module-4

Unix Command Lines, Backtrack Linux, Mac Ports, Cygwin, Windows Power Shell, Net Cat Commands, Net Cat Uses, SSH, Data Pipe, Fpipe

Module-5

Network Defense tools and block chain technology

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.

Textbooks

Text Books:

1. Anti-Hacker Tool Kit (Indian Edition) by Mike Shema, Publication McGraw Hill. (Chapters: 2, 7, 8, 11)

2. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal 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, 4.2,
4.4, 4.5, 4.6, 4.7, 4.8, 4.9, 4.10, 4.11)

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

Data Mining with Business Intelligence **Choice Based Credit System**	
Semester:II	CIE Marks:40
Course Code:20MCA252	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: Analyse the concept of data warehouse, Business Intelligence and OLAP
CO2: Demonstrate data pre-processing techniques and application of association rule mining algorithms
CO3: Apply various classification algorithms and evaluation of classifiers for the given problem
CO4: Analyse data mining for various business intelligence applications for the given problem
CO5: Apply classification and regression techniques for the given problem.

Module-1

Overview and concepts Data Warehousing and Business Intelligence:
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 1marts - Overview of the components - Metadata in the data warehouse - Need for data warehousing - Basic elements of data warehousing - trends in data warehousing.

The Architecture of BI and DW

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.

Module-2

Introduction to data mining (DM):
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

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.

Module-3

Concept Description and Association Rule Mining

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.

Module-4

Classification and prediction:

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.

Module-5

Data Mining for Business Intelligence Applications:

Data mining for business Applications like Balanced Scorecard, Fraud Detection, 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

Enterprise Resource Planning Choice Based Credit System	
Semester: II	CIE Marks:40
Course Code:20MCA253	SEE Marks:60
Contact Hours (L: T:P): 2:2:0	Exam Hours:03
Course Outcomes: At the end students will be able to CO1: Analyse the pros and cons of ERP, Data warehousing/Mining and OLAP for the given problem/application. CO2: Analyse the implementation of ERP in the context of business of the different organization. CO3: Analyse and apply ERP for different business modules. CO4: With the help of a case study explain ERP marketing CO5: Analyze the design ERP with future E-commerce and internet.	
Module-1	
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	
Module-2	

ERP Implementation: Implementation of Life Cycle, Implementation Methodology, Hidden Costs, Organizing Implementation, Vendors, Consultants and Users, Contracts, Project Management and Monitoring
Module-3
Business Modules: Business Modules in an ERP Package, Finance, Manufacturing, Human Resource, Plant Maintenance, Materials Management, Quality Management, Sales and Distribution
Module-4
ERP Market : ERP Market Place, SAP AG, People Soft, Baan Company, JD Edwards World Solutions Company, Oracle Corporation, QAD , System Software Associates.
Module-5
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
Course Outcomes: at the students will be able to Course Outcomes: At the of the course, students will be able to CO1:Analyse the new technologies that provide interactive devices and interfaces.	

CO2: Apply the guidelines to develop the UID and evaluate
CO3: Apply the development methodologies with an analysis of the social impact and legal issues Understand Direct Manipulation and Virtual Environment
CO4: Discuss the command, natural languages and issues in design for maintaining QoS
CO5: Persuade user documentations and information search.

Module-1

Introduction
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.

Module-2

Development Processes
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.

Evaluating Interface Design
Introduction, Expert Reviews, Usability Testing and Laboratories, Survey Instruments, Acceptance tests, Evaluation during Active Use, Controlled Psychologically Oriented Experiments

Module-3

Direct Manipulation and Virtual Environments:
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

Module-4

Command and Natural Languages
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

Design Issues
Quality of Service: Introduction, Models of Response-Time Impacts, Expectations and Attitudes, User Productivity, Variability in Response time, Frustrating Experiences Balancing Function and Fashion: Introduction, Error Messages, Nonanthropomorphic Design, Display design, web page design, Window Design, Color

Module-5

User Documentation and Online Help :
Introduction, Online versus paper documentation, Reading from paper versus Displays, Shaping the content of the Manuals, Accessing the Documentation, Online Tutorials 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 tyoe 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 Finalay, Gregory D AbiwdmRusselBealel: 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

Optimization Techniques Choice Based Credit System	
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.

Module-1

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

Module-2

Linear programming- Simplex method, two-phase method, Big M method.

Module-3

Duality in linear programming, formulation of dual linear programming and examples.

Assignment problem- Mathematical model of assignment problem, Hungarian method for solving assignment problem.

Module-4

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.

Module-5

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).

Text books

1. Operations Theory and Applications, J.K. Sharma, 5th edition, MacMillan publisher India(Chapter 1,2,3,4,5,910,11,12,20).

References

1. Operations Research S.D Sharma, Kedarnath, Ramnath and Co, 2002.
2. Operations Research – An Introduction Taha H A- Low price edition 7th edition,2006.
3. Introduction to operation Research, Hiller and Liberman, Mc GRaw Hill , 5th edition ,2001.
4. Operation Research, Prem Kumar Gupta, D S Heera, S Chand Pub., New Delhi, 2007.

Cryptography and Network Security Choice Based Credit System	
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.

Module-1

Introduction: OSI Security Architecture, Security Attacks, Security Services, Security Mechanism, model for Network Security.

Classical Encryption Technique: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques.

Module-2

Data Encryption and advanced encryption techniques:

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.

Public Key Cryptography and Key Management: Principles of Public Key Cryptosystem, RSA algorithm, Key management, Diffie Hellman Key exchange.

Module-3

Message Authentication and Hash Function: Authentication Requirement, Authentication Functions, Message Authentication Code, Hash Functions, Digital Signatures, Digital Signature Standard.

Authentication Applications: Kerberos, X.509 Authentication Service

Module-4

Electronic Mail Security: Pretty Good Privacy (PGP), S/MIME

IP Security:IP Security Overview; IP Security Architecture; Authentication Header; Encapsulating Security Payload; Combining Security Associations; Key Management.

Module-5

Web Security: Web security Considerations; Secure Socket layer (SSL) and Transport layer Security (TLS); Secure Electronic Transaction (SET).

System Security: Intruders, Intrusion Detection, Firewall Design Principles- Characteristics, Types of Firewall and Firewall Configuration.

Text books

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)

References

1. Behrouz A. Forouzan and Debdeep Mukhopadhyay: "Cryptography and Network Security", 2nd Edition, Tata McGraw-Hill, 2010.

2. AtulKahate, "Cryptography and Network Security" 2nd Edition TMH.

Artificial Intelligence **Choice Based Credit System**	
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:

- Identify problems that are amenable to solution by AI methods.
- Identify appropriate AI methods to solve a given problem.
- Formalise a given problem in the language/framework of different AI methods.
- Implement basic AI algorithms.
- Design and carry out an empirical evaluation of different algorithms on a problem formalisation, and state the conclusions that the evaluation supports.

Module-1

INTRODUCTION TO Al AND PRODUCTION SYSTEMS

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 Breath first, Constraints satisfaction – Related algorithms, Measure of performance and analysis of search algorithms.

Module-2

REPRESENTATION OF KNOWLEDGE

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.

Module-3

KNOWLEDGE INFERENCE

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.

Module-4

PLANNING AND MACHINE LEARNING

Basic plan generation systems – Strips -Advanced plan generation systems – K strips - Strategic explanations -Why, Why not and how explanations. Learning- Machine

learning, adaptive Learning.

Module-5

EXPERT SYSTEMS

Expert systems – Architecture of expert systems, Roles of expert systems – Knowledge Acquisition – Meta knowledge, Heuristics. Typical expert systems – MYCIN, DART, XOON, Expert systems shells.

Text books

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).

Reference books

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. http://nptel.ac.in

Supply Chain Management **Choice Based Credit System**	
Semester: II	CIE Marks:40
Course Code:20MCA263	SEE Marks:60
Contact Hours(L:T:P):2:2:0	Exam Hours:03

Course Outcomes:

CO1: Demonstrate knowledge of the functions of logistics and supply chain management.

CO2: Illustrate the concepts and activities of the supply chain to actual organizations.

CO3: Analyse the role of technology in logistics and supply chain management.

CO4: Evaluate cases for effective supply chain management and its implementation.

CO5:Analyse the role information technology in bringing transparency and execute smart contracts to maintain relationship management.

Module-1

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.

Module-2

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.

Module-3

Designing and Planning Transportation Networks.: Role of transportation - modes and their performance - transportation infrastructure and policies - design options and their trade- offs - Tailored transportation.

Module-4

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.

Module-5

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.

Distributed Operating System **Choice Based Credit System**	
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:

CO1: Analyse design issues and different message passing techniques in DOS, distributed systems
CO2: Analyse RPC implementation and its performance in DOS
CO3: Analyse the major security issues associated with distributed systems and evaluate techniques available for increasing system security
CO3: Apply the concepts of distributed shared memory and resource management for the given problem/ case study.
CO4: Analyse distributed file systems and evaluate the performance in terms of fault tolerance, file replication as major factors
CO5:Apply modification to the existing algorithms to improve the performance of DOS.

Module-1

Fundamentals: 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).**Message Passing:** 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.
Module-2
Remote Procedure Calls: 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.
Module-3
Distributed Shared Memory: 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
Module-4
Resource Management: Introduction, Desirable Features of a Good Global Scheduling Algorithm, Task Assignment Approach, Load – Balancing Approach, Load – Sharing Approach **Process Management:** Introduction, Process Migration, Threads.
Module-5
Distributed File Systems: 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.
Text books
1. Pradeep. K. Sinha: Distributed Operating Systems: Concepts and Design, PHI, 2007.
References
1. Andrew S. Tanenbaum: Distributed Operating Systems, Pearson Education, 2013.

Natural Language Processing **Choice Based Credit System**	
Semester:II	CIE Marks:40
Course Code:20MCA265	SEE Marks:60
Contact Hours(L:T:P):2:2:0	Exam Hours:03
Course Outcomes: CO1: Apply parsing technique to the given problem and verify the output and give valid conclusions	
Module-1	
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.
Module-2
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.
Module-3
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:
Module-4
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
Module-5
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.
Text books
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.
References
1. Christopher D.Manning and Hinrich Schutze, "Foundations of Statistical Natural LanguageProcessing", MIT Press, 1999. 2.TanveerSiddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008. 3.AnneKao and Stephen R. Poteet (Eds), "Natural Language Processing and Text Mining", Springer Verlag London Limited 2007.

DataBase Management Systems Laboratory with Mini Project Choice Based Credit System	
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

Instructions for the Exercises:
1. Draw ER diagram based on given scenario with various Constraints.
2. Create Relational Database Schema based on the scenario using Mapping Rules.
3. Perform the given queries using any RDBMS Environment.
4. Suitable tuples have to be entered so that queries are executed correctly.
5. The results of the queries may be displayed directly.

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 A group of two students has to develop a mini-project where they need to implement SQL queries for inserting, deleting and searching the required record.

Note: In CIE and SEE part-A and part-B shall be given weightage of 50% each.

Data Structures Laboratory
Choice Based Credit System

Semester: II	CIE Marks: 40
Course Code:20MCA28	SEE Marks:60
Contact Hours (L:T:P): 0:0:4	Exam Hours:03

Course Outcome: at the end of the course, Students will be able to
CO1: Perform various sorting and searching techniques.
CO2: Implement various types of data structures, operations and algorithms.
CO3: Work with Stacks, Queues, Circular Queues, Linked Lists, and Trees.
CO4: Design and apply appropriate data structures for solving computing problems

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
Course Outcomes: at the end of the course students will be able to CO1: Apply the concept and usages web based programming techniques. CO2: Learning and Developing XHTML documents using JavaScript and CSS. CO3: To be familiar in the use of CGI and Perl programs for different types of server side applications. CO4: Design and implement user interactive dynamic web based applications.	
1.Create an XHTML page that provides information about your department. Your XHTML page must use the following tags: a) Text Formatting tags b) Horizontal rule c) Meta element d) Links e) Images f) Tables (Use of additional tags encouraged).	
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.	
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 b) Input : A number n obtained using prompt Output : A table of numbers from 1 to n and their squares using alert	
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.	
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.	
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.	
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 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.

Machine Learning and Data Analytics using Python	
Semester: III	CIE Marks:40
Subject Code:20MCA31	SEE Marks:60
Contact Hours(L:P:T):4-0-0	Exam Hours:03

Course Outcomes: •
CO1: Demonstrate basic data analytics principles and techniques
CO**2**: Apply control structures to the given problems
CO3: Apply the concepts of inheritance and overloading for a given problem.
CO4: Demonstrate the concepts of learning and decision trees for a given problem.
CO5: Demonstrate the concepts of neural networks and genetic algorithms for a given problem.

Module 1

Python Basic Concepts and Programming

Interpreter – Program Execution – Statements – Expressions – Flow Controls – Functions - Numeric Types – Sequences - Strings,

Parts of Python Programming Language, Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, The type( ) Function and Is Operator, Control Flow Statements, The if Decision Control Flow Statement, The if…else Decision Control Flow Statement, The if…elif…else Decision Control Statement, Nested if Statement, The while Loop, The for Loop, The continue and break Statements, Built-In Functions, Commonly Used Modules, Function Definition and Calling the Function, The return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments.

Module 2

Python Collection Objects, Classes

Strings- Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings, Lists-Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods. Sets, Tuples and Dictionaries. Files: reading and writing files. Class Definition – Constructors – Inheritance – Overloading

Module 3

Data Pre-processing and Data Wrangling

Acquiring Data with Python: Loading from CSV files, Accessing SQL databases. Cleansing Data with Python: Stripping out extraneous information, Normalizing data AND Formatting data. Combining and Merging Data Sets – Reshaping and Pivoting – Data Transformation – String Manipulation, Regular Expressions.

Module 4

Web Scraping And Numerical Analysis

Data Acquisition by Scraping web applications –Submitting a form - Fetching web pages – Downloading web pages through form submission – CSS Selectors. NumPy Essentials:The NumPy array, N-dimensional array operations and manipulations, Memory mapped files.

Module 5

Data Visualization with NumPy Arrays, Matplotlib, and Seaborn

Data Visualization: Matplotlib package – Plotting Graphs – Controlling Graph – Adding Text – More Graph Types – Getting and setting values – Patches. Advanced data visualization with Seaborn.- Time series analysis with Pandas.

Text Books:

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist‘‘, 2nd edition, Updated for Python 3, Shroff/O‘Reilly Publishers, 2016 (http://greenteapress.com/wp/thinkpython/)
2. Guido van Rossum and Fred L. Drake Jr, ―An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.
3. Jake Vander plas, "Python Data Science Handbook: Essential tools for working with data", O‘Reilly Publishers, I Edition.

References:

1. Mark Lutz, "Programming Python", O'Reilly Media, 4th edition, 2010.
2. Tim Hall and J-P Stacey, "Python 3 for Absolute Beginners", Apress, 1st edition, 2009.
3. Magnus Lie Hetland, "Beginning Python: From Novice to Professional", Apress, Second Edition, 2005.
4. Shai Vaingast, "Beginning Python Visualization Crafting Visual Transformation Scripts", Apress, 2nd edition, 2014. 6. Wes Mc Kinney, "Python for Data Analysis", O'Reilly Media, 2012

Internet of Things
Choice Based Credit System

Semester: III	CIE Marks:40
Subject Code:20MCA32	SEE Marks:60
Contact Hours(L:T:P):4:0:0	Exam Hours:03

CO**1:** Analyse the IoT architecture and design along with functional/compute stack and data management.
CO**2:** Apply IOT architecture for a given problem
CO**3:** Analyse the application protocol, transport layer methods for the given business case.
CO**4:** Analyse the application of data analytics for IOT for a given
CO5: Analyse the architecture and develop programming using modern tools for the given use case

Module-1

What is IoT, Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT and IoT, IoT Challenges, IoT Network Architecture and Design, Drivers Behind New Network Architectures, Comparing IoT Architectures, A Simplified IoT Architecture, The Core IoT

Functional Stack, IoT Data Management and Compute Stack
Module-2
Smart Objects: The "Things" in IoT, Sensors, Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects, Communications Criteria, IoT Access Technologies.
Module-3
IP as the IoT Network Layer, The Business Case for IP, The need for Optimization, Optimizing IP for IoT, Profiles and Compliances, Application Protocols for IoT, The Transport Layer, IoT Application Transport Methods.
Module-4
Data and Analytics for IoT, An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytics Tools and Technology, Edge Streaming Analytics, Network Analytics, Securing IoT, A Brief History of OT Security, Common Challenges in OT Security, How IT and OT Security Practices and Systems Vary, Formal Risk Analysis Structures: OCTAVE and FAIR, The Phased Application of Security in an Operational Environment 10
Module-5
IoT Physical Devices and Endpoints - Arduino UNO: Introduction to Arduino, Arduino UNO, Installing the Software, Fundamentals of Arduino Programming. IoT Physical Devices and Endpoints - RaspberryPi: Introduction to RaspberryPi, About the RaspberryPi Board: Hardware Layout, Operating Systems on RaspberryPi, Configuring RaspberryPi, Programming RaspberryPi with Python, Wireless Temperature Monitoring System Using Pi, DS18B20 Temperature Sensor, Connecting Raspberry Pi via SSH, Accessing Temperature from DS18B20 sensors, Remote access to RaspberryPi, Smart and Connected Cities, An IoT Strategy for Smarter Cities, Smart City IoT Architecture, Smart City Security Architecture, Smart City Use-Case Examples.
Textbooks
1.David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry,"IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the 2. Internet of Things", 1stEdition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 9789386873743) 2. Srinivasa K G, "Internet of Things",CENGAGE Leaning India, 2017
References
1.Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1stEdition, VPT, 2014. (ISBN: 978-8173719547) 2. Raj Kamal, "Internet of Things: Architecture and Design Principles", 1st Edition, McGraw Hill Education, 2017. (ISBN: 978-9352605224)

Advances in Java **Choice Based Credit System**	
Semester: III	CIE Marks:40
Subject Code:20MCA33	SEE Exam:60
Contact Hours(L: T:P):4:0:0	Exam Hours:03
Course Outcomes: CO1: Apply the concept of Servlet and its life cycle to create web application. CO2: Apply JSP tags and its services to web application. CO3: Create packages and interfaces in the web application context. CO4: Build Database connection for the web applications. CO5: Develop application programs using beans concept	

Module-1

Servlet Structure, Servlet packaging, HTML Building utilities, Lifecycle, Single Thread Model Interface, Handling Client request: Form Data, HTTP Request Headers.
Generating Server Response: HTTP Status Codes, HTTP Response Headers, Handling Cookies, Session Tracking.

Module-2

Introduction to JSP:
Overview of JSP: JSP Technology, Need of JSP, Benefits of JSP, Advantages of JSP, Basic Syntax, Invoking Java code with JSP Scripting Elements, Creating Template Text, Invoking Java Code form JSP, Limiting Java Code in JSP, Using JSP Expressions, Comparing Servlets And JSP, Writing Scriptlets. For Example: Using Scriplets to make parts of JSP Conditional, Using declarations, Declaration Examples.

Module-3

Controlling the structure, Structure of generated Servlets and Java Beans, Controlling the structure of generated Servlets: The JSP Page directive, Import Attribute, Session Attribute, isElignore attribute, Buffer and Autoflush Attribute, Info Attribute, errorPage, and iserrorPage Attributes, isThreadSafe Attribute, extends Attribute, language Attribute, Including Files and Applets in JSP Pages using Java Beans components in JSP documents.
JAR File, Manifest file, Working with Java Beans. Introspection, Customisers, Bean Properties: Simple properties, Design pattern events, Creating bound properties, Bean Methods, Beaninfo class, Persistence.

Module-4

Annotations and JDBC
Annotations: Built-in Annotations with examples, Custom Annotation. Talking to Database, Immediate Solutions, Essentials JDBC program, using prepared statement object, and Interactive SQL tool. JDBC in Action Result sets, Batch updates, Mapping, Basic JDBC data types, Advanced JDBC data types, immediate solutions.

Module-5

EJB and Server Side Components Models
Introduction to EJB: The Problem domain, Breakup responsibilities, Code Smart not hard, the enterprise java bean specification, Components Types.
Server Side Component Types: session Beans, MessageDriven Beans, Entity Beans, The Java Persistence Model. Container services: Dependency Injection, Concurrency, Instance pooling n caching, Transactions, security, Timers, Naming and object stores, Interoperability, Life Cycle Callbacks, Interceptors, platform integration. Developing your first EJB, Models: The Stateless Session Bean, The Stateful Session Bean, the Singleton Session Bean, Message-Driven Beans. EJB and Persistence. Persistence Entity Manager Mapping persistence objects, Entity Relationships.

TextBooks

1. Marty Hall,Larry Brown Core Servlets and Java server pages. Vol 1: Core Technologies. 2nd Edition. (Chapter 3,4,5,6,7,8,9,10,11,12,13,14)
2. Java 6 Programming Black Book, Dreamtech press 2012(Chapter 17,18,19,20,21,22,27,28,29,30)
3. Andrew LeeRubinger, Bill Burke. Development Enterprise Java Components. Enterprise JavaBeans 3.1. O'reilly (Chapters 1,2,3,4,5,6,7,8,9,10,11)

References

1. Michel Siklora, EJB 3 Developer Guide, A Practical Guide For Developers And Architects to the Enterprise Java Beans Standard,Shroff Publishers and Distributers Private Limited July2008.
2. Herbert Schildt The Java Complete Reference, 8th Edition, Comprehensive coverage of the Java Language, Tata Mc Graw Hill Edition

Block Chain Technology **Choice Based Credit System(CBCS)**	
Semester: III	**CIE Marks:40**
Course Code:20MCA341	**SEE Marks:60**
Contact Periods (L:T:P):3-0-0	**Exam Hours:03**
Course Out Comes: CO1: Understand the building blocks of Block chain CO2: Analyze the importance of block chain applications CO3: Evaluate the usage of Block chain features CO4: Exemplify the usage of bitcoins CO5: Analyze the application specific block chain architecture for a given problem	
Module-1	
Introduction to Blockchain, How Blockchain works, Blockchain vs Bitcoin, Practical applications, public and private key basics, pros and cons of Blockchain, Myths about Bitcoin.	
Module-2	
Blockchain :Architecture , versions ,variants , use cases, Life use cases of blockchain, Blockchain vs shared Database, Introduction to cryptocurrencies, Types, Applications.	
Module-3	
Concept of Double Spending, Hashing, Mining, Proof of work. Introduction to Merkel tree, Privacy , payment verification , Resolving Conflicts , Creation of Blocks	
Module-4	
Introduction to Bitcoin, key concepts of Bitcoin, Merits and De Merits Fork and Segwits, Sending and Receiving bitcoins, choosing bitcoin wallet, Converting Bitcoins to Fiat Currency.	
Module-5	
Introduction to Ethereum, Advantages and Disadvantages, Ethereum vs Bitcoin, Introduction to Smart contracts, usage, application, working principle , Law and Regulations. Case Study.	
Textbooks	
1. Beginning Blockchain: A Beginner's Guide to Building Blockchain Solutions by Arshdeep Bikramaditya Signal, Gautam Dhameja (Priyansu Sekhar Panda., APress. 2. Blockchain Applications: A Hands-On Approach by Bahga, Vijay Madisetti 3. Blockchain by Melanie Swan, OReilly	
References	
1. Bitcoin and Cryptocurrency Technologies by Aravind Narayan. Joseph Bonneau,	

princton
2. Bitcoin and Blockchain Basics: A non-technical introduction for beginners by Arthu.T Books.

Cloud Computing **Choice Based Credit System(CBCS)**	
Semester: III	**CIE Marks:40**
Course Code:20MCA342	**SEE Marks:60**
Contact Periods (L:T:P):3-0-0	**Exam Hours:03**
Course Out Comes: CO1: Demonstrate the system & software models and mechanisms that support cloud computing CO2: Classify various cloud services and their providers CO3: Compare various cloud deployment models CO4: Differentiate various types of computing environments CO5: Identify enabling technologies of cloud computing.	
Module-1	
Introduction to Cloud Computing: Eras of computing, The vision of Cloud Computing, Defining a cloud, A closer look, Cloud computing reference model, Historical developments: Distributed systems, Virtualization, Web 2.0; Service oriented computing; Utility oriented computing.	
Module-2	
Architectures for parallel and distributed computing: Parallel Vs Distributed computing, Elements of distributed computing, Technologies for distributed computing.	
Module-3	
Virtualization: Introduction, Characteristics of virtualized environments, Taxonomy of virtualization techniques, Virtualization and cloud computing, Pros and cons of virtualization, Technology examples: Xen: Para virtualization, VmWare: Full virtualization, Microsoft Hyper – V.	
Module-4	
Cloud computing architecture: Introduction, Cloud reference model: Architecture, IaaS, PaaS, SaaS, Types of Clouds: Public, Private, Hybrid and Community clouds, Economics of the cloud, Open challenges.	
Module-5	
Cloud Tools and Applications: Aneka PaaS; Open stack: Introduction to open stack; Components of open stack; Amazon web services; Google AppEngine; Microsoft Azure; Scientific applications: Healthcare; Biology; Geo-Science, Business and Consumer applications: ARM & ERP; Productivity; Social networking.	
Textbooks	
1. Rjkumar Buyya, Christian Vecchiola, and Thamarai Selci, Mastering Cloud Computing,	

Tata McGraw Hill, New Delhi, India, 2013.
References
1. Cloud Computing for Dummies by Judith Hurwitz, R.Bloor, M. Kanfman, F.Halper (Wiley India Edition) 2. Cloud Computing: A Practical Approach by J.Vette, Toby J. Vette, Robert Elsenpeter (Tata McGraw Hill)

Digital Marketing **Choice Based Credit System(CBCS)**	
Semester: III	**CIE Marks:40**
Course Code:20MCA343	**SEE Marks:60**
Contact Periods (L:T:P):3-0-0	**Exam Hours:03**
Course Out Comes: CO1: Demonstrate the key concepts related to e-marketing for the given case. CO2: Demonstrate the use of different electronic media for designing marketing activities. CO3: Analyze the role of search engine in improving digital marketing CO4: Analyze role of social media marketing for the given problem CO5: Analyze technical solutions to overcome social media threats	
Module-1	
Introduction to Digital Marketing Evolution of Digital Marketing from traditional to modern era, Role of Internet; Current trends, Info-graphics, implications for business & society; Emergence of digital marketing as a tool; Drivers of the new marketing environment; Digital marketing strategy; P.O.E.M. framework, Digital landscape, Digital marketing plan, Digital marketing models.	
Module-2	
Internet Marketing and Digital Marketing Mix – Internet Marketing, opportunities and challenges; Digital marketing framework; Digital Marketing mix, Impact of digital channels on IMC; Search Engine Advertising: - Pay for Search Advertisements, Ad Placement, Ad Ranks, Creating Ad Campaigns, Campaign Report Generation Display marketing: - Types of Display Ads - Buying Models - Programmable Digital Marketing - Analytical Tools - YouTube marketing.	
Module-3	
Social Media Marketing – Role of Influencer Marketing, Tools & Plan– Introduction to social media platforms, penetration & characteristics; Building a successful social media marketing strategy Facebook Marketing: - Business through Facebook Marketing, Creating Advertising Campaigns, Adverts, Facebook Marketing Tools Linkedin Marketing: - Introduction and Importance of Linkedin Marketing, Framing Linkedin Strategy, Lead Generation through Linkedin, Content Strategy, Analytics and Targeting Twitter Marketing: - Introduction to Twitter Marketing, how twitter Marketing is different than other forms of digital marketing, framing content strategy, Twitter Advertising Campaigns Instagram and Snapchat: - Digital Marketing Strategies through Instagram and Snapchat Mobile Marketing: - Mobile Advertising, Forms of Mobile Marketing, Features, Mobile Campaign Development, Mobile Advertising Analytics Introduction to social media metrics	
Module-4	

Introduction to SEO, SEM, Web Analytics, Mobile Marketing, Trends in Digital Advertising– - Introduction and need for SEO, How to use internet & search engines; search engine and its working pattern, On-page and off-page optimization, SEO Tactics - Introduction to SEM Web Analytics: - Google Analytics & Google AdWords; data collection for web analytics, multichannel attribution, Universal analytics, Tracking code Trends in digital advertising

Module-5

Social Media Channels: Introduction, Key terms and concepts, Traditional media vs Social media. Social media channels: Social networking. Content creation, Bookmarking & aggregating and Location & social media. Tracking social media campaigns. Social media marketing: Rules of engagement. Advantages and challenges.

Social Media Strategy: Introduction, Key terms and concepts. Using social media to solve business challenges. Step-by-step guide to creating a social media strategy. Documents and processes. Dealing with opportunities and threats. Step-by-step guide for recovering from an online brand attack. Social media risks and challenges

Textbooks

1. Seema Gupta "Digital Marketing" Mc-Graw Hill 1st Edition – 2017

References

1. Ian Dodson "The Art of Digital Marketing" Wiley Latest Edition
2. Puneet Singh Bhatia "Fundamentals of Digital Marketing" Pearson 1st Edition – 2017
3. Prof. Nitin C. Kamat, Mr.Chinmay Nitin Kamat Digital Social Media Marketing Himalaya Publishing House Pvt. Ltd. Latest Edition

Software Testing **Choice Based Credit System(CBCS)**	
Semester: III	**CIE Marks:40**
Course Code:20MCA344	**SEE Marks:60**
Contact Periods (L:T:P):3-0-0	**Exam Hours:03**

Course Out Comes:

CO1: Acquire knowledge of basic principles and knowledge of software testing and debugging and test cases.

CO2: Will be able to understand the perceptions on testing like levels of testing, generalized pseudo code and with related examples.

CO3: To study the various types of testing.

CO4: Differentiate between functional testing and structural testing.

CO5: Analyze the performance of fault based testing, planning and Monitoring the process, Documentation testing.

Module-1

Basics of Software Testing, Basic Principles, Test case selection and Adequacy

Humans, Errors and Testing, Software Quality; Requirements, Behavior and Correctness, Correctness Vs Reliability; Testing and Debugging; Test Metrics; Software and Hardware Testing; Testing and Verification; Defect Management; Execution History; Test Generation Strategies; Static Testing; Test Generation from Predicates. Sensitivity, Redundancy, Restriction, Partition, Visibility and Feedback, Test Specification and cases, Adequacy Criteria, Comparing Criteria

Module-2

A perspective on Testing

Basic definitions, Test cases, Insights from a Venn diagram, Identifying test cases, Error and fault taxonomies, Level of testing, Examples: Generalized pseudo code, The triangle problem, the Next Date function, The commission problem, The SATM (Simple Automation Teller Machine) problem, The currency converter, Saturn windshield wiper

Module-3

Boundary value testing, Equivalence class testing, Decision table based testing

Boundary value analysis, Robustness testing, Worst-case testing, special value testing, Examples, Random testing, Equivalence classes, Equivalence test cases for triangle problem, Next Date function and commission problem, Guidelines and observations, Decision tables, Test cases for triangle problem

Module-4

Path Testing, Data flow testing, Levels of Testing, Integration Testing

DD Paths, Test coverage metrics, Basis path testing, guidelines and observations, Definition Use testing, Slice based testing, Guidelines and observations. Traditional view of testing levels, Alternative life cycle models, the SATM systems, separating integration and system testing, Guidelines and observations.

Module-5

Fault Based Testing, Planning and Monitoring the Process, Documenting Analysis and Test

Assumptions in fault-based testing, Mutation Analysis, Fault-based Adequacy Criteria; Variations on mutation Analysis; From Test case specification to Test Cases, Scaffolding, Generic vs. specific Scaffolding, Test Oracles, Self checks as oracles, Capture and Replay. Quality and Process, Test and Analysis strategies and plans, Risk Planning, Monitoring the Process, Improving the process, The quality team, Organizing documents, Test strategy document, Analysis and test plan, Test design specifications documents, Test and analysis reports.

Textbooks

1. Adithya P.Mathur " Foundations of Software Testing – Fundamental Algorithms and Techniques", Pearson Education India, 2011
2. Mauro Pezze, Michael Young, Software testing and Analysis- Process, Principles and Techniques, Wiley India, 2012
3. Paul C Jorgensen, "Software Testing A Craftsman's Approach", Auerbach publications, 3rd edition, 2011.

References

1. KshirasagaraNaik, PriyadarshiTripathy: Software Testing and Quality Assurance, Wiley India 2012
2. M.G.Limaye: Software Testing-Principles, Techniques and Tools – McGraw Hill, 2009

NOSQL **Choice Based Credit System(CBCS)**	
Semester: III	**CIE Marks:40**
Course Code:20MCA345	**SEE Marks:60**
Contact Periods (L:T:P):3-0-0	**Exam Hours:03**
Course outcomes: The students will be able to:	

CO1: Demonstrate the concepts of unstructured data

CO2: Analyse and Manage the Data using CRUD operations

CO3: Develop the applications using NoSQL

CO4: Realize the concept of Map Reduce its applicability in the real world application development

CO5: Analyze the framework of NOSQL

Module-1

Introduction to NoSQL
Definition of NoSQL, History of NoSQL and Different NoSQL products.
Exploring NoSQL
Exploring Mongo DB Java/Ruby/Python, Interfacing and Interacting with NoSQL.

Module-2

NoSQL Basics : NoSQL Storage Architecture, CRUD operations with Mongo DB, Querying, Modifying and Managing.
Data Storage in NoSQL: NoSQL Data Stores, Indexing and ordering datasets (MongoDB/CouchDB/Cassandra)

Module-3

Advanced NoSQL, NoSQL in Cloud, Parallel Processing with Map Reduce, Big Data with Hive.

Module-4

Working with NoSQL, Surveying Database Internals, Migrating from RDBMS to NoSQL, Web Frameworks and NoSQL, using MySQL as a NoSQL.

Module-5

Developing Web Application with NOSQL and NOSQL Administration
Php and MongoDB, Python and MongoDB, Creating Blog Application with PHP.

Textbooks

1.Professional NOSQL Shashank Tiwari WROX Press

References

2. The Definitive Guide to Mongo DB, The NOSQL Database for cloud and Desktop Computing Eelco Plugge, Peter Membreyand Tim Hawkins APress

Deep Learning **Choice Based Credit System(CBCS)**	
Semester: III	**CIE Marks:40**
Course Code:20MCA351	**SEE Marks:60**
Contact Periods (L:T:P):3-0-0	**Exam Hours:03**

Course Out Comes:

1. Demonstrate the basics of deep learning
2. Implement various deep learning models
3. Realign high dimensional data using reduction techniques
4. Analyze optimization and generalization in deep learning
5. Analyse the deep learning applications

Module-1
Introduction to machine learning- Linear models (SVMs and Perceptron's, logistic regression)- Intro to Neural Nets: What a shallow network computes- Training a network: loss functions, back propagation and stochastic gradient descent- Neural networks as universal function approximates
Module-2
DEEP NETWORKS : History of Deep Learning- A Probabilistic Theory of Deep Learning- Backpropagation and regularization, batch normalization- VC Dimension and Neural Nets- Deep Vs Shallow Networks Convolutional Networks- Generative Adversarial Networks (GAN), Semi- supervised Learning
Module-3
DIMENTIONALITY REDUCTION : Linear (PCA, LDA) and manifolds, metric learning - Auto encoders and dimensionality reduction in networks - Introduction to Convnet - Architectures – AlexNet, VGG, Inception, ResNet - Training a Convnet: weights initialization, batch normalization, hyperparameter optimization
Module-4
OPTIMIZATION AND GENERALIZATION Optimization in deep learning– Non-convex optimization for deep networks- Stochastic Optimization Generalization in neural networks- Spatial Transformer Networks- Recurrent networks, LSTM - Recurrent Neural Network Language Models- Word-Level RNNs & Deep Reinforcement Learning - Computational & Artificial Neuroscience
Module-5
CASE STUDY AND APPLICATIONS Imagenet- Detection-Audio Wave Net-Natural Language Processing Word2Vec - Joint Detection BioInformatics- Face Recognition- Scene Understanding- Gathering Image Captions
Textbooks : 1. Cosma Rohilla Shalizi, Advanced Data Analysis from an Elementary Point of View, 2015.
References: 1. Deng & Yu, Deep Learning: Methods and Applications, Now Publishers, 2013. 2. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, 2016. Michael Nielsen, Neural Networks and Deep Learning, Determination Press, 2015.

Big data Analytics Choice Based Credit System(CBCS)	
Semester: III	**CIE Marks:40**
Course Code:20MCA352	**SEE Marks:60**
Contact Periods (L:T:P):3-0-0	**Exam Hours:03**

Course Out Comes:

CO1: Identify the business problem for a given context and frame the objectives to solve it through data analytics tools.

CO2: Apply various algorithms for handling large volumes of data.

CO3: Illustrate the architecture of HDFS and explain functioning of HDFS clusters.

CO4: Analyse the usage of Map-Reduce techniques for solving big data problems.

CO5: Experiment with various datasets for analysis and visualization.

Module-1

Big Data and Analytics

Example Applications, Basic Nomenclature, Analysis Process Model, Analytical Model Requirements , Types of Data Sources, Sampling, Types of Data Elements, Data Exploration, Exploratory Statistical Analysis, Missing Values, Outlier Detection and Treatment, Standardizing Data Labels, Categorization

Module-2

Big Data Technology

Hadoop's Parallel World, Data discovery, Open source technology for Big Data Analytics, Cloud and Big Data, Predictive Analytics, Mobile Business Intelligence and Big Data, Crowd Sourcing Analytics, Inter- and Trans-Firewall Analytics.

Module-3

Meet Hadoop

Data, Data Storage and Analysis, Comparison with Other Systems, RDBMS, Grid Computing, Volunteer Computing, A Brief History of Hadoop, Apache Hadoop and the Hadoop Ecosystem Hadoop Releases Response.

Module-4

The Hadoop Distributed File system

The Design of HDFS, HDFS Concepts, Blocks, Namenodes and Datanodes, HDFS Federation, HDFS High-Availability, The Command-Line Interface, Basic Filesystem Operations, Hadoop Filesystems Interfaces, The Java Interface, Reading Data from a Hadoop URL, Reading Data Using the FileSystem API, Writing Data, Directories, Querying the Filesystem, Deleting Data, Data Flow Anatomy of a File Read, Anatomy of a File Write, Coherency Model, Parallel Copying with distcp Keeping an HDFS Cluster Balanced,

Hadoop Archives.

Module-5

A Weather Dataset ,Data Format, Analysing the Data with Unix Tools, Analyzing the Data with Hadoop, Map and Reduce, Java MapReduce, Scaling Out, Data Flow, Combiner functions, Running a Distributed MapReduce Job, Hadoop Streaming, Hadoop Pipes, Compiling and Running, Developing a MapReduce Application, The Configuration API, Combining Resources, Variable Expansion, Configuring the Development Environment, Managing Configuration, GenericOptionsParser, Tool and ToolRunner, Writing a Unit Test, Mapper, Reducer, Running Locally on Test Data, Running a Job in a Local Job Runner, Testing the Driver, Running on a Cluster, Packaging, Launching a Job, The MapReduce Web UI, Retrieving the Results, Debugging a Job, Hadoop Logs, Remote Debugging.

Textbooks

1. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications" Wiley.
2. Michael Minelli, Michehe Chambers, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", 1st Edition, Michael Minelli, Michele Chambers, AmbigaDhiraj, Wiley CIO Series, 2013.
3. Tom White, "Hadoop: The Definitive Guide", 3rd Edition, O'reilly, 2012.

References

1.Boris Lublinsky, Kevin T. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", Wiley, ISBN: 9788126551071, 2015.
2. Chris Eaton, Dirk deroos et al., "Understanding Big data", McGraw Hill, 2012.
3. Vignesh Prajapati, "Big Data Analytics with R and Haoop", Packet Publishing 2013.
4. Tom Plunkett, Brian Macdonald et al, "Oracle Big Data Handbook", Oracle Press, 2014.

Programming using C# Choice Based Credit System(CBCS)	
Semester: III	**CIE Marks:40**
Course Code:20MCA353	**SEE Marks:60**
Contact Periods (L:T:P):3-0-0	**Exam Hours:03**

Course Out Comes:

CO1: Analyse C# and client-server concepts using .Net Frame Work Components.

CO2: Apply delegates, event and exception handling to incorporate with ASP, Win Form, ADO.NET.

CO3: Analyze the use of .Net Components depending on the problem statement.

CO4: Implement & develop a web based and Console based application with Database connectivity

CO5: Implement & develop a web based application with Database connectivity

Module-1

Getting started with .NET Framework 4.0 and C#

Understanding Previous Technologies, Benefits of .NET Framework, Architecture of .NET Framework 4.0,.NET Execution Engine, Components of .NET Framework 4.0: CLR, CTS, Metadata and Assemblies, .NET Framework Class Library, Windows Forms, ASP .NET and ASP .NET AJAX, ADO .NET, Windows workflow Foundation, Windows Presentation Foundation, Windows Communication Foundation, Widows Card Space and LINQ.

Introducing C#

Creating a Simple C# Console Application, Identifiers and Keywords. System Data Types, Variables and Constants: Value Types, Reference Types, Understanding Type Conversions, Boxing and UnBoxing. Namespaces, The System namespace, .NET Array Types.

Module-2

Classes, Objects and Object Oriented Programming

Classes and Objects: Creating a Class, Creating an Object, Using this Keyword, Creating an Array of Objects, Using the Nested Classes, Defining Partial Classes and Method, Returning a Value from a Method and Describing Access Modifiers. Static Classes and StaticMembers, Properties: Read-only Property, Static Property, Indexers, Structs: Syntax of a struct and Access Modifiers for structs, System.Object Class Encapsulation: Encapsulation using accessors and mutators, Encapsulation using

Properties. Inheritance: Inheritance and Constructors, Sealed Classes and Sealed Methods, Extension methods.

Polymorphism: Compile time Polymorphism/ Overloading, Runtime Polymorphism/ Overriding. Abstraction: Abstract classes, Abstract methods. Interfaces: Syntax of Interfaces, Implementation of Interfaces and Inheritance.

Module-3

Delegates, Events, Exception Handling and ADO.NET Delegates:Creating and using

Delegates, Muticasting with Delegates. Events: Event Sources, Event Handlers, Events and Delegates, Multiple Event Handlers.
Exception Handling: The try/catch/throw/finally statement, Custom Exception.System.Exception, Handling Multiple Exception.\
Data Access with ADO.NET :Understanding ADO.NET: Describing the Architecture of ADO.NET, ADO.NET,ADO.NET Entity Framework. Creating Connection Strings: Syntax for Connection Strings.Creating a Connection to a Database: SQL Server Database, OLEDB Database, ODBC Data Source. Creating a Command Object. Working with DataAdapters: Creating DataSet from DataAdapter.

Module-4

Graphical User Interface with Windows Forms and WPF Windows Forms : Introduction, Windows Forms, Event Handling: A Simple Event- Driven GUI, Control Properties and Layout, Labels, TextBoxes and Buttons, GroupBoxes and Panels, CheckBoxes and RadioButtons, ToolTips, Mouse-Event Handling, Keyboard-Event Handling. Menus, Month Calendar Control, LinkLabel Control, ListBox Control, ComboBox Control, TreeView Control, ListView Control, TabControl and Multiple Document Interface (MDI) Windows.
WPF: New WPF Controls, WPF Architecture: Presentation Framework, Presentation Core, WindowsBase, MIL or Milcore, Working with WPF Windows: Using XAML in WPF 4.0 Applications : Contents of XAML and WPF Applications: XAML Elements Namespace and XAML, XAML Property Syntax, Markup Extensions.

Module-5

Web App Development and Data Access using ADO.NET
Introduction, Web Basics, Multitier Application Architecture, Your First Web Application: Building Web-Time Application, Examining Web-Time.aspx's Code- Behind File, Understanding Master pages, Standard Web Controls: Designing a Form, Validation Controls, GridView Control, DropDownList, Session Tracking, ASP.NET AJAX : Exploring AJAX,Need for AJAX, AJAX and other Technologies, AJAX Server Controls, ScriptManager control, Update Panel, UpdateProgress Control, Creating Simple Application using AJAX Server Controls

Textbooks

1. .NET 4.0 Programming (6-in-1), Black Book, Kogent Learning Solutions Inc., Wiley- Dream Tech Press. (Chapters: 1,10,11,12,13,14 and 19).
2. Paul Deitel and Harvey Deitel: C# 2010 for Programmers, 4th Edition, Pearson Education. (Chapters: 14,15,19 and 27.3)

References

1. Andrew Trolsen: Pro C# 5.0 and the .NET 4.5 Framework, 6th Edition, Wiley-Appress.
2. Bart De Smet: C# 4.0 Unleashed, Pearson Education- SAMS Series.
3. Herbert Schildt: Complete Reference C# 4.0, Tata McGraw Hill, 2010.

Software Project Management Choice Based Credit System(CBCS)	
Semester: III	**CIE Marks:40**
Course Code:20MCA354	**SEE Marks:60**
Contact Periods (L:T:P):3-0-0	**Exam Hours:03**

Course Out Comes:

CO1: Apply the practices and methods for successful software project management

CO2: Identify techniques for requirements, policies and decision making for effective resource management

CO3: Illustrate the evaluation techniques for estimating cost, benefits, schedule and risk

CO4: Devise a framework for software project management plan for activities, risk, monitoring and control

CO5: Design a framework to manage people

Module-1

INTRODUCTION TO SOFTWARE PROJECT MANAGEMENT

Introduction, Why is Software Project Management important? What is a Project?, Contract Management, Activities Covered by Software Project Management, Plans, Methods and Methodologies, Some ways of categorizing software projects, Stakeholders, Setting Objectives, Business Case, Project Success and Failure, What is Management? Management Control, Traditional versus Modern Project Management Practices

Module-2

PROJECT EVALUATION & FINANCE

Evaluation of Individual Projects, Cost Benefit Evaluation Techniques, Risk Evaluation, Programme Management, Managing allocation of Resources within Programmes, Financial Accounting –An overview – Accounting concepts, Principles & Standards, Ledger posting, Trial balance, Profit and Loss account Balance sheet

Module-3

ACTIVITY PLANNING

Objectives of Activity Planning, When to Plan, Project Schedules, Sequencing and Scheduling Activities, Network Planning Models, Forward Pass – Backward Pass , Identifying critical path, Activity Float, Shortening Project Duration, Activity on Arrow Networks Risk Management, Nature of Risk, Categories of Risk, A framework for dealing with Risk, Risk Identification, Risk analysis and prioritization, risk planning and risk monitoring

Module-4

MONITORING AND CONTROL

Creating the Framework, Collecting the Data, Review, Project Termination Review, Visualizing Progress, Cost Monitoring, Earned Value Analysis, Prioritizing Monitoring, Getting Project Back To Target, Change Control, Software Configuration Management

Module-5

MANAGING PEOPLE AND WORKING IN TEAMS

Introduction, Understanding Behavior, Organizational Behavior: A Background, Selecting the Right Person for the Job, Instruction in the Best Methods, Motivation, The Oldham – Hackman Job Characteristics Model, Stress –Health and Safety Working In Teams, Becoming a Team, Decision Making, Leadership.
Textbooks
1. Bob Hughes, Mike Cotterell, Rajib Mall, "Software Project Management", Fifth Edition, Tata McGraw Hill, 2011. 2."Accounting for Management" JawaharLal, 5th Edition, Wheeler Publications, Delhi.
References
1.JackMarchewka," Information Technology-Project Management", Wiley Student Version, 4th Edition, 2013. 2.James P Lewis,"Project Planning, Scheduling & Control", McGraw Hill, 5th Edition, 2011. 3.Pankaj Jalote," Software Project Management in Practise", Pearson Education, 2002.

Software Defined Networks Choice Based Credit System(CBCS)	
Semester: III	**CIE Marks:40**
Course Code:20MCA355	**SEE Marks:60**
Contact Periods (L:T:P):3-0-0	**Exam Hours:03**

Course Out Comes:

CO1: Recognize the fundamentals and characteristics of Software Defined Networks
CO2: Understand the basics of Software Defined Networks Operations and Data flow
CO3: Discriminate different Software Defined Network Operations and Data Flow
CO4: Analyse alternative definitions of Software Defined Networks
CO5: Apply different Software Defined Network Operations in real world problem

Module-1

Introduction to SDN

Understanding the SDN, Understanding the SDN technology, Control Plane, Data Plane, Moving information between planes, separation of the control and data planes, Distributed control planes, Load Balancing, Creating the MPLS Overlay, Centralized control planes.

Module-2

Working of SDN

Evaluation of Switches and Control planes, SDN Implications, Data centre Needs, Forerunner of SDN, Software Defines Networks is Born, Sustain SDN interoperability, Open source contribution, Fundamental Characteristics of SDN, SDN Operations, SDN Devices, SDN Controllers, SDN Applications, Alternate SDN methods.

Module-3

The Open Flow Specifications

Open Flow Overview, Open Flow Basics, Open Flow 1.0 additions, Open Flow 1.1 additions, Open Flow 1.2 additions, Open Flow 1.3 additions, Open Flow limitations.

Module-4

SDN via APIS, SDN via Hypervisor-Based Overlays, SDN via Opening up the device, Network function virtualization, Alternative Overlap and Ranking.

Module-5

Data centres definition, Data centres demand, tunnelling technologies for Data centres Path technologies in data centres, Ethernet fabrics in Data centres, SDN use case in Data centres.

Textbooks

1. Software Defined Networking by Thomas D Nadeau and Ken Gray.
2. Software Define Networks, A Comprehensive Approach, Paul Goransson, Chuck Black. MK Publications.

References

1. Software Defined Networking for Dummies brought you by cisco, Brian Underdahl and

Gary Kinghorn.

Data Analytics Lab **Choice Based Credit System**	
Semester: III	CIE Marks:40
Subject Code:20MCA36	SEE Marks:60
Contact Hours(L:T:P):04:0:0	Exam Hours:03
Course Outcomes: 1.Develop python program to perform search/sort on a given data set 2.Demonstrate object oriented principles 3. Demonstrate data visualization using Numpy for a given problem 4. Demonstrate regression model for a given problem 5.Deign and develop an application for the given problem	
1.Write a Python program to perform linear search	
2.Write a Python program to insert an element into a sorted list	
3.Write a python program using object oriented programming to demonstrate encapsulation, overloading and inheritance	
4.Implement a python program to demonstrate 1) Importing Datasets 2) Cleaning the Data 3) Data frame manipulation using Numpy	
5.Implement a python program to demonstrate the following using NumPy a) Array manipulation, Searching, Sorting and splitting. b) broadcasting and Plotting NumPy arrays	
6. Implement a python program to demonstrate Data visualization with various Types of Graphs using Numpy	
7.Write a Python program that creates a mxn integer arrayand Prints its attributes using matplotlib	
8.Write a Python program to demonstrate the generation of linear regression models.	
9.Write a Python program to demonstrate the generation of logistic regression models using Python.	
10.Write a Python program to demonstrate Timeseries analysis with Pandas.	
11.Write a Python program to demonstrate Data Visualization using Seaborn.	
Part-B Students shall carry out a mini project using python/pandas to demonstrate the data analysis. A team shall consist not more than 2 candidates	

Note: In CIE and SEE part-A shall be given 40% weightage whereas 60% weightage shall be given to Part-B mini project.

Mini project with IOT Lab **Choice Based Credit System**	
Semester :III	CIE Marks:40
Subject Code:20MCA37	SEE Exam:60
Contact Hours(L:T:P)0:0:4	Exam Hours:03
Course Outcomes: CO**1: Demonstrate the** IoT architecture and design for a given problem CO**2:** Apply IOT architecture for a given problem CO**3:** Analyse the application protocol, transport layer methods for the given business case. CO**4:** .Design and develop an application for the given problem CO5: Develop python program for the given problem and verify the output	
1.Run some python programs on Pi like: Read your name and print Hello message with name Read two numbers and print their sum, difference, product and division.Word and character count of a given string Area of a given shape (rectangle, triangle and circle) reading shape and appropriate values from standard input Print a name 'n' times, where name and n are read from standard input, using for and while loops. Handle Divided by Zero Exception. Print current time for 10 times with an interval of 10 seconds. Read a file line by line and print the word count of each line.	
2. Get input from two switches and switch on corresponding LEDs	
3. Flash an LED at a given on time and off time cycle, where the two times are taken from a file.	
4. Switch on a relay at a given time using cron, where the relay's contact terminals are connected to a load.	
5. Access an image through a Pi web cam	

6. Control a light source using web page.
7. Implement an intruder system that sends an alert to the given email.
8. Get the status of a bulb at a remote place (on the LAN) through web.
9.Get an alarm from a remote area (through LAN) if smoke is detected. The student should have hands on experience in using various sensors like temperature, humidity, smoke, light, etc. and should be able to use control web camera, network, and relays connected to the Pi.
Part-B
Candidate shall demonstrate a mini project in a team not more than two candidates.

Note: In CIE and SEE part-A shall be given 40% weightage whereas 60% weightage shall be given to Part-B mini project.

Advances in Java Lab **Choice Based Credit System**	
Semester: III	CIE Marks:40
Subject Code:20MCA38	SEE Marks:60
Contact Hours(L:T:P):0:0:4	Exam Hours:03
Course Outcomes: Students will be able to CO1: Apply the concept of Servlet and its life cycle to create web application. CO2: Apply JSP tags and its services to web application. CO3: Create packages and interfaces in the web application context. CO4: Build Database connection for the web applications. CO5: Develop application programs using beans concept.	
1.Write a JAVA Servlet Program to implement a dynamic HTML using Servlet (user name and Password should be accepted using HTML and displayed using a Servlet).	
2.Write a JAVA Servlet Program to Auto Web Page Refresh (Consider a webpage which is displaying Date and time or stock market status. For all such type of pages, you would need to refresh your web page regularly; Java Servlet makes this job easy by providing refresh automatically after a given interval).	
3.Write a JAVA Servlet Program to implement and demonstrate GET and POST methods (Using HTTP Servlet Class).	

4.Write a JAVA Servlet Program using cookies to remember user preferences.
5.Write a JAVA Servlet program to track HttpSession by accepting user name and password using HTML and display the profile page on successful login.
6.Write a JSP Program which uses jsp:include and jsp:forward action to display a Webpage.
7.Write a JSP Program which uses tag to run an applet
8.Write a JSP Program to get student information through a HTML and create a JAVA Bean class, populate Bean and display the same information through another JSP
9. Write a JSP program to implement all the attributes of page directive tag.
10.Write a JAVA Program to insert data into Student DATA BASE and retrieve info based on particular queries (For example update, delete, search etc…).
11.An EJB application that demonstrates Session Bean (with appropriate business logic).
12.An EJB application that demonstrates MDB (with appropriate business logic).
13. An EJB application that demonstrates persistence (with appropriate business logic).

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI.

Master of Computer Applications

Scheme of Teaching and Examination

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

Semester-IV

Sl. No.	Course Type	Course Code	Title	Teaching Hours / Week			Examination				Credits
				Tutorial (T)	Lecture (L)	Practical (P) / Seminar (S)	Duration (in Hrs)	SEE Marks	CIE Marks	Total Marks	
1.	PCC	20MCA41	Research / Technical Seminar	-	-	2	2	-	100	100	2
2.	PCC	20MCA42	Industry Internship (4 weeks)	-	-	-	-	-	100	100	2
3.	PCC	20MCA43	Project Work (16 Weeks)	-	-	-	3	60	40	100	20
			TOTAL	-	-	2	5	60	240	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 the 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.

Paper publication:

- Student has to publish a research paper in indexed journal / conference in leading avenues like IEEE, Springer.
- Publication follows the Thesis.
- 25% weightage is given in CIE as well as in SEE.

Project:

- The candidate should carry out the project in any industry or R&D organization 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 carried out should be free from plagiarism.
- The literature study may be clearly written which may be the summary of existing work and highlight of what are the functionalities that are proposed to the project.
- Student shall indicate the different research papers, documents referred as a part of the literature study.
- The guidelines given to mini-project are to be followed.

- This is an individual project for duration of minimum of 4 months.
- **Paper publication in an indexed journal / conference is compulsory as part of the project work.**
- The student shall present the progress of the project to the panel of members constituted by the Head of the Department (HoD).
- There shall be a minimum of three reviews. Each review has the maximum of 50 marks which includes presentation about the progress of the work (25 Marks) and question and answer (25 Marks). The marks secured by all the three reviews will be brought down to 10 marks.

General Rules

1) Project work may be application/testing or research oriented and accordingly the project report contents may vary.

2) The students are informed to strictly follow the report format as prescribed by the University. **If the project report is not as per the format, internal guide / external examiner will have every right to reject the project.**

3) Students are encouraged and appreciated to show their project code demo along with their power point slide show during their viva-voce exams as an added advantage.

Guidelines for Industry Internship:

- The students shall undergo internship in the industry for a period of 6 weeks during the vacation immediately after the 5th semester examination.
- The internship shall be carried out in industry / R&D labs or institutions.
- Internship should be presented along with the report by the end of 6 weeks and shall be evaluated by the internal panel for 50 marks each.
- There shall be at least one review conducted to find the status of the internship progress. This will carry 25 marks for presentation and 25 marks for question / answer.
- The student shall prepare a report and submit the same to the guide allotted by the institute. This carries 50 marks. The report format for the internship shall be as equivalent as the Project Report as prescribed by the University.
- The student shall present the progress about the internship to the panel of members constituted by the Head of the Department (HoD).

Rubrics / Scheme of Evaluation:

Course code	Title	Internal (CIE)					External (SEE)			Total Marks
		Report	Presentation	Question and Answer	Dissertation evaluation	Paper Publication	Paper Publication	Dissertation evaluation	Viva-Voce	
20MCA41	Research / Technical Seminar	50	25	25	--	--	--	--	--	100
20MCA42	Industry Internship	50	25	25	--	--	--	--	--	100
20MCA43	Project Work	--	10*		20	10	15	30	15	100

Rubrics: Dept. can have its own rubrics as per the scheme mentioned above for the evaluation of internship and project work.

VISVESVARAYA TECHNOLOGICAL UNIVERSITY

JNANA SANGAMA, BELAGAVI



Internship Report on

<INTERNSHIP TOPIC>

Submitted in partial fulfillment of the requirements of the 4th Semester in

MASTER OF COMPUTER APPLICATIONS

BY

<<STUDENT NAME>>

<<USN>>

Under the Guidance of

<<Guide1 Name1>>

<<Designation>>

<<Guide**2** Name**2**>>

<<Designation>>



BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

Yelahanka, Bengaluru-64

2021-22 Even Semester

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

MASTER OF COMPUTER APPLICATIONS

Yelahanka, Bengaluru-64

INTERNSHIP CERTIFICATE

This is to certify that <<**Student Name**>> bearing <<**USN**>> has satisfactorily completed the Internship – 20MCA42 entitled **<<Topic>>** in the academic year **2021-22** as prescribed by VTU for IV Semester of Master of Computer Applications.

Signature of the internal Guide **Signature of the external Guide**

Signature of the HOD

ACKNOWLEDGEMENT

DEPARTMENT OF MASTER OF COMPUTER APPLICATIONS
Yelahanka, Bengaluru-64

VISION

To develop quality professionals in Computer Applications who can provide sustainable solutions to the societal and industrial needs

MISSION

Facilitate effective learning environment through quality education, state-of-the-art facilities, and orientation towards research and entrepreneurial skills.

PROGRAMME EDUCATIONAL OBJECTIVES

PEO 1

Develop innovative IT applications to meet industrial and societal needs

PEO 2

Adapt themselves to changing IT requirements through life-long learning

PEO 3

Exhibit leadership skills and advance in their chosen career

PROGRAM OUTCOMES

PO1: Apply knowledge of computing fundamentals, computing specialization, mathematics and domain knowledge to provide IT solutions

PO2: Identify, analyse and solve IT problems using fundamental principles of mathematics and computing sciences

PO3: Design, Develop and evaluate software solutions to meet societal and environmental concerns

PO4: Conduct investigations of complex problems using research based knowledge and methods to provide valid conclusions.

PO5: Select and apply appropriate techniques and modern tools for complex computing activities

PO6: Practice and follow professional ethics and cyber regulations

PO7: Involve in life-long learning for continual development as an IT professional.

PO8: Apply and demonstrate computing and management principles to manage projects in multidisciplinary environments by involving in different roles

PO9: Comprehend& write effective reports and make quality presentations.

PO10: Understand and assess the impact of IT solutions on socio-environmental issues

PO11: Work collaboratively as a member or leader in multidisciplinary teams.

PO12: Identify potential business opportunities and innovate to create value to the society and seize that opportunity

Project Internship (16MCA61)

Course Outcomes

1. Analyse the real-time industry/research work environment with emphasis on organizational structure/job process/different departments and functions / tools /technology.
2. Develop applications using modern tools and technologies.
3. Demonstrate self-learning capabilities with an effective report and detailed presentation.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3		3					2		
CO2			3	3	3						2	
CO3						3	3		3			

Rubrics for Internship Presentation Assessment

	Excellent (10)	V. Good (8)	Good (6)	Satisfactory (4)	Poor (2)	Final Score
Knowledge on Industry experience /Research work	Demonstrates in depth knowledge about Industry / Research processes; answered all questions with elaboration	Adequate knowledge on most of the industry/ Research processes. Answered all questions but failed to elaborate	Knowledge to a limited extent on major processes. Able to answer most of the questions though not elaborate	Superficial knowledge of topic; only able to answer basic questions	Does not have any knowledge; Unable to answer questions	
Organization of the presentation	Presented in logical sequence; introduction and background given in proper context; key points and conclusions are clear and well presented with citations and references	Most information presented in logical sequence; clear introduction; adequate background; some irrelevant information. Some References are overlooked	Organized in a presentable manner though lacks details of some of the topics. Or very less references and citations.	Problems with sequencing, lacks clear transitions; incomplete or overly detailed introduction, emphasis given to less important information	Little or no organization, difficult to follow; missing or ineffective introduction; confusing background; key points unclear	
Usage of Modern tools and technologies	Effectively utilized appropriate tools and technologies for implementation.	Involved sufficiently in developing applications by utilizing modern tools and technologies	Developed applications, though not very effectively. Fair enough.	Sufficient for understanding but not clearly elaborated about usage of tools and technologies	Too brief or insufficient for understanding or too detailed	
Presentation Skills	Clear articulation about tools/technology, steady delivery rate, good posture and eye contact, confident and appropriately dressed	Clear articulation about tools/technology but not very polished. Able to recover from minor mistakes. Appropriately dressed	Good articulation about tools/technology and not very polished. Not able to realize minor mistakes. Presentable attire	Refers to slides to make points, occasional eye contact, incorrect pronunciations, and Voice fluctuation.	No clarity in sentence, Inaudible or too loud, no eye contact, delivery rate is too slow or too fast, not in formal attire	
Visuals	Visually pleasing and easy to read; good use of white space, colour, backgrounds; images and	Adequate layout, but with some fonts, colours, backgrounds difficult to read	Good visuals but can be improved largely.	Difficult to read, cluttered appearance; images improperly sized; some distracting graphics or	Confusing layout, text extremely difficult to read; many graphics, sounds, animations distract from	

	Graphics support.			animations	the presentation	
					Total Score	

Rubrics for Internship Report Assessment

	Excellent (10)	**V. Good (8)**	**Good(6)**	**Satisfactory (4)**	**Poor (2)**	**Final Score**
Purpose and Objective of Internship	The purpose and objective of the Internship report is made clear, and the report addresses the objective(s) in a focused and logical manner.	The purpose and objective of the Internship report is made clear, and the report addresses the objective(s).	Documented well but with slight ambiguity in analyzing the problems	Purpose and objectives are stated ambiguously	The report does not clearly address the objective(s) of Internship.	
Documenting the essence of Tools/Technology used, Grammar & Spelling	Complete information is provided about tools/technology, Very few spelling errors, correct punctuation, grammatically correct, complete sentences.	Information is provided about tools/technology, Occasional lapses in spelling, punctuation, grammar, but not enough to seriously distract the reader.	Average technical details on tools/technology usage, Grammatical mistakes not corrected.	Less technical details, sentences are not framed properly and with a few spelling mistakes	No details about tools/technology, Numerous spelling errors, non-existent or incorrect punctuation, and/or severe errors in grammar that interfere with understanding.	
Code Development / self learning	Design and Code is self-developed wherever applicable.	Design and Code is self-developed wherever applicable. Code snippets are partially cited	Design and Code is not partially self-developed wherever applicable	Major part of the implementation is copied.	No details about design and development	
Report Format	All required elements of the report are present and completed efficiently.	All required elements of the report are present and completed to a satisfactory standard.	All required elements are present but some of them are not given completely	All required elements are provided but in a haphazard way	Key elements of the report are not provided. Overall presentation of the document is not to a professional standard.	
Plagiarism Check	Uniqueness 90% and above	Uniqueness 85% to 89%	Uniqueness 80% to 85%	Uniqueness between 75% to 79%	Uniqueness less than 75%	
					Total Score	

Rubrics for Internship Presentation and Question/ Answer

(Knowledge on Industry experience /Research work) Assessment (out of 25 + 25 marks)

Rubrics for Internship Report Assessment (out of 50 marks) =

Total Marks (Out of 100 marks) =

Signature of Project Guide

Table of Contents

Page No.

Department of Master of Computer Applications

Rubrics for Technical/Research Seminar Presentation Assessment

Name of the Student: **USN:**

Seminar Guide:

Particulars	Excellent (4)	Good (3)	Fair (2)	Poor (1)	Final Score
Knowledge of the topic at analyse level	Demonstrates in depth knowledge; answered all questions with elaboration	Adequate knowledge on most of the topics. Answered all questions but failed to elaborate	Superficial knowledge of topic; only able to answer basic questions	Does not have any knowledge; Unable to answer questions	
Organization of the presentation	Presented in logical sequence; introduction and background give proper context; key points and conclusions are clear and well presented	Most information presented in logical sequence; clear introduction; adequate background; some irrelevant information	Problems with sequencing, lacks clear transitions; incomplete or overly detailed introduction, emphasis given to less important information	Little or no organization, difficult to follow; missing or ineffective introduction; confusing background; key points unclear	
Level of Understanding	Sufficient for understanding and presented very effectively	Sufficient for understanding and presented well	Sufficient for understanding but not clearly presented	Too brief or insufficient for understanding or too detailed	
Presentation Skills	Clear articulation, steady delivery rate, good posture and eye contact, confident and appropriately dressed	Clear Articulation but not very polished. Able to recover from minor mistakes. Appropriately dressed	Refers to slides to make points, occasional eye contact, incorrect pronunciations, and Voice fluctuation.	Inaudible or too loud, no eye contact, delivery rate is too slow or too fast, not in formal attire	
Visuals	Visually pleasing and	Adequate layout, but with	Difficult to read, cluttered	Confusing layout, text	

	easy to read; good use of white space, colour, backgrounds; images and Graphics support.	some fonts, colours, backgrounds difficult to read	appearance; images improperly sized; some distracting graphics or animations	extremely difficult to read; many graphics, sounds, animations distract from the presentation	
				Total Score	

Rubrics for Seminar Report Assessment

	Excellent (2)	**Good (1)**	**Poor(0)**	**Final Score**
Objective, relevance, impact and conclusion	The purpose and objective, relevance and impact of the topic is made clear, and the report addresses them in a focused and logical manner.	The purpose and objective, relevance and impact of the topic is made clear, and the report addresses them.	The report does not clearly address any of them.	
Grammar & Spelling	Very few spelling errors, correct punctuation, grammatically correct, complete sentences.	Occasional lapses in spelling, punctuation, grammar, but not enough to seriously distract the reader.	Numerous spelling errors, non-existent or incorrect punctuation, and/or severe errors in grammar that interfere with understanding.	
References	Sources are acknowledged with full reference details.	Sources are acknowledged with bare reference details.	Sources are not acknowledged.	
Report Format	All required elements of the report are present and completed efficiently.	All required elements of the report are present and completed to a satisfactory standard.	Key elements of the report are not provided. Overall presentation of the document is not to a professional standard.	
Plagiarism Check	Plagiarism below 10%	Plagiarism between 10% and 25%	Plagiarism more than 25%	
			Total Score	

The seminar rubrics can be mapped to the following POs:

POs / Rubrics	PO1/PO2	PO5/PO6	PO7	PO9	PO10
Knowledge of the topic	**3**		**3**		**2**
Organization of the presentation & Report	**2**	**3**	**3**	**3**	
Level of Understanding			**3**		**1**
Presentation Skills			**3**	**3**	
Visuals		**3**	**3**	**3**	

PO1: Apply knowledge of computing fundamentals to provide IT solutions.

PO2: Analyse IT problems using fundamental principles of mathematics and computing sciences

PO5: modern tool usage [for references handling, plagiarism check, spelling check etc]

PO6: Understand professional ethics, cyber regulations, and responsibilities.

PO7: Engage and learn independently for continual development as an IT professional.

PO9: Comprehend, write effective reports and make quality presentations.

PO10: Understand the impact of IT solutions on socio-environmental issues

Course outcomes: At the end of the Seminar Course, students will be able to

CO1: Analyse relevant topic in computing sciences and make valid conclusions on industry/society/environment using fundamental/ research based knowledge

[mapped to PO1, PO2 and PO10]

CO2: Demonstrate self-learning by making effective presentation and report writing

[Mapped to PO7 and PO9]

CO3: Understand ethics, cyber regulations / responsibilities and demonstrate the same by using relevant / modern tool [mapped to PO5 and PO6]

Rubrics for Seminar Presentation Assessment (out of 50 marks) =

Rubrics for Seminar Report Assessment (out of 50 marks) =

Total Marks (Out of 100 marks) =

Note : Marks obtained out of 100 may be considered as attainment in CO1, CO2 and CO3 taken together.

Signature of Seminar Guide / Coordinator

1. **Name:**
   Signature:

2. Name:
Signature:

Signature of HOD