VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI.

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

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VISVESVARAYA TECHNOLOGICAL UNIVERSITY
Scheme of Teaching and Examination

Master of Computer Applications

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

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SEMESTER-I

S.No	Course Type	Course Code	Title	Teaching Hours/ Week			Examination				
				L	P	T/S DA	Duration in hours	SEE Marks	CIE Marks	Total Marks	Credits
1	PCC	20MCA11	Data Structures with Algorithms	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**	**Data Structures with Algorithms 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	BC	20MCA19-BC*	Basics of Programming & CO	02	-	02	03	60	40	100	-
			Total	17	12	06	27	540	360	900	24

*Only for non-computer science students

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 Multiple Choice Questions (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 (**50**% weightage), remaining 50% 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:

1) Four credit courses are designed for 50 hours of teaching and learning process
2) Three credit courses are designed for 40hours Teaching – Learning process.
3) Two credit courses are designed for 30hours Teaching – Learning process.

Research/Technical Seminar:

As a part of the course Research Methodology & IPR, presenting the seminar is mandatory. The CIE marks awarded for Resaerch/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. Seminar is to be considered for **20 marks. Remaining 20 marks is for internal tests.**

Students shall do the literature survey of existing work on contemporary topics and present. Student shall highlight on the research gap and propose solution. Seminar presentation and report have to be evaluated using rubrics.

Bridge course: 20MCA19-BC

20MCA19-BC: Bridge course is a non-credit course introduced to the students who admits into MCA program from non-computer science background. Students have to secure eligibility by scoring 50% marks in aggregate (CIE and SEE).

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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	Object Oriented Programming with Java	03	-	-	03	60	40	100	03
3	PCC	20MCA23	Web Technologies	04	-	-	03	60	40	100	04
4	PCC	20MCA24	Software Engineering	03	-	02	03	60	40	100	04
5	PEC	20MCA25X	Elective-1	03	-	-	03	60	40	100	03
6	PEC	20MCA26X	Elective-2	03	-	-	03	60	40	100	03
7	PCC	20MCA27	DBMS Lab	-	04	-	03	60	40	100	02
8	PCC	20MCA28	Java Programming Lab.	-	04	-	03	60	40	100	02
9	PCC	20MCA29	Web Technologies Lab with Mini-project	-	04	-	03	60	40	100	02
			Total	**19**	**12**	**02**	**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	Mobile Application Development
20MCA254	User Interface Design	20MCA264	Distributed operating System
20MCA255	Optimization Techniques	20MCA265	Natural Language Processing

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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**	**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	03
5	PEC	20MCA35X	Elective-III	03	-	-	03	60	40	100	03
6	PCC	20MCA36	Data Analytics Lab with Mini-project	-	04		03	60	40	100	02
7	PCC	20MCA37	IoT Lab with Mini Project	-	04		03	60	40	100	02
8	PCC	20MCA38	Advances in Java Lab	-	04		03	60	40	100	02
			Total	18	12	-	24	480	320	800	24

Elective-III		Elective-IV	
20MCA341	Block chain Technology	20MCA351	Deep Learning
20MCA342	Cloud Computing	20MCA352	Big data Analytics
20MCA343	Digital Marketing	20MCA353	Wireless Ad Hoc Networks
20MCA344	Software Testing	20MCA354	Software Project Management
20MCA345	NOSQL	20MCA355	Software Defined Networks

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SEMESTER-IV

S.No	Course Type	Course Code	Title	Lecture(L)	Tutorial(T)	Practical(P)\Seminar	Duration in hours	SEE Marks	CIE Marks	Total Marks	Credits
				Teaching Hours/Week			**Examination**				
1	PCC	20MCA41	Advances in Web Technologies	02	02		3	60	40	100	02
2	PCC	20MCA42	Programming using C#	02	02	-	03	60	40	100	02
3	PCC	20MCA43	Industry Internship (4 weeks in vacation of 3rd sem.)	-	-	-	-	-	100	100	02
4	PCC	20MCA44	Project work Phase 2 (During 4th Semester- min. of 4 Months)			02	03	60	40	100	20
			Total	**4**	**4**	**02**	**09**	**180**	**220**	**400**	**26**

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.

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. It is recommended to do prior

art search as part of literature survey before submitting the synopsis for the projects.

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 work evaluation

There shall be three project presentations each to be considered for 5 marks (5X3= 15 marks) and a final presentation for 15 marks. Presentation may be given using Power point presentation/demonstrations of the work. Synopsis submitted in a proper format is to be evaluated for 10 marks. Student has to publish a research paper in indexed journal / conference. Publications follow the Thesis. 10% weightage is given in SEE. Project report organization/contents can be similar to project report contents of 2018 scheme/syllabus .

Data Structures with Algorithms Choice Based Credit System			
Semester:	I	CIE Marks:	40
Course Code:	20MCA11	SEE Marks:	60
Contact Hours (L:T:P):	4:0:0	Exam Hours:	03

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

1. CO1: Demonstrate different data structures, its operations using C programming.
2. CO2: Analyse the performance of Stack, Queue, Lists, Trees, Hashing, Searching and Sorting techniques.
3. CO3: Implement some applications of data structures in a high-level language such as C/C++
4. CO4: Design and apply appropriate data structures for solving computing problems.
5. 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.

Operating System with UNIX Choice Based Credit System(CBCS)			
Semester: I	I	CIE Marks:	40
Course Code:	20MCA12	SEE Marks:	60
Contact Periods (L:T:P):	4-0-0	Exam Hours:	3

Course Outcomes:

1. CO1:Analyse the basic Operating System Structure and concept of Process Management
2. CO2: Analyse the given Synchronization/ Deadlock problem to solve and arrive at valid conclusions.
3. CO3: Analyse OS management techniques and identify the possible modifications for the given problem context.
4. CO4:Demonstrate the working of basic commands of Unix environment including file processing
5. CO5: : Demonstrate the usage of different shell commands, variable and AWK filtering to the given problem

Module-1

Introduction to Operating Systems, Computer System Architecture; Operating System Operations; ; Operating System Structure: Operating System Services; System Calls; Types of System Calls; System Programs;; Virtual Machines; System boot.

Process Management Process Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Multiple Processor Scheduling. Process Synchronization

Module-2

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; Demand Paging; Page Replacement; Allocation of Frames; Thrashing.

Module-3

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-4

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, 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.

Module-5

AWK and Advanced Shell Programming

Simple AWK Filtering, Splitting a Line into Fields, printf, the Logical and Relational Operators, Number Processing, Variables, The –f option, BEGIN and END positional Parameters, getline, Built-invariables, Arrays, Functions, Interface with the Shell, Control Flow. The sh command, export Command, Conditional Parameter Substitution, Merging Streams, Shell Functions, eval, Exec Statement and Examples

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
4. Behrouz A Forouzan and Richard F Gilberg
5. 4.D M Dhamdhere: Operating Systems – A Concept Based Approach, 2nd Edition, Tata McGraw – Hill, 2002.
6. P C P Bhatt: Operating Systems, 2ndEdition, PHI, 2006.
7. 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

1. CO1: Apply the basic concepts of networking and to analyse different parameters such as bandwidth, delay, throughput of the networks for the given problem.
2. CO2: Apply different techniques to ensure the reliable and secured communication in

wired and wireless communication
3. CO3: Analyse the networking concepts of TCP/IP for wired and wireless components
4. CO4: Identify the issues of Transport layer to analyse the congestion control mechanism
5. 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(L: T:P)::3-2-0	Exam Hours:03
Course Outcomes: At the end of the course student will be to	

1. CO1: Apply the fundamentals of set theory and matrices for the given problem.

2. CO2: Apply the types of distribution, evaluate the mean and variance for the given case study/ problem.
3. CO3: solve the given problem by applying the Mathematical logic concepts
4. CO4: Model the given problem by applying the concepts of graph theory.
5. CO5: Design strategy using gaming theory concepts for the given problem.
6. 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. 1.Richard A Johnson and C.B Gupta "Probability and statistics for engineers" Pearson Education.
2. 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

1. CO1: Identify the suitable research methods and articulate the research steps in a proper sequence for the given problem.
2. CO2: Carry out literature survey, define the problem statement and suggest suitable solution for the given problem and present in the format of the research paper (IEEE).
3. CO3: Analyse the problem and conduct experimental design with the samplings.
4. CO4:Perform the data collection from various sources segregate the primary and secondary data
5. 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. 1.Research Methods: the concise knowledge base   Trochim, Atomic Dog Publishing, 2005. 2. 2.Conducting Research Literature Reviews: From the Internet to Paper   Fink A Sage Publications, 2009.

Data Structures with Algorithms Lab

Semester: II	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, Students will be able to

1. CO1: Implement sorting / searching techniques, and validate input/output for the given problem.
2. CO2: Implement data structures (namely Stacks, Queues, Circular Queues, Linked Lists, and Trees), its operations and algorithms.
3. CO3: Implement the algorithm to find whether the given graph is connected or not and conclude on the performance of the technique implemented.
4. CO4: Design and apply appropriate data structures for solving computing problems
5. CO5: Implement the techniques for evaluating the given expression.

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 C 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 with the help of a c programming.
8.	Check whether a given graph is connected or not using DFS method using C programming.
9.	From a given vertex in a weighted connected graph, find shortest paths to other vertices Using Dijkstra's algorithm (C programming)
10.	Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm (C programming)

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

1. CO1:Demonstrate the working of basic commands of Unix environment including file processing
2. CO2: Apply Regular expression to perform pattern matching using utilities like grep,sed and awk.
3. CO3: Implement unix commands/ system calls to demonstrate process management
4. CO4: Demonstrate the usage of different shell commands, variable and AWK filtering to the given problem.
5. 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. 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 awk script 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

1. CO1:Apply the basic concepts of networking and to analyse different parameters such as bandwidth, delay, throughput of the networks for the given problem.
2. CO2:Apply different techniques to ensure the reliable and secured communication in wired and wireless communication
3. CO3:Analyse the networking concepts of TCP/IP for wired and wireless components
4. CO4:Identify the issues of Transport layer to analyse the congestion control mechanism
5. 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.

Note 1: In the practical exam student has to execute one program from part-A and one from part-B(equal weightage of marks).

Bridge Course: Basics of Programming and Computer Organisation	
Choice Based Credit System	
Semester: I	CIE Marks:40
Course Code: 20MCA19-BC	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
1. CO1: Demonstrate the key concepts introduced in C programming by writing and executing the programs.
2. CO2: Demonstrate the concepts of structures and pointers for the given application/problem.
3. CO3: Implement the single/multi-dimensional array for the given problem.
4. CO4: Demonstrate the application of logic gates in solving some societal/industrial problems.
5. CO5: Analyse how memory organization, operations, instruction sequencing and interrupts are useful in executing the given program.

Module-1

C Programming: decision making, control structures and arrays

C Structure, Data Types, Input-Output Statements, 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, Pointer arithmetic, Functions , Call by value, Call by reference, Pointer as function arguments, recursion, Passing arrays to functions, passing strings to functions, Functions returning pointers, Pointers to functions, Programming Examples

Module-4

Binary Systems and Combinational Logic

Digital Computers and Digital Systems, Binary Numbers, Number Base Conversion, Octal and Hexadecimal Numbers, subtraction using r's and r-1 complements, Binary Code, Binary Storage and Registers, Binary Logic, Integrated Circuits, Digital Logic Gates

Module-5

Basic Structure of Computer Hardware and Software

Computer Types, Functional Units, Basic Operational Concepts, Bus structure, Software, Performance, Multiprocessing and Multi computers, Machine Instruction: Memory Locations and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes, Interrupts.

Textbooks

1. Programming in ANSI C,Balaguruswamy, 7th Edition, McGraw Hill Education

2.C : The Complete Reference, Herbert Schild,4th Edition, McGraw Hill Education

3. Let us C, YashwantKanetkar, BPB Publications

4.M.Morris Mano, "Digital Logic and Computer Design", Pearson, 2012.

5.Carl Hamacher, ZvonkoVranesicSafwatZaky, "Computer Organization", 5th edition, Tata McGraw-Hill, 2011

DatabaseManagement 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 of the course students will be able to

1. CO1: Apply the basic concepts of database management in designing the database for the given problem.
2. CO2: Design entity-relationship diagrams to the given problem to develop database application with appropriate fields and validations.
3. CO3: Implement a database schema for the given problem domain.
4. CO4: Formulate and execute SQL queries to the given problem.
5. 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.

Object Oriented Programming with Java	
Choice Based Credit System(CBCS)	
Semester: I	CIE Marks:40
Course Code:20MCA22	SEE Marks:60
Contact Periods (L:T:P):3-0-0	Exam Hours:03

Course Outcomes:

1. CO1: Demonstrate the basic programming constructs of Java and OOP concepts to develop Java programs for a given scenario.
2. CO2: Illustrate the concepts of generalization and run time polymorphism applications to develop reusable components.
3. CO3: Demonstrate the usage of Packages, Interfaces, Exceptions and Multithreading in building given applications.
4. CO4: Apply Enumerations, Wrappers, Auto boxing, Collection framework and I/O operations for effective coding to the given problem.
5. CO5: Implement the concepts of Applets, and networking using Java network classes for developing the distributed applications to the given problem.

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

InterfaceFundamentals,CreatinganInterface,Implementingan   Interface,Using InterfaceReferences,ImplementingMultipleInterfaces,Constantsin   Interfaces, Interfacescanbeextended,NestedInterfaces,FinalThoughtsonInterfaces.

Packages

Package Fundamentals, Packages andMember Access, Importing Packages, Static Import

ExceptionHandling

TheExceptionHierarchy,ExceptionHandlingFundamentals,The Consequencesof an Uncaught Exception, Exceptions Enable you to handle   errors gracefully, using Multiple catch clauses, Catching subclass Exceptions, try blocks can   be nested, ThrowinganException,A CloserlookatThrowable,usingfinally,usingthrows,Java's   Built-inExceptions,NewExceptionfeaturesaddedbyJDK7, CreatingException Subclasses.

Module-4

MultithreadedProgramming

Multithreadingfundamentals,The   ThreadClassandRunnableInterface,Creating   Thread, Creating Multiple Threads, Determining   When a Thread Ends, Thread Priorities,Synchronization,using   SynchronizationMethods,TheSynchronized Statement,ThreadCommunicationusingnotify(),wait()and   notifyAll(),suspending, ResumingandstoppingThreads.

Enumerations,AutoboxingandAnnotations

Enumerations, Java Enumeration are class types, The Values() and Valueof() Methods,Constructors,methods,instancevariablesand   enumerations,Autoboxing, Annotations(metadata)

Module-5

NetworkingwithJava.net

Networkingfundamentals,   TheNetworkingclassesandInterfaces,TheInetAddressclass,The

SocketClass,TheURLclass,TheURLConnectionClass,The HttpURLConnectionClass.

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.JavaFundamentals,AcomprehensiveIntroductionbyHerbertSchildt,DaleSkrien.TataMcGrawHill Edition2013.(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.JavaProgrammingbyHariMohanPandey,PearsonEducation,2012.

2.Java6 Programming,BlackBook,KoGenT, DreamtechPress,2012.

3.Java2Essentials,CayHortsmann,secondedition,Wiley

Web Technologies	
Choice Based Credit System	
Semester: II	CIE Marks:40
Course Code:20MCA23	SEE Marks:60
Contact Hours(L:T:P): 4:0:0	Exam Hours:03

Course outcomes

1. CO1: Apply the features JQuery for the given web based problem.
2. CO2: Demonstrate the development of XHTML documents using JavaScript and CSS.
3. CO3: Illustrate the use of CGI and Perl programs for different types of server side applications.
4. CO4: Design and implement user interactive dynamic web based applications.
5. 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,progress, 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	
Choice Based Credit System	
Semester:II	CIE Marks:40
Course Code:20MCA24	SEE Marks:60
Contact Hours(L:T:P): 3:2:0	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 dynamic diagrams to represent 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 and generate code (skeleton) using the modern tool.	
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, Metrics.

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 McGrawHill,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):3:0:0	Exam Hours:03

Course Outcomes: At the end of the course 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 and evaluate its suitability.

CO5: 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, SQLinjection, Buffer Overflow.

Module-3

Phishing and Identity Theft

Introduction, Phishing – Methods of Phishing, Phishing Techniques, Phishing Toolkits andSpy 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

Cybercrime: Mobile and Wireless devices, Introduction, proliferation of mobile and wireless devices, Trends in Mobility, credit card frauds in Mobile and wireless computing, Attacks on Mobile/cell phones.

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

DataMining with Business Intelligence	
Choice Based Credit System	
Semester:II	CIE Marks:40
Course Code:20MCA252	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: 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. PaulrajPonnian, "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): 3:0:0	Exam Hours:03

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

CO1: Analyse the essentials of supply chain management in ERP.

CO2: Analyse the implementation of ERP in the context of business of the different organization.

CO3: Analyse and apply ERP for different business modules for the given problem.

CO4: Analyse the given case study of ERP marketing.

CO5: Analyse the design of ERP with future E-commerce and internet.

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

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. Sunil Chopra and Peter Meindl, Supply Chain Management – Strategy, Planning and Operation, Pearson/PHI, 3rd Edition, 2007

2. Alexis Leon, "ERP Demystified", Tata McGraw Hill, 1999.

3. 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): 3:0:0	Exam Hours:3

Course Outcomes: At the end 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 for the given problem.

CO3: Apply the development methodologies with an analysis of the social impact and legal issuesUnderstand Direct Manipulation and Virtual Environment

CO4: Discuss the command, natural languages and issues in design for maintaining QoS

CO5: Demonstrate techniques for information search and visualization for the given problem.

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.BenShneiderman, 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):3:0:0	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 technique.

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 for the given problem.

Module-1

Linear programming problem(LPP): introduction, structure of linear programming model, advantages, general model of Linear programming problem(LPP), examples of LP formulation, graphical solutions of LP problem and Solution of LPP by simplex method:

Module-2

Linear programming problem(LPP):Artificial variables-two-phase method, Big M method. Duality in linear programming, formulation of dual linear programming and examples.

Module-3

Transportation and Assignment Problems: 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. Mathematical model of assignment problem, Hungarian method for solving assignment problem.

Module-4

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.

Module-5

Network Analysis: PERT and CPM, Network construction anddetermination of critical path, Calculation of ES, EF, LS, LF, TF, FFand IF, Crashing of a project, Scheduling of a project and resourcelevelling.

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).
2. Operations Research S.D Sharma, Kedarnath, Ramnath and Co, 2002.

3.	

References

1. Operations Research – An Introduction Taha H A- Low price edition 7th edition,2006.
2. Introduction to operation Research, Hiller and Liberman, Mc GRawHill , 5th edition ,2001.
3. 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): 3:0:0	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 SecurityPayload; 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 DebdeepMukhopadhyay: "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): 3:0:0	Exam Hours:03
Course Outcomes: at the end of the course students will be able to: CO1: Identify problems that are amenable to solution by AI methods. CO2: Identify appropriate AI methods to solve a given problem. CO3: Formalize a given problem in the language/framework of different AI methods.	

CO4: Implement basic AI algorithms for the given problem.

CO5: 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

Mobile Applications Development	
Choice Based Credit System	
Semester: II	CIE Marks:40
Course Code:20MCA263	SEE Marks:60
Contact Hours(L:T:P):3:0:0	Exam Hours:03

Course Outcomes:

CO1: Develop effective user interfaces that leverage evolving mobile devices

CO2: Develop applications using software development kits (SDKs), frameworks and toolkits.

CO3: Implement suitable methods to integrate database and server-side technologies

CO4: Design and develop open source software based mobile application to the given problem.

CO5:Build and deploy competent mobile application to solve the societal/industrial problems.

Module-1

Introduction : Preliminary Considerations – Cost of Development – Importance of Mobile Strategies in the Business World – Effective use of Screen Real Estate –

Understanding Mobile Applications: Understanding Mobile Applications Users – Understanding Mobile Information Design – Understanding Mobile Platforms – Using the Tools of Mobile Interface Design.

Module-2

Getting Started with Android Programming

What is Android – Obtaining the required tools– Anatomy of an Android Application – Components of Android Applications – Activities – Fragments – Utilizing the Action Bar

Module-3

Android UI Design and Location Based Services
Views and View Groups – Basic Views – Fragments – Displaying Maps – Getting Location Data – Publishing for Publishing – Deploying APK Files

Module-4
Android Messaging and Networking **SMS Messaging – Sending Email – Networking – Downloading Binary Data, Text** **files – Accessing Web Services – Performing Asynchronous Call – Creating your** **own services – Communicating between a service and an activity – Binding** **activities to services**
Module-5
Feedback and Oscillator Circuits **iOS – Obtaining the tools and SDK – Components of XCODE – Architecture of** **iOS – Building Derby App in iOS – Other useful iOS things – Windows Phone:** **Getting the tools you need – Windows Phone 7 Project** **Building Derby App in Windows Phone 7 – Distribution – Other useful** **Windows Phone Thing**
Text books

1. **Jeff McWherter and Scott Gowell, "Professional Mobile Application**
   Development", 1st Edition, 2012, ISBN: 978-1-118-20390-3
2. **Wei-Meng Lee, "Beginning Android Application Development", Wiley**
   2011.

References
1. Reto Meier, " Professional Android 4 Application Development ", Wrox   Publications 2012.

Distributed Operating System **Choice Based Credit System**	
Semester: II	CIE Marks:40
Course Code:20MCA264	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: 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 ComputingEnvironment(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.
2. Ajay D. Kshemkalyani and MukeshSinghal, Distributed Computing: Principles, Algorithms and Systems, Cambridge University Press, 2008
3. SunitaMahajan, Seema Shan, " Distributed Computing", Oxford University Press,2015

Natural Language Processing	
Choice Based Credit System	
Semester:II	CIE Marks:40
Course Code:20MCA265	SEE Marks:60
Contact Hours(L:T:P):3:0:0	Exam Hours:03

Course Outcomes:

CO1: Apply parsing technique to the given problem and verify the output and give valid conclusions

CO1: Illustrate the approaches to syntax and semantics in NLP.

CO3: Formulate solutions for a range of natural language components using existing algorithms, techniques and frameworks, including part-of-speech tagging, language modelling, parsing and semantic role labelling.

CO4. Evaluate NLP solutions of the given problem and arrive at valid conclusions.

CO5: Illustrate information retrieval techniques.

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.DanielJurafsky 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 HinrichSchutze, "Foundations of Statistical Natural LanguageProcessing", MIT Press, 1999. 2.TanveerSiddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008. 3.Anne Kao and Stephen R. Poteet (Eds), "Natural Language Processing and Text Mining", Springer Verlag London Limited 2007.

DataBase Management Systems Laboratory **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 given database applications CO2: Implement a database schema for a given problem. CO3: Formulate SQL queries in Oracle for the given problem. CO4: Apply normalization techniques to improve the database design for the given problem. CO5: Build database and verify for its appropriate normalization 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.

3. 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.

4. Design an ER-diagram for the following scenario, Convert the same into a relational model, normalize Relations into a suitable Normal form and then solve the following queries. A country can have many Tourist places . Each Tourist place is identified by using tourist_place_id, having a name, belongs to a state, Number of kilometers away from the capital city of that state,history. There are many Tourists visits tourist places every year. Each tourist is identified uniquely by using Tourist_id, having a Name, age, Country and multiple emailids. A tourist visits many Tourist places, it is also required to record the visted_date in the database. A tourist can visit a Tourist place many times at different dates. A Tourist place can be visited by many tourists either in the same date or at different dates.

Queries:

i. List the state name which is having maximum number of tourist places.

ii. List details of Tourist place where maximum number of tourists visited.

iii. List the details of tourists visited all tourist places of the state "KARNATAKA".

iv. Display the details of the tourists visited at least one tourist place of the state, but visited all states tourist places.

v. Display the details of the tourist place visited by the tourists of all country.

5. A country wants to conduct an election for the parliament. A country having many constituencies. Each constituency is identified uniquely by Constituency_id, having the Name, belongs to a state,Number_of_voters. A constituency can have many voters. Each voter is uniquely identified by using Voter_id, having the Name, age, address (involves Houseno,city,state,pincode). Each voter belongs to only one constituency. There are many

candidates contesting in the election. Each candidates are uniquely identified by using candidate_id, having Name, phone_no, age, state. A candidate belongs to only one party.Thereare many parties. Each party is uniquely identified by using Party_id, having Party_Name,Party_symbol. A candidate can contest from many constituencies under a same party. A party can have many candidates contesting from different constituencies. No constituency having the candidates from the same party. A constituency can have many contesting candidates belongs to different parties. Each voter votes only one candidate of his/her constituencty.

Queries:

i. List the details of the candidates who are contesting from more than one constituencies

which are belongs to different states.

ii. Display the state name having maximum number of constituencies.

iii. Create a stored procedure to insert the tuple into the voter table by checking the voter age. If voter's age is at least 18 years old, then insert the tuple into the voter else display the "Not an eligible voter msg" .

iv. Create a stored procedure to display the number_of_voters in the specified constituency. Where the constituency name is passed as an argument to the stored procedure.

v. Create a TRIGGER to UPDATE the count of " Number_of_voters" of the respective

constituency in "CONSTITUENCY" table , AFTER inserting a tuple into the "VOTERS" table.

Java Programming Lab	
Choice Based Credit System	
Semester:I	CIE Marks:40
Course Code:20MCA28	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.

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. CO5: Evaluate the given wed application and enhance it using latest web technologies.	
Part - A	
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.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.

5. 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)

6. 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.

7.Develop and demonstrate a HTML5 page which contains

a) Dynamic Progressive bar.

b) Display Video file using HTML5 video tag.

8.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.

9.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.

A SIMPLE CALCULATOR

Number 1 = [56]

Number 2 = [47]

Result = [2632]

[ADD] [SUB] [MUL] [DIV] [CLEAR]

10.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.

11.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.

Part-B

Develop a web application (mini-project) using the languages and concepts learnt in the theory and exercises listed in part A with a good look and feel effects. Database connection needs to be implemented.

Note:

1. A team of two students must develop the mini project. However during the examination, each student must demonstrate the project individually.
2. Each students has to execute one program picked from Part-A during the semester end examination.
3. The team must submit a brief project report (20-25 pages) that must include the following

   a. Introduction   b. Requirement Analysis c Software Requirement Specification

   d. Analysis and Design,   e. Implementation f. Testing

4. Brief synopsis not more than two pages to be submitted by the team as per the format given. It was recommended that students to do prior art search as part of literature survey before submitting the synopsis for the Mini/Major projects.
5. Rubrics may be used to evaluate the Mini-Project.

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 ScrapingAnd Numerical Analysis

Data Acquisition by Scraping web applications –Submitting a form - Fetching web pages – Downloading web pages through form submission – CSS Selectors. NumPyEssentials:TheNumPy

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 andupdated 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 enterprise applications using Java Beans concepts for the given problem.

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: Demonstrate the basics of Block chain concepts using modern tools/technologies.
CO2: Analyze the role of block chain applications in different domains including cybersecurity.
CO3: Evaluate the usage of Block chain implementation/features for the given problem.
CO4: Exemplify the usage of bitcoins and its impact on the economy.
CO5: Analyze the application of 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 ArshdeepBikramaditya Signal, GautamDhameja (PriyansuSekhar 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 Outcomes:

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. RjkumarBuyya, Christian Vecchiola, and ThamaraiSelci, 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 Outcomes: 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 Outcomes: 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. AdithyaP.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 EelcoPlugge, 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 Outcomes:
1. Demonstrate the basics of deep learning for a given context.

2. Implement various deep learningmodels for the given problem
3. Realign high dimensional data using reductiontechniques for the given problem
4. Analyze optimization and generalization techniques of deeplearning for the given problem.
5. Evaluate the given deep learningapplication and enhance by applying latest techniques.

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 NetworksConvolutional 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.   CosmaRohillaShalizi, 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, YoshuaBengio, 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 Outcomes:

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: Conduct experiment with various datasets for analysis / visualization and arrive at valid conclusions.

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.

Choice Based Credit System (CBCS) and Outcome Based Education(OBE) SEMESTER – III Wireless Ad Hoc Networks	
Course Code : 20MCA353	CIE Marks : 40
Contact Periods (L:T:P): 3:0:0	SEE Marks : 60
Credits : 03	Exam Hours : 03

Course outcomes
CO1: Analyze the issues of ad-hoc wirelessnetwork
CO2 : Evaluate the existing network and improve its quality ofservice
CO3 : Choose appropriate protocol for variousapplications and design the architecture
CO4: Examine security measures present at differentlevels and identify the
        possible improvements for the latest version of the ad hoc network IEEE standard
CO5 : Analyze energy consumption andmanagement in ad-hoc wirelessnetworks

Module-1
Ad-hoc Wireless Networks Introduction, Issues in Ad-hoc Wireless Networks, Ad-hoc Wireless Internet; MAC Protocols for Ad-hoc Wireless Networks: Introduction, Issues in Designing a MAC Protocol, Design Goals of MAC Protocols, Classification of MAC protocols, Contention- Based Protocols, Contention-Based Protocols with Reservation Mechanisms, Contention-Based   Protocols with Scheduling Mechanisms, MAC Protocols that Use Directional Antennas.
Module -2
Routing Protocols for Ad-hoc Wireless Networks Introduction, Issues in Designing a Routing Protocol for Ad-hoc Wireless Networks; Classification of Routing Protocols; Table Driven Routing Protocols; On-Demand Routing Protocols, Hybrid Routing Protocols, Hierarchical   Routing Protocols and Power-Aware Routing Protocols.
Module – 3

Multicast Routing in Ad-hoc Wireless Networks Introduction, Issues in Designing a Multicast Routing Protocol, Operation of Multicast Routing Protocols, An Architecture Reference Model for Multicast Routing Protocols, Classifications of Multicast Routing Protocols, Tree-Based
Multicast Routing Protocols and Mesh-Based Multicast Routing Protocols.

Module-4

Transport Layer and Security Protocols for Ad-hoc Networks: Introduction, Issues in Designing a Transport Layer Protocol; Design Goals of a Transport Layer Protocol; Classification of Transport Layer Solutions; TCP over Transport Layer Solutions; Other Transport Layer Protocols for Ad-hoc Networks; Security in Ad-hoc Wireless Networks, Issues and Challengesin
Security Provisioning, Network Security Attacks, Key Management and Secure Touting Ad-hoc Wireless Networks.

Module-5

Quality of Service and Energy Management in Ad-hoc Wireless Networks: Introduction, Issues and Challenges in Providing QoS in Ad-hoc Wireless Networks, Classification of QoS Solutions, MAC Layer Solutions, Network Layer Solutions; Energy Management in Ad-hoc Wireless Networks: Introduction, Need for Energy Management in Ad-hoc Wireless Networks, Classification of Energy Management Schemes, Battery Management Schemes, Transmission
Management Schemes, System Power Management Schemes.

Textbook

1. Ad-hoc Wireless Networks, C. Siva Ram Murthy& B. S. Manoj, Pearson Education, 2nd Edition, 2011

Reference Books

1. Ad-hoc Wireless Networks, Ozan K. Tonguz and John Wiley, 2007 ,Gianguigi Ferrari

2. Ad-hoc Wireless Networking. Xiuzhen Cheng, Xiao Hung, Ding-Zhu Du, Kluwer Academic Publishers, 2004

3. Ad-hoc Mobile Wireless Networks- Protocols and Systems, C.K. Toh, Pearson Education, 2002

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 thepracticesandmethodsforsuccessfulsoftwareprojectmanagement CO2:Identifytechniquesforrequirements,policiesanddecisionmakingforeffectiveresource management CO3:Illustratetheevaluationtechniquesforestimatingcost,benefits,scheduleandrisk CO4:Deviseaframeworkforsoftwareprojectmanagementplanforactivities,risk,monitoring andcontrol CO5:Designaframeworktomanagepeople	
Module-1	
INTRODUCTIONTOSOFTWAREPROJECTMANAGEMENT Introduction,WhyisSoftwareProjectManagementimportant?Whatisa Project?, ContractManagement,ActivitiesCoveredbySoftwareProjectManagement, Plans, MethodsandMethodologies,Somewaysof categorizingsoftwareprojects, Stakeholders,SettingObjectives,BusinessCase,ProjectSuccessandFailure,Whatis Management? Management Control, Traditional versus Modern Project ManagementPractices	
Module-2	

PROJECTEVALUATION&FINANCE
Evaluationof IndividualProjects,CostBenefitEvaluationTechniques,RiskEvaluation, ProgrammeManagement,Managingallocationof ResourceswithinProgrammes, FinancialAccounting–Anoverview– Accountingconcepts,Principles&Standards, Ledgerposting,Trialbalance,ProfitandLossaccountBalancesheet
Module-3
ACTIVITYPLANNING
ObjectivesofActivityPlanning,Whento Plan,ProjectSchedules,Sequencingand SchedulingActivities,NetworkPlanningModels,ForwardPass– BackwardPass, Identifyingcriticalpath,ActivityFloat,ShorteningProjectDuration,Activityon Arrow Networks RiskManagement,NatureofRisk,CategoriesofRisk,Aframeworkfordealingwith Risk, Risk Identification, Risk analysis and prioritization, risk planning and risk monitoring
Module-4
MONITORINGANDCONTROL
CreatingtheFramework,CollectingtheData,Review,ProjectTerminationReview, VisualizingProgress,CostMonitoring,EarnedValueAnalysis,PrioritizingMonitoring, GettingProjectBackToTarget,ChangeControl,SoftwareConfiguration Management
Module-5
MANAGINGPEOPLEANDWORKINGINTEAMS
Introduction,UnderstandingBehavior,OrganizationalBehavior:A Background, SelectingtheRightPersonfortheJob,InstructionintheBestMethods,Motivation, TheOldham– HackmanJobCharacteristicsModel,Stress–HealthandSafety WorkingInTeams,BecomingaTeam,DecisionMaking,Leadership.
Textbooks
1.BobHughes, MikeCotterell, RajibMall, "Software Project Management", Fifth Edition,TataMcGrawHill,2011. 2."AccountingforManagement"JawaharLal,5th Edition,WheelerPublications,Delhi.
References
1.JackMarchewka," Information Technology-Project Management", Wiley Student Version,4th Edition,2013. 2.JamesPLewis,"ProjectPlanning,Scheduling&Control",McGrawHill,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 Outcomes: CO1: Apply the fundamentals of Software Defined Networks for the given problem CO2: Illustrate the basics of Software Defined Networks Operations and Data flow CO3: Apply 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):0:0:4	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

6. Students shall carry out a mini project using python/pandas to demonstrate the data analysis.
7. A team of two students must develop the mini project. However during the examination, each student must demonstrate the project individually.
8. The team must submit a brief project report (20-25 pages) that must include the following
   a. Introduction   b. Requirement Analysis c Software Requirement Specification
   d. Analysis and Design,   e. Implementation f. Testing
9. Brief synopsis not more than two pages to be submitted by the team as per the format given. It is recommended that students to do prior art search as part of literature survey before submitting the synopsis for the Mini/Major projects.
10. Rubrics may be used to evaluate the Mini-Project

Each students has to execute one program picked from Part-A during the semester end examination. In SEE   Part-A and Part-B shall be given 50% weightage each.

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:
CO1: Demonstrate theIoT architecture design for a given problem
CO2: Apply IOT techniques for a given problem
CO3: Analyse the application protocol, transport layer methods for the given business case.
CO4: .Design and develop an application for the given problem for the societal/industrial problems
CO5: Develop python program by applying suitable feature 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

1. A team of two students must develop the mini project. However during the examination, each student must demonstrate the project individually.
2. The team must submit a brief project report (20-25 pages) that must include the following

    a. Introduction   b. Requirement Analysis c Software Requirement Specification

    d. Analysis and Design,   e. Implementation f. Testing

3. Brief synopsis not more than two pages to be submitted by the team as per the format given. It is recommended that students to do prior art search as part of literature survey before submitting the synopsis for the Mini/Major projects.
4. Rubrics may be used to evaluate the Mini-Project

Each students has to execute one program picked from Part-A during the semester end examination. In SEE Part-A and Part-B shall be given 50% weightage each.

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: at the end of the course 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 informationthrough 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).

Semester-IV

Sl. No.	Course Type	Course Code	Title	Tutorial (T)	Lecture (L)	Practical (P) /	Duration (in Hrs.)	CIE Marks	SEE Marks	Total Marks	Credits
				Teaching Hours/Week			Examination				
1.	PCC	20MCA41	Advances in web technologies	2	2	-	3	40	60	100	2
2.	PCC	20MCA42	Programming using C#	2	2	-	3	40	60	100	2
	PCC	20MCA43	Industry Internship (4 weeks)	-	-	-	-	100	-	100	2
3.	PCC	20MCA44	Project Work (16 Weeks)	-	-	2*	3	40	60	100	20
			TOTAL	4	4	2	-	220	180	400	26

* Two hours per week is allocated to the faculty members in order to review the progress of the students' projects. The students will present the progress to the faculty member or discuss about the further direction of project work during the allocated hours. Students shall maintain diary where in he/she records the weekly work done duly signed by internal/external guides.

Advances in Web Technologies Choice Based Credit System	
Semester: IV	CIE Marks:40
Course Code:20MCA41	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: Build the Web Applications using JQuery, PHP, XML for the given problem
CO2: Design the Web Pages using AJAX for the given problem.
CO3: Analyse the advances in Web2.0 and demonstrate its usage for the problem considered.
CO4 Analyse the web services and demonstrate its usage for the problem considered.
CO5: Design responsive web applications using Bootstrap for the given problem.

Module-1

Module 1:
Introduction to PHP: Origins and uses of PHP, Overview of PHP, General syntactic characteristics, Primitives, operations andexpressions, Output, Control statements, Arrays, Functions, Pattern matching.
Building Web applications with PHP:
Form handling, Files, Tracking users, cookies, sessions, Using databases, Handling XML.

Module-2

Introduction to Ruby and Introduction to Rails:

Origins and uses of Ruby, Scalar types and their operations ,Simple input and output, Controlstatements, Arrays, Hashes, Methods, Classes, Codeblocks and iterates, Pattern matching.
Overview of Rails, Document requests, Processing forms, Layouts. Rails applications with Databases.

Module-3

Rich Internet Applications With Ajax: Limitations of Classic Web application model, AJAX principles,Technologies behind AJAX, Examples of usage of AJAX; Asynchronous communication and AJAXapplication model.
Ajax with XMLHTTP object: Part 1
Creating Ajax Applications: An example, Analysis of example ajax.html, Creating the JavaScript, Creatingand opening the XMLHttpRequest object, Data download, Displaying the fetched data, Connecting tothe server, Adding Server-side programming, Sending data to the server using GET and POST.

Module-4

Ajax with XMLHTTP object: Part 2
Handling multiple XMLHttpRequest objects in the same page, Using two XMLHttpRequest objects, Usingan array of XMLHttpRequestobjects,AJAX Patterns – Predictive Fetch, Multi-stage download, PeriodicRefresh and Fallback patterns, Submission throttling.

Module-5

Introduction to Bootstrap:
What Is Bootstrap? Bootstrap File Structure, Basic HTML Template, Global Styles, Default Grid System,Basic Grid HTML, Offsetting Columns, Nesting Columns, Fluid Grid System, Container Layouts,Responsive Design. Typography, Emphasis Classes, Lists, Code, Tables, Optional Table Classes, Table RowClasses, Forms, Buttons, Images, Icons.

Textbooks

1. RobertW.Sebesta: Programming the Worldwide Web, 4thEdn, Pearson, 2012
2. Professional AJAX – Nicholas C Zakas et al, Wrox publications, 2008.
3. Steven Holzner: Ajax: A Beginner's Guide, Tata McGraw Hill, 2014.
4. Jake Spurlock: "Bootstrap: Responsive Web Development", O'Reilly Media, 2014.

Reference books

1. Thomas A. Powel: Ajax The Complete reference, McGraw Hill,2008.
2. AravindShenoy, Ulrich Sossou: Learning Bootstrap, Packt, Dec 2014.
3. Dana Moore, Raymond Budd, Edward Benson: Professional Rich Internet Applications: AJAX andBeyond, Wiley 2012.

Programming using C# Choice Based Credit System(CBCS)	
Semester: IV	CIE Marks:40
Course Code:20MCA42	SEE Marks:60
Contact Periods (L:T:P): 2:2:0	Exam Hours:03

Course Out Comes:
CO1:Analyse C#andclient-serverconceptsusing.NetFrameWork Components.
CO2:Applydelegates,eventandexceptionhandlingtoincorporatewithASP,WinForm, ADO.NET.
CO3:Analyzetheuseof.NetComponentsdependingontheproblemstatement.
CO4:Implement&developawebbasedandConsolebasedapplicationwithDatabase connectivity
CO5: Implement & develop a web based application with Databaseconnectivity

Module-1

Gettingstartedwith.NETFramework4.0andC#
Understanding PreviousTechnologies, Benefitsof.NETFramework,Architecture of.NETFramework 4.0,.NET Execution Engine, Components of.NET Framework 4.0: CLR,CTS,MetadataandAssemblies,.NETFrameworkClassLibrary,WindowsForms, ASP.NETand ASP.NETAJAX,ADO.NET,WindowsworkflowFoundation,Windows PresentationFoundation,WindowsCommunicationFoundation,WidowsCardSpace andLINQ. IntroducingC# Creating aSimple C# Console Application, Identifiers and Keywords. System DataTypes,Variablesand Constants:ValueTypes,ReferenceTypes,UnderstandingType Conversions,BoxingandUnBoxing.Namespaces,TheSystemnamespace,.NETArray Types.

Module-2

Classes,ObjectsandObjectOrientedProgramming
Classes and Objects: Creating a Class, Creating an Object, Using this Keyword, CreatinganArrayofObjects,UsingtheNestedClasses,DefiningPartialClassesand Method,ReturningaValuefroma MethodandDescribingAccessModifiers.Static Classes and StaticMembers, Properties: Read-only Property, Static Property, Indexers,Structs:SyntaxofastructandAccessModifiersforstructs,System.ObjectClass Encapsulation: Encapsulation using accessors and mutators, Encapsulation using Properties. Inheritance: InheritanceandConstructors, Sealed Classes and Sealed Methods,Extensionmethods. Polymorphism:Compiletime Polymorphism/Overloading,RuntimePolymorphism/ Overriding.Abstraction:Abstractclasses,Abstract methods.Interfaces:Syntaxof Interfaces,ImplementationofInterfacesandInheritance.

Module-3

Delegates,Events,ExceptionHandlingandADO.NET
Delegates:CreatingandusingDelegates,MuticastingwithDelegates. Events:Event Sources,EventHandlers,EventsandDelegates,MultipleEventHandlers. Exception Handling: The try/catch/throw/finally statement, Custom Exception.System.Exception, HandlingMultipleException.\ DataAccesswithADO.NET:UnderstandingADO.NET:DescribingtheArchitectureof ADO.NET,ADO.NET,ADO.NETEntityFramework.CreatingConnectionStrings:Syntax forConnectionStrings.Creatinga Connectiontoa Database:SQLServerDatabase, OLEDBDatabase,ODBCDataSource.Creatinga CommandObject.Workingwith DataAdapters:CreatingDataSetfromDataAdapter.

Module-4

GraphicalUserInterfacewithWindowsFormsandWPF
WindowsForms:Introduction,WindowsForms,EventHandling:A SimpleEvent- Driven GUI, Control Properties and Layout, Labels, TextBoxesand Buttons, GroupBoxesand Panels,CheckBoxesand RadioButtons,ToolTips,Mouse-Event Handling, Keyboard-Event Handling. Menus, Month Calendar Control, LinkLabelControl,ListBoxControl, ComboBoxControl,TreeViewControl,ListViewControl, TabControlandMultipleDocumentInterface(MDI)Windows. WPF:New WPF Controls,WPF Architecture:PresentationFramework,Presentation Core, WindowsBase, MILorMilcore,Working withWPFWindows: UsingXAMLin WPF4.0Applications: Contentsof XAMLandWPFApplications:XAMLElements NamespaceandXAML,XAMLPropertySyntax,MarkupExtensions.

Module-5

WebAppDevelopmentandDataAccessusingADO.NET
Introduction,WebBasics,MultitierApplicationArchitecture,Your First Web Application: Building Web-Time Application, Examining Web-Time.aspx'sCode- BehindFile,UnderstandingMasterpages, StandardWebControls:DesigningaForm,

Validation Controls, GridViewControl, DropDownList, Session Tracking, ASP.NET AJAX:ExploringAJAX,NeedforAJAX,AJAXand otherTechnologies,AJAXServer Controls,ScriptManagercontrol, UpdatePanel, UpdateProgressControl,Creating SimpleApplicationusingAJAXServerControls

| **Textbooks** |
| 1. .NET4.0Programming(6-in-1),BlackBook,KogentLearningSolutionsInc.,Wiley-DreamTechPress.(Chapters:1,10,11,12,13,14and19).
2.
PaulDeitelandHarveyDeitel:C#2010forProgrammers,4thEdition,PearsonEducation.(Chapters:14,15,19and27.3) |

| **References** |
| 1.AndrewTrolsen:ProC#5.0andthe.NET4.5Framework,6thEdition,Wiley-Appress.
2.BartDeSmet:C#4.0Unleashed,PearsonEducation-SAMSSeries.
3.HerbertSchildt:CompleteReferenceC#4.0,TataMcGrawHill,2010. |

Industry Internship **Choice Based Credit System**	
Semester: IV	CIE Marks: 100
Course Code: 20MCA43	SEE Marks:---
Contact Hours (L:T:P/S): 0:0:0	Exam Hours:-

Course outcomes:

CO1: Analyse the real-time industry/research work environment with emphasis on organizational structure/job process/different departments and functions / tools /technology.

CO2: Develop applications using modern tools and technologies.

CO3: Demonstrate self-learning capabilities with an effective report and detailed presentation.

General Rules
1) All the students have to undergo mandatory internship of 4 weeks during the vacation of 3rd semester to take up individual project in companies/respective Colleges at higher than the mini project standards already taken up during previous semesters.
2) Internship shall be considered as a head of passing and shall be considered for the award of degree.
3) 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.
4) After satisfying the internship requirements the degree will be awarded.
5) However, student can carry out 4thsemester project without completing the internship.
6) The student can present the progress about the internship to the committee at the department level.
7) CIE marks shall be evaluated with a weightage of Internship presentation for 50 marks and reports for 50 marks . The marks can be awarded to the student based on the criteria/rubrics formulated by the department.
8) The student has to submit a report about the outcome of the internship at the end of the semester along with the project report.

9) The internship report submitted by the studenthas to be evaluated by the guide concerned / a committee constituted by the head of the department.
10) The report shall be preserved at the department for future reference.

Project Work	
Choice Based Credit System	
Semester: IV	CIE Marks:40
Course Code:20MCA44	SEE Marks:60
Contact Hours (L:T:P/S): 0:0:0/2	Exam Hours:03

Course outcomes:

Course outcomes: At the end of this course, the students will be able to
CO1: Identify a suitable problem making use of the technical and engineering knowledgegained from previous courses with the awareness of impact of technology on the societyand their ethical responsibilities.
CO2: Work as an individual and team to segregate work and execute/implement projects using appropriate tools.
CO3: Develop skills to disseminate technical and general information by means of oral aswell as written presentation and professional skills.
CO4: To conduct testing of application using appropriate techniques and tools.
CO5: To enhance interpersonal skills and group cohesion among the peers during the project work

General Rules

- The candidate should carry out the project individually 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 as per the guideline provided by the university.
- 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. It is recommended to do prior art search as part of literature survey before submitting the synopsis for the projects.
- This is an individual project for a duration of minimum of 4 months or duration of the semester.
- Regular project work weekly diary should be maintained by the students, signed by the external guide and internal guide in order to verify the regularity of the student.
- Project work may be application/testing or research-oriented and accordingly the project report contents may vary.
- The presentation should be given at various levels such as Synopsis, SRS, Design

- and Project implementation/ completion levels.
- Student has to publish a paper in conference or journal of either National or International level

- Paper publication in an indexed journal/conference is compulsory as part of the project work.
- Publications follow the Thesis. 10% weightage is given in SEE.
- There shall be three project presentations each to be considered for 5 marks (5X3= 15 marks) and a final presentation for 15 marks. Presentation may be given using Power point presentation/demonstrations of the work. Synopsis submitted in a proper format is to be evaluated for 10 marks.
- The students are informed to strictly follow the report format as prescribed by the University. However as per the title/domain of the project with a suitable justification guide/department can make the minor changes.
- If the project report is not as per the format, internal guide / external examiner will have every right to reject the project.
- The Students are encouraged and appreciated to show their project demo along with their power pointduring their viva-voce exams as an added advantage.
- In case of the paper publication could not be completed before the submission of the report, or acceptance received from the organiser of the conference / journal authorities should be included while uploading/submitting the report to the university.

Rubrics / Scheme of Evaluation:

Course Code	Title	Internal (CIE)					External (SEE)			Total Marks
		Review-1	Review-2	Review-3	Final Review	Synopsis	Dissertation evaluation	Paper Publication	Viva-Voce	
20MCA44	Project Work	5	05	05	15	10	24	6	30	100

Each Faculty member shall be allocated to supervise individual internship/project work as an internal guide and review the internship/ project work carried out on weekly basis for a minimum of one hour duration. The review carried out shall be recorded week-wise in a dairy maintained for it.

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

<<Guide1Name1>>

<<Designation>>

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

<<Designation>>

<<Affiliated College Logo>>

<< College Name and Address>>

2021-22 Even Semester

<< College name and Address.>

<<College Logo>>

INTERNSHIP CERTIFICATE

This is to certify that <<**Student Name**>> bearing <<**USN**>> has satisfactorily completed the Internship – 20MCA43entitled **<<Topic>>** in the academic year **2021-22**as prescribed by VTU for IV Semester of Master of Computer Applications.

Signature of the internal/external Guide   **Signature of the HOD**

ACKNOWLEDGEMENT

\<\<College name Address\>\>

\<\<College Logo\>\>

VISION

MISSION

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

Internship (20MCA43)

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 Graphics support.	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 animations	Confusing layout, text extremely difficult to read; many graphics, sounds, animations distract from 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+ 25marks)

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

Total Marks (Out of 100 marks)   =

Signature of Project Guide

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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 logicalsequence; introductionand background giveproper context; key pointsand conclusions are clearand well presented	Most information presented in logicalsequence; clearintroduction; adequatebackground; some irrelevant information	Problems withsequencing, 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	Adequate layout, but	Difficult to	Confusing	

	pleasing and easy to read; good use of white space, colour, backgrounds; images and Graphics support.	with some fonts, colours, backgrounds difficult toread	read, cluttered appearance; images improperly sized; some distracting graphics or animations	layout, text 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 of CO1, CO2 and CO3 taken together.

Signature of Seminar Guide / Coordinator

1. **Name:**   2. **Name:**
   Signature: **Signature:**

Signature of HOD

Note: Department offering MCA programme can define its own programme outcomes/course outcomes/rubrics. Sample of such items given here may be referred.