BCA+MCA 1ST Sem SYLLABUS & SCHEME

PAPERS CODE	PAPERS NAME	INTERNAL	EXTERNAL	TOTAL
BMCA101	Discrete Mathematics	40	60	100
BMCA102	Programming in C	40	60	100
BMCA103	Fundamentals of Computers & IT	40	60	100
BMCA104	Web Technologies	40	60	100
BMCA105	Technical Communication I	40	60	100
BMCA106	Practical 1- C program lab	60	40	100
BMCA107	Practical 2- IT Lab	60	40	100
BMCA108	Practical 3- Web Technologies	60	40	100
Total		380	420	800

Course Code: BMCA 101

Course Name: Discrete Mathematics

LEARNINGOBJECTIVES:

The objective of this course is to provide the learners with thefollowing:

1. Knowledge about sets, relations and functions.
2. Make them familiar with basics of lattices and graphs.
3. Understanding of the concept of propositional logic.
4. Acquiring the insight of combinatorics and recurrence relations

PRE-REQUISITES: Basic Concepts of Mathematics

UNIT I

No. of Hours: 13 Chapter/Book Reference: TB1 [chapters 1, 2, 7], TB2 [chapters 1, 2, 4, 5], TB3 [chapters

1, 4]

SETS: Sets, Subsets, Equal Sets, Universal Sets, Finite and Infinite Sets, Operations on Sets: Union, Intersection difference and Complements of Sets, Algebra of sets, Cartesian product, Simple applications.

Relations, Equivalence Relation, Partial Order Relation, Composition of relations, and Representation of relations using digraph and Matrix, Function: Domain and Range, onto, into and One to One Functions, Composite and Inverse Functions, Hashing functions, Recursive function.

PROPOSITIONAL LOGIC: Introduction, Proposition, First order logic, Basic logical operations, truth tables, tautologies, contradictions, Algebra of Propositions, logical implications, logical equivalence, predicates, Universal and existential quantifiers.

UNIT II

No. of Hours: 10 Chapter/Book Reference: TB2 [chapter 6] TB 3 [Chapter 6]

PARTIAL ORDER RELATIONS AND LATTICES: Partial Order Sets, Totally ordered set, Representation of POSETS using Hasse diagram, Chains, Maximal and Minimal elements, Greatest lower bound, least upper bound, Lattices and Algebraic Structure, Principle of Duality, Elementary Properties of Lattices, Atoms. Sub lattices, Bounded lattice, Distributed & Complemented Lattices, Isomorphic lattices. Boolean lattice.

UNIT- III

No. of Hours: 11 Chapter/Book Reference: TB1 [chapters 5, 6], TB2 [chapter 3], TB3 [chapters 2, 3],

COMBINATORICS: Introduction, Basic Counting Principles, Permutations, Permutations of things not all different, Circular Permutations, Combinations, Restricted Permutations and Combinations, Derangement, Pascal's Triangle, Binomial Theorem (only for natural Numbers)

RECURRENCE RELATIONS: Introduction, Order of Recurrence Relations, Degree of Recurrence Relations, Linear Homogeneous Recurrence Relations, Non Homogeneous Recurrence Relations, Solution of linear homogeneous and non-non homogeneous recurrence relations.

UNIT -IV

No. of Hours: 10 Chapter/Book Reference: TB1 [chapter 8], TB2 [chapter 8], TB3 [chapter 8] GRAPHS: Introduction, Degree of a vertex of a graph, Handshaking Theorem, types of Graphs, sub graph, Matrix representation of a graph: adjacent and incidence matrices, Isomorphic graphs, path and circuit (Floyd's and Warshall algorithms), Connected graph, Hamiltonian graph, Euler graph, Graph coloring (Vertex, Edges and Map).

TEXT BOOKS:

TB1. Rosen, K.H., Discrete Mathematics and its Applications, McGraw Hill Education, 8th edition 2021,

TB2. Kolman, Busby and Ross, "Discrete Mathematical Structures", Pearson, 10th edition 2015

TB3. Babu Ram, "Discrete Mathematics", Pearson Education, 1st edition 2010

REFERENCE BOOKS:

RB1. D. S. Malik, M. K. Sen, "Discrete Mathematics" Cengage Learning, 2012

RB2. S.K. Sarkar "A Text Book of Discrete Mathematics" S. Chand Publications, 9th edition 2019

RB3. Singh J. P. "Discrete Mathematics for Undergraduates" ANE Books, 1st edition, 2013

RB4. Tremblay J.P. and Manohar, R., "Discrete Mathematical Structures with Applications to Computer Science" Tata McGraw Hill

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Course Code: BMCA102

Course Name: Programming Using 'C' Language

LEARNING OBJECTIVES:

This course will provide the learners the following:-

1. Understanding of the syntax and the semantics of C programming language
2. Building of their logics for solving a given problem.

PRE-REQUISITES: None

UNIT – I

No. of Hours: 12 Chapter/Book Reference: TB1 [1,2,3,4,5,6,7]; TB2 [1,2,3,4,5,6,7]; TB3 [1,2,3,4,5,6]

C basics: C character set, Identifiers and keywords, Data types, constants, symbolic constants, variable declarations, structure of basic C program, writing and executing the first C program, #include Preprocessor directive, expression statements, compound statements, operators: Arithmetic, Unary, Relational, logical, assignment, shorthand assignment, conditional and bitwise, comma operator.

C control structures: if statement, if….else statement, else if ladder, while, do….while, for, and switch statement, nested control structure, break, labelled break, continue, labelled continue statement, exit statement, goto statement.

UNIT II

No. of Hours: 13 Chapter/Book Reference: TB1 [8,9,10,13,14]; TB2 [8,9,10,12]; TB3 [7,8, 9,10,11,12]

C Functions: Functions: declaration, definition & scope, recursion, call by value, call by reference. Preprocessor directive: #define, macros with arguments, nested macros, # and ## operators, conditional compilation.

Storage Classes: automatic, external (global), static & registers. Arrays: Arrays (1D, 2D), strings, pointers, array & pointer relationship, pointer arithmetic, dynamic memory allocation, pointer to arrays, array of pointers, pointers to functions, array of pointers to functions.

UNIT – III

No. of Hours: 11 Chapter/Book Reference: TB1 [17,19,20,21]; TB2 [11,13,14]; TB3 [13,14,16]

Structures: Structures, unions, Enumeration, passing structure to functions, arrays and structures, typed of, difference between structure and union, self-referential structure, bit fields. File handling [text (ASCII), binary]: file input output operations, file access modes, file pointers, file Positioning functions (fseek, ftell, rewind etc.)

UNIT – IV

No. of Hours: 08 Chapter/Book Reference: TB1 [15,22]; TB2 [9]; TB3 [8]

Standard library functions from stdio.h, stdlib.h, conio.h, ctype.h, math.h, string.h, process.h., Usage of command line arguments.

TEXT BOOKS:
TB1. Yashwant Kanetkar, "Let us C" 17th edition, 2020.
TB2. E. BalaGuruswamy, "Programming in ANSI C", 8th edition, 2019.
TB3. Ashok N. Kamthane, "Programming in C", Pearson Education, 3rd Edition, 2015

REFERENCE BOOKS:
RB1. K R Venugopal, Sudeep R Prasad, "Mastering C", McGraw Hill Education; 2nd edition, 2017

RB2. V Rajaraman , "Computer Programming in C", 2nd Edition, 2019

RB3. Kernighan and d. Ritchie, "The ANSI C Programming Language", 2015

RB4. Stephen Prata, "C Primer Plus" 6th Edition, 2014

RB5. Schaum's Outline Series, "Programming with C", 4th Edition, 2018

RB6. Reema Thareja, Programming In C" , Oxford University Press, September 2018

Course Code: BMCA 103

Course Name: Fundamentals of Computers and IT

LEARNINGOBJECTIVES:

The objectives of thiscourse is to provide the learners:

1. Awareness of evolution of Computers, various types of computers its characteristics, usage, and limitations.
2. Identification of different categories of computers, their peripherals and memory.
3. Knowledge about operating system, their types, MS-Office various software.
4. Understanding of computer network fundamentals and various communication networks.
5. Overview of emerging technologies in IT i.e. AI and Machine Learning, IOT, Data Analytics etc.

PRE-REQUISITES: None

UNIT–I

No. of Hours: 12 Chapter/BookReference:TB1[Chapters:1,2,7,8,9], TB2:[Chapters:1,2,3,4];RB1[Chapters:6,7], RB3[Chapters:1a,1b,2a,2b,4a,5a],

Fundamentals of Computers:

Definition and Characteristics of Computer System. Computer Generation from First Generation to Fifth Generation. Classifications of Computers: Micro, Mini, Mainframe and super computers.

Computer Hardware: Major Components of a digital computer, Block Diagram of a computer, Input-output devices, Description of Computer Input Units, Output Units, CPU.

Computer Memory: Memory Hierarchy, Primary Memory – RAM and its types, ROM and its types, Secondary Memory, Cache memory. Secondary Storage Devices - Hard Disk, Compact Disk, DVD, Flash memory.

UNIT–II

No. of Hours: 12Chapter/Book Reference: TB1 [Chapters: 10,12,14]; TB2[Chapters:6,7]; RB1[Chapters:6A, 6B, 12A,12B], RB3 [Chapters: 8, 9]

Interaction with Computers:

Computer Software: System software: Assemblers, Compilers, Interpreters, linkers, loaders. Application Software: Introduction to MS Office (MS-Word, MS Power point, MS-Excel).

Operating Systems: Elementary Operating System concepts, Different types of Operating Systems. **DOS:**

Booting sequence; Concepts of File and Directory, Types of DOS commands.

Computer Languages: Introduction to Low-Level Languages and High-Level Languages.

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UNIT–III

No. of Hours: 12 Chapter/Book Reference: TB1 [Chapters:3,5,4]; TB2 [Chapters:5]; RB1[Chapter:2]

Computer Number System: Positional and Non-positional number systems, Binary, Decimal, Octal and Hexadecimal Number Systems and their inter-conversion.

Binary Arithmetic: Addition, subtraction, multiplication and division. Use of complement method to represent negative binary numbers, 1's complement, 2's complement, subtraction using 1's complement and 2's complement. Introduction to Binary Coded Decimal (BCD), ASCII Codes, EBCDIC codes.

UNIT–IV

No. of Hours: 10 Chapter/Book Reference: TB1 [Chapters:17,18]; TB2[Chapters:9,10]; RB3[7A,7B,8A,8B]

Computer Network & Internet: Basic elements of a communication system, Data transmission modes, Data Transmission speed, Data transmission media, Digital and Analog Transmission, Network topologies, Network Types (LAN, WAN and MAN), Basics of Internet and Intranet.

Internet: Terminologies related to Internet: Protocol, Domain name, Internet Connections, IP address, URL, World Wide Web. Introduction to Client-Server Model, Search Engine, Voice over Internet Protocol (VOIP), Repeater, Bridge, Hub, Switch, Router, Gateway, Firewall, Bluetooth technology.

Advanced Trends in IT Applications – Brief Introduction to Cloud Computing, Internet of Things, Data Analytics, AI and Machine Learning.

TEXT BOOKS:

TB1. P. K. Sinha & Priti Sinha, "Computer Fundamentals", BPB Publications, 1992.

TB2. Anita Goel "Computer Fundamentals", Pearson.

REFERENCE BOOKS:

RB1. B.Ram Computer fundamentals Architecture and Organization, New Age Intl. **RB2.** Alex Leon & Mathews Leon, "Introduction to Computers", Vikas Publishing. **RB3.** Norton Peter, "Introduction to computers", 4th Ed., TMH, 2001.

RB4. Vikas Gupta, "Comdex Computer Kit", Wiley Dreamtech, Delhi, 2004.

Course Code: BMCA 104

Course Name: Web Technologies

LEARNING OBJECTIVES:

The objective of this course is to provide the learners the following:

1. Knowledge about the semantic structure of HTML, Javascript, CSS, XML and bootstrap.
2. Ability to compose forms and tables using HTML, Javascript, CSS and Bootstrap.
3. Expertise to design static web pages
4. Skills to create dynamic user interface and perform Client-Side validations using JavaScript

PRE-REQUISITES: None

UNIT – I

No. of Hours: 11 Chapter/Book Reference: TB1 [Chapters: 1-3]; TB2 [Chapters: 2]; TB3 [Chapters: 1-4]

World Wide Web: Introduction, Web page, Home page, Web site, Static and Dynamic website, Client Server computing concepts. Web Client and Web Server, Web Browser, Client Side and server side Scripting Languages. **HTML Overview**: Introduction to HTML, HTML

UNIT – II

No. of Hours: 11 Chapter/Book Reference: TB1 [Chapters: 4-5]; TB2 [Chapters: 3-5]; TB3 [Chapters: 5- 12]; TB4 [Chapters 1-3]

Cascading Style Sheet: Types of Style Sheets – Internal, inline and External style sheets, creating styles, link tag, CSS Properties, CSS Styling, Style Selector- Id, class name and Pseudo Class.

BootStrap Basics: Introduction to Bootstrap, Responsive web design, Linking with Bootstrap, container class, grids, tables, images, buttons, typography classes, jumbotron, glyphicons,

UNIT – III

No. of Hours:11 Chapter/Book Reference: TB1 [Chapters: 4-5]; TB2 [Chapters: 3-5]; TB3 [Chapters: 5- 12]

Introduction to Java Script: Data Types, Control Statements, operators, dialog boxes, Built in and User Defined Functions, Objects in Java Script, Handling Events, basic validations, Document Object Model, Browser Object Model.

UNIT – IV

No. of Hours: 11 Chapter/Book Reference: TB1 [Chapters]; TB2 [Chapter: 7, 9]; TB3 [Chapter: 1]

XML: Introduction, Features, XML Naming rules, Building block of XML Document, Difference between HTML & XML, XML Parser, DTD's Using XML with HTML and CSS.

Web Hosting Concepts: Concept of domain- Physical domain, virtual domain, registering a domain, need of IP addressing, Web Hosting and Publishing Concepts

TEXT BOOKS:
TB1. The complete reference HTML and CSS, by Thomas A powell, TMH publication. **TB2.** Jeffrey C. Jackson, "Web Technologies: A Computer Science Perspective", Pearson **TB3.** Internet and World Wide Web Deitel HM, Deitel ,Goldberg , Third Edition.
TB4. Bootstrap: Responsive Web development, Jake Spurlock, O'reilly, First Edition

REFERENCE BOOKS:
RB1. HTML Black Book , Stephen Holzner, Wiley Dreamtech.
RB2. Rajkamal, "Web Technology", Tata McGraw-Hill, 2001.
RB3. Jeffrey C. Jackson, "Web Technologies : A Computer Science Perspective", Pearson.
RB4. XML How to Program by Deitel Deitel Nieto

Course Code: BMCA 105

Course Name: Technical Communication

LEARNING OBJECTIVES:

This course will provide the learners the following:

1. Understanding of the correct use of English Language.
2. The student will improve in oral as well as written communication skills.

PRE-REQUISITES: Nil

No. of Hours: 10 Chapter/Book Reference: TB1, TB2, TB3, TB4

Concepts and Fundamentals: Introduction to Technical Communication, Need and importance of communication, channel, Distinction between general and technical communication, nature and features of technical communication, Seven Cs of communication, Types of Technical communication, style in technical communication, technical communication skills, Language as a tool of Communication, History of development of Technical Communication, Computer Aided Technical Communication

UNIT-II

No. of Hours: 12 Chapter/Book Reference: TB1, TB2, TB3

Oral Communication: Principles of effective oral communication, Introduction of Self and others, Greetings, Handling Telephone Calls**Interviews:** Meaning & Purpose, Art of interviewing, Types of interview, Interview styles, Essential, Techniques of interviewing, Guidelines for Interviewer, Guidelines for interviewee.**Meetings:** Definition, Kind of meetings, Agenda, Minutes of the Meeting, Advantages and disadvantages of meetings/ committees, Planning and organization of meetings.**Project Presentations:** Advantages & Disadvantages, Executive Summary, Charts, Distribution of time (presentation, questions & answers, summing up), Visual presentation, Guidelines for using visual aids, Electronic media (power-point presentation).The technique of conducting Group Discussion and JAM session.

UNIT-III

No. of Hours: 12 Chapter/Book Reference: TB1, TB2, TB3, TB4

Written Communication: Overview of Technical Writing:Definition and Nature of Technical Writing, Basic Principles of Technical Writing, Styles in Technical Writing,

Note – Making, Notice, E-mail Writing

Writing Letters: Business letters, Persuasive letters- Sales letters and complaint letters Office memorandum, Good news and bad news letters

Report Writing**:** Definition & importance; categories of reports, Elements of a formal report, style and formatting in report

Special Technical Documents Writing: Project synopsis and report writing, Scientific Article and Research Paper writing, Dissertation writing: Features, Preparation and Elements

Proposal Writing: Purpose, Types, characteristics and structure

Job Application**:** Types of application, Form & Content of an application, drafting the application, Preparation of resume.

UNIT-IV

No. of Hours: 10 Chapter/Book Reference: TB3, RB1, RB3

Soft Skills: Business Etiquettes – Professional Personality, Workplace Protocols, Cubicle. Non-Verbal Communication: Kinesics and Proxemics, Paralanguage, Interpersonal Skills

Language Skills: Improving command in English, improving vocabulary, choice of words, Common problems with verbs, adjectives, adverbs, pronouns, tenses, conjunctions, punctuations, prefix, suffix, idiomatic use of prepositions. Sentences and paragraph construction, improve spellings, common errors and misappropriation, Building advanced Vocabulary (Synonyms, Antonyms), introduction to Business English.

TEXTBOOKS:

TB1. Kavita Tyagi and Padma Misra , "Advanced Technical Communication", PHI, 2011

TB2. P.D.Chaturvedi and Mukesh Chaturvedi, "Business Communication – Concepts, Cases and Applications", Pearson, second edition.

TB3. Rayudu, "C.S- Communication", Himalaya Publishing House, 1994.

TB4. Asha Kaul , "Business Communication", PHI, second edition.

REFERENCES:

RB1. Raymond Murphy, "Essential English Grammar- A self study reference and practice book for elementary students of English" , Cambridge University Press, second edition.

RB2. Manalo, E. & Fermin, V. (2007). Technical and Report Writing. ECC Graphics. Quezon City.

RB3. Kavita Tyagi and Padma Misra , "Basic Technical Communication", PHI, 2011.

RB4. Herta A Murphy, Herbert W Hildebrandt and Jane P Thomas, "Effective Business Communication", McGraw Hill, seventh edition.

Course Code: BMCA 106

Course Name: Practical -1 'C' Prog. Lab

LEARNING OBJECTIVES:

This course will provide the learners the following:-

1. Understanding of the syntax and the semantics of C programming language

2. Building of their logics for solving a given problem.

PRE-REQUISITES: None

S. No.	Detailed Statement
1.	Write a program to convert temperature from Celsius to Fahrenheit by taking input from the user.
2.	Write a program to find the greatest number among 3 numbers given by the user.
3.	Write a program to check if a given number is a prime number or not.
4.	Write a program to display the following pattern upto N rows, taking the value of N from the user: 1 2 3 4 5 6 7 8 9 10

5.	Write a program to input marks of 50 students using an array and display the average marks of the class.
6.	Write a program to search for a number entered by the user in a given array and display the array in ascending order.
7.	Write a program to check if a string is palindrome or not.
8.	Write a program to add, subtract, multiply and divide two numbers using pointers.
9.	Write a program to create a structure for employees containing the following data members: Employee ID, Employee Name, Age, Address, Department and Salary. Input data for 10 employees and display the details of the employee from the employee ID given by the user.
10.	Write a program to create two files with names EvenFile and OddFile. Input 20 numbers from the user and save even numbers in EvenFile and odd numbers in OddFile.
11.	Write a menu driven program to construct a calculator for following arithmetic operations: addition, subtraction, multiplication, division, average and percentage.

12.	Write a menu driven program to perform the following operations: (i) Print armstrong numbers upto N, (ii) Display prime numbers between 1 to N, (iii) Reverse of an integer
13.	Write a program to convert a hexadecimal number into a binary number.
14.	Write a program to calculate factorial of a number and display fibonacci series upto N terms using recursive functions.
15.	Write a program to perform matrix addition, (ii) matrix multiplication, and (iii) Matrix transpose) on 2D arrays.
16.	Write a program to make use of arrays with structures in the following ways:

	(i) Use array as a structure data member. (ii) reate array of structure variables
17.	Write a program to compare the contents of two files by taking names of the files through command line arguments.
18.	WAP to perform I/O and make use of file positioning functions on Binary files. (using fseek, ftell, rewind functions)

19.	Write a menu driven program to implement the following string operations:
	
	 (i) Calculate length of a string
	
	 (ii)
	   Concatenate at the end of a given
	
	 (iii)
	   Copy one string to another
	
	 (iv)
	   Compare contents of two strings
	
	 (v)Copy nth character string to another

20.	Write a program to read time in string format and extract hours, minutes and second also check time validity

Course Code: BMCA

Course Name: Practical – II IT Lab

LEARNING OBJECTIVES:

The objective of this course is to provide the learners :

1. Basic knowledge of computers Software and Hardware

2. Expertise in using DOS Commands.

3. Attain proficiency in using application software for Word Processing, Spreadsheet and Presentation.

PRE-REQUISITES: Nil

S. No.	Detailed Statement

1.	To explore the System settings – Personalisation, System, Devices, Apps, Network & Internet.
2.	To practice basic DOS commands like cd, md, dir, erase, cls, copy, date etc.
3.	To explore Windows Explorer functionalities like create, rename, move, delete folder and files etc.
4.	To practice the use of basic formatting features - Format Painter, Indentation, Line spacing, background color, find, replace, dictate commands.
5.	To practice the use of Bullets, numbering, multilevel lists and use of Table Feature- Insert table with rows and columns, draw tables, excel spreadsheet and quick tables etc.
6.	To practice the use of Insert Features – add picture, Chart, SmartArt, WordArt, Equation, Symbols, Header and Footer, Page Numbering etc. and the use of Design Features – Watermark, Page color, Page Border, Themes implementation etc.
7.	To practice the use of Layout Features – Margins, Orientation, Size, Columns, Indent, Spacing etc.
8.	To practice the use of Mail Merge Feature to generate Envelops and Labels.
9.	To practice the use of Excel basic formatting features – Wrap Text, Insert and Delete (Cells, Sheet, Row or Column), Format – Cell Height, Cell Width, Hide, Un Hide Cell, Protection, Freeze and Unfreeze panes, Macros etc.
10.	To practice the use of Insert Features- Pivot Table, Pivot Chart, Picture, Chart and its formatting and Design and the use of Page Layout Features- Margins, Orientation, Page Break , Background, Height and Width of Cells.
11.	To practice the use of Formula Features – user defined function, predefined functions – Logical, Date, Time, Maths and the use of Data Manipulation Features – Sort, Filter, Advanced Filters, Whatif analysis.
12.	To practice the creation of Blank presentation and Selecting Themes and the use of the basic design features – Adding New Slides, Reuse slides, Slides layout etc.
13.	To practice the use of Insert Features – add pictures, screenshots, shapes, wordart, audio, video, date-time etc. and use of Design Features- Changing the theme of presentation, format background and design ideas.
14.	To practice the use of Transition features to be applied on Slides content, setting sound, duration etc. and the use of Animation Features to be applied on presentation of Slide, set animation timings and rehearse etc.

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15.	To practice the use of Slide Show Features – Custom Slide Show, Rehearse Timing etc.
16.	Create a Folder by your name in your system, store all the work done in this semester inside that folder.
17.	Create your Resume using basic formatting features like : table, bullets, wordart etc
18.	Design an Invitation to Birthday Party using mail merge features send the invitation to 10 friends.
19.	Write an Article for Magazine with 3 columns and hyperlink.
20.	Create your own marksheet using basic formatting features.
21.	Create a list of marks of 10 students create charts and pivot table.
22.	Prepare a Sales summary and use features like sort, filter etc. to manipulate the data.
23.	Create a Power Point Presentation on any topic of your choice using animation and transition features.

Course Code: BCA

Course Name: Practical-III Web Tech Lab

LEARNING OBJECTIVE

In this course, the learners will be able to develop expertise related to:

1. Apply the Semantic Structure of HTML, javascript, CSS, bootstrap and XML
2. Design forms and tables using HTML, CSS and bootstrap.
3. Design Client-Side programs using JavaScript
4. Design and develop static Web page.

S. No.	Detailed Statement

1.	Make following five different web pages:
	
	     i. Formatting Styles and Headings: Include Bold, italics, Underline, Strike, Subscript, superscript and all six type of headings
	
	     ii. Font Styles and Image tag
	
	     iii. Marquee: Move text, image and hyperlink
	
	     iv. Other tags: br, hr, pre, p Include following specifications:
	
	     ● In all these web pages only mention about use, attributes apply them.
	
	     ● Insert a background image on home page
	
	     ● Make all the topics as hyperlinks and go to some other page for description
	
	     ● Insert a marquee showing HTML Tutorial as moving text.
	
	     ● Use different font style for different topics
	
	     ● On every page, make a hyperlink for going back to home page and internal link also.

2.	Create an unordered list nested inside ordered list and apply the following :
	
	     ● Insert an image of Main item on top right corner of web page.
	
	     ● Display heading as a marquee.
	
	     ● Use different font styles and colors for different ordered list items.
	
	     ● Insert horizontal line after each ordered item.

3.	Design a table with row span and column span and make use of attributes colspan, rowspan, width, height, cellpadding, cellspacing etc.
4.	Design following frame:
5.	Make an image map showing the usage of shape, coords, href attributes in map definition. Link each hotspot to their respective details. All the web pages should be designed with proper background color, images, font styles and headings.

6.	Design Student registration form for admission in college.
7.	Create a webpage and show the usage of inline and internal style sheet and

	external style sheet?
8.	Create a webpage containing a background image and apply all the background styling attributes?
9.	Create a web page showing the usage of font styling attributes
10.	Create a web page and apply all Text styling attributes use Id and class selector.
11.	Create a webpage and implement all list styling attributes.
12.	Create a Webpage with three equal columns.
13.	Create a webpage containing bootstrap table.
14.	Create a webpage containing various types of images.
15.	Create a webpage containing various types of buttons
16.	Create a webpage containing various, typography classes.
17.	Create a webpage containing to display the heading using. Jumbotron.
18.	Write a program to show the usage of inbuilt functions and dialog boxes.
19.	Write a program to show the usage of alert box and confirm box
20.	Write a program to implement event handling using onclick, on mouse over and on mouse out events.
21.	Write a program to show the usage of all the date, math and string object functions
22.	WAP to display the bookstore details in XML with CSS and internal DTD.
23.	WAP to format the Teacher details in XML with CSS using external DTD
24.	Design the registration form for a web site and when the user clicks on submit button the login form should be appeared on the screen (use external javascript file).
25.	Design a website and apply all the features of HTML, css, javascript and bootstrap to make the website attractive.
26.	Write a JavaScript function that creates a table, accept row, column numbers from the user, and input row-column number as content (e.g. Row-0 Column-0) of a cell.

BCA+MCA SECOND SEMESTER EXAMINATION SCHEME AND SYLLABUS

PAPERS CODE	PAPERS NAME	INTERNAL	EXTERNAL	TOTAL
BMCA201	Applied Mathematics	40	60	100
BMCA202	Web based programming	40	60	100
BMCA203	Data Structure and algorithm using C	40	60	100
BMCA204	DBMS	40	60	100
BMCA205	Environment Studies	40	60	100
PRACTICAL				
BMCA206	Web based programming lab	60	40	100
BMCA207	DSA LAB	60	40	100
BMCA208	DBMS	60	40	100
Total		380	420	800

CourseCode: BMCA201

CourseName: Applied Mathematics

LEARNING OBJECTIVES:

The objectives of this course are to provide the learners with the following:

1. The Knowledge of mathematical probability
2. Understanding of various numerical techniques
3. Familiarity with the Linear Programming and it's applications

PRE-REQUISITES: Basic Concepts of Mathematics

UNIT -I

No. of Hrs. 12 Chapter/Book Reference: TB2 [chapters 3, 4], TB3 [chapters 2, 3, 4, 5, 6] PROBABILITY: Introduction, Axiomatic definition of Probability, Addition Theorem, Multiplication theorem, Conditional Probability, Baye's Theorem and its applications

PROBABILITY DISTRIBUTIONS: Random Variable, Probability Mass function, Probability density function, Mathematical Expectations of a Random Variable, Binomial Distribution, Poisson distribution, Normal Distribution.

UNIT -II

No. of Hrs. 10 Chapter/Book Reference: TB1 [chapters 2, 3], TB3 [chapters 7, 8, 9]

INTERPOLATION: Operators: Shift; Forward Difference, Backward Difference Operators and their Inter- relation, Interpolation Formulae-Newton's Forward, Backward and Divided Difference Formulae: Lagrange's Formula

SOLUTIONS OF NON LINEAR EQUATIONS: Bisection Method, False Position Method, Newton – Raphson

Method for Solving Equation Involving One Variable only.

UNIT -III

No. of Hrs. 10 Chapter/Book Reference: TB1 [chapters 5, 6], TB3 [chapters 10, 11]

SOLUTION OF LINEAR SIMULTANEOUS EQUATIONS: Gaussian Elimination Method with and without Row Interchange: LU Decomposition: Gauss - Jacobi and Gauss-Seidel Method; Gauss – Jordan Method and to find Inverse of a Matrix by this Method.

NUMERICAL DIFFERENTIATION: First and Second Order Derivatives at Tabular and Non-Tabular Points, **NUMERICAL INTEGRATION**: Trapezoidal Rule, Simpsons 1/3 Rule: Error in Each Formula (without proof.)

UNIT -IV

No. of Hrs. 12 Chapter/Book Reference: TB4 [Chapters 2, 3, 4, 9, 10]

LINEAR PROGRAMMING: Formulation of linear Programming model, Graphical method of solving linear Programming problem, Simplex Method (Maximization and Minimization)

TRANSPORTATION & ASSIGNMENT PROBLEM: General structure of transportation problem, solution procedure for transportation problem, methods for finding initial solution, test for optimality. Maximization of transportation problem, unbalanced transportation problem, Assignment problem approach of the assignment model, solution methods of assignment problem, maximization in an assignment, unbalanced assignment problem, restriction on assignment

TEXT BOOKS:

TB1.   S.S. Sastry, "Numerical Analysis"; Prentice Hall of India, 1998.

TB2.   Johnson, R., Miller, I. and Freunds, J., Miller and Freund's "Probability and Statistics for Engineers, Pearson Education (2005) 7th Ed.

TB3.   Singh J P "Probability and Numerical Methods" ANE Books, 4th Edition 2019

TB4.   Sharma, J.K.; Operations Research: problems & solutions; Macmillan India

REFERENCE BOOKS:

RB1.   Grewal B S "Numerical Methods in Engineering and Science" Khanna Publishers, 2012

RB2.   Walpole, Ronald E., Myers, Raymond H., Myers, Sharon L. and, Keying Ye, Probability and Statistics for Engineers and Scientists, Pearson Education (2007) 8th Ed.

RB3.   Gupta S C, Kapoor V K "Fundamental of Mathematical Statistics" Sultan Chand and Sons 11th edition 2002

RB4.   Manmohan, Gupta, P K, Kanti Swarup "Introduction to Management science operations research" Sultan Chand and Sons

Course Code: BMCA202

Course Name: Web Based Programming

LEARNING OBJECTIVES:

The objectives of this course are to provide the learners expertise in the following:-

1. Understanding of the syntax and semantics of PHP language
2. Ability to design and develop web applications using PHP as a server side language.
3. Performing CRUD operations in the database

PRE-REQUISITES:

1. Basic knowledge of HTML, CSS and Javascript.
2. Skills to Design static Webpage.

UNIT – I

No. of Hours: 11 Chapter/Book Reference: TB1 [Chapters 1-3, 5]

Introduction to web applications, Client Side Scripting Vs Server Side Scripting, Web Servers : Local Servers and Remote Servers, Installation Process - WAMP, LAMP, XAMPP & MAMP Server, Static website vs Dynamic website development.

Introduction to PHP: Data types, Variables, Super Global Variables, Constants, Comments, Operators and Expressions, Regular Expression, Advantages of PHP

Control statements: Conditional Statement -if else, if elseif else, nested if, switch case, PHP Loops – for, while, do while and foreach loop

Arrays: Indexed Array, Associate Array, Multi-dimensional Array, Array pre-defined Functions

UNIT – II

No. of Hours: 11 Chapter/Book Reference: TB1 [Chapter 7]

Functions: Defining and Calling Functions, Passing by Value and passing by references, Inbuilt Functions, variable scope, Mail function, PHP Errors

Working with Forms: Get and Post Methods, HTML form controls and PHP, State Management: Cookies, Session, Query String, Hidden Field.

UNIT – III

No. of Hours: 11 Chapter/Book Reference: TB1 [Chapter 6]

Working With Files: Opening and Closing Files, creating directories and files, Reading and Writing to Files, file inclusion, file uploading and downloading, Getting Information on Files.

Object Oriented Features: Classes and Objects, Building Classes, Access Modifiers, Reusability, Constructors, Destructor.

UNIT – IV

No. of Hours: 11 Chapter/Book Reference: TB1 [Chapter 8]

PHP Database Connectivity: Using PHP to Access a Database, Relational Databases and SQL, PHP Data Objects, MySQLi Object Interface, SQLite, MongoDB

Introduction to MYSQL, Creating database and other operations on database, Querying a MySQL database with PHP database, connecting to a database, Parsing of the query results, Checking data errors.

TEXT BOOKS:

TB1.   Programming PHP: Creating Dynamic Web Pages, Kevin Tatroe. Peter Macintyre, Rasmus Lerdorf, O'Reilly, Third Edition

REFERENCE BOOKS:

RB1.   Professional   PHP   Programming,Jesus   Castagnetto,Harish   Rawat, Sascha Schumann,Chris Scollo,Deepak Veliath - Wrox Publications
RB2.   PHP 5 Advanced, Larry Ullman, Peachpit Press
RB3.   Core PHP Programming. Leon Atkinson (Prentice Hall, ISBN 0130463469).
RB4.   Beginning PHP5 and MySQL: From Novice to Professional, W. Jason Gilmore, 2004,Apress, ISBN: 1- 893115-51-8

Course Code: BMCA203

Course Name: Data Structure and Algorithm Using C

LEARNING OBJECTIVES:

In this course, the learners will be provided expertise in

1. Understanding of the basic concepts of data structures and their operations like, insertion, deletion, searching and sorting
2. Design algorithms and pseudo codes of various linear and non-linear data structures

PRE-REQUISITES:

1. C Programming Skills

2. Discrete Mathematics

UNIT – I

No. of Hours: 14 Chapter / Book Reference: TB1 [Chapters 1, 4, 9], TB2 [Chapters 1, 6, 7], TB3

[Chapters 1, 2,6,10]

Linear Data Structures- Static: Introduction to Algorithms- Attributes, Design Techniques, Time Space Trade Off, Data Structures, Classification and Operations of Data Structures.

Arrays: Single Dimension, Two-Dimension and Introduction to Multi Dimensions, Memory Representation, Address Calculation, Sparse Matrices- Types, Representation.

Searching and Sorting: Linear and Binary Search, Selection Sort, Bubble Sort, Insertion Sort, Merge Sort, Elementary Comparison of Searching and Sorting Algorithms.

Hashing: Hash Table, Hash Functions, and Collision Resolution.

UNIT – II

No. of Hours: 10 Chapter / Book Reference: TB1 [Chapter 5], TB2 [Chapter 4], TB3 [Chapter 3] Linear Data Structures- Dynamic

Introduction: Dynamic Memory Allocation**,** Dynamic Memory versus Static Memory Allocation. **Linked List Types:** Singly Linked List, Doubly Linked List, Header Linked List, Circular Linked List**. Operations:** Creation, Insertion, Deletion, Modification, Searching,Sorting, Reversing, and Merging.

UNIT – III

No. of Hours: 09 Chapter / Book Reference: TB1 [Chapter 6], TB2 [Chapters 2, 4], TB3 [Chapters 4, 5] Abstract Data Types:

Stacks: Introduction, Static and Dynamic Implementation, Operations, Applications- Evaluation and Conversion between Polish and Reverse Polish Notations.

Queues: Introduction, Static and Dynamic Implementation, Operations, Types- Linear Queue, Circular Queue, Doubly Ended Queue, Priority Queue.

UNIT – IV

No. of Hours: 11 Chapter / Book Reference: TB1 [Chapters 7, 8], TB2 [Chapters 5, 8], TB3 [Chapters 7,8]

Non Linear Data Structures:

Introduction to Graphs: Notations & Terminologies, Representation of Graphs- Adjacency Matrix, Incidence Matrix and Linked Representation.

Trees: Notations & Terminologies, Memory Representation, Binary Trees Types- Complete, Full, Strict, Expression Binary Tree, Tree Traversals (Recursive), Binary Search Tree and Basic Operations

Introduction and Creation (Excluding Implementation): AVL Tree, Heap Tree, M- Way Tree, and B Tree.

TEXT BOOKS:

TB1.   Schaum's Outline Series, "Data Structures", TMH, Special Indian Ed., Seventeenth Reprint, 2014.

204**TB2.** Y. Langsam, M. J. Augenstein and A.M. Tanenebaum, "Data Structures using C and C++", Pearson Education India, Second Edition, 2015.

TB3.   D. Samanta, "Classic Data Structures", PHI, Second Edition, 2009.

REFERENCE BOOKS:

RB1.   Ashok N kamthane "Introduction to Data Structures in C", Pearson**,** Third Edition, 2009.

RB2.   E. Horowitz and S. Sahni, "Fundamentals of Data Structures in C". Universities Press, Second edition, 2008.

RB3.   D. Malhotra and N. Malhotra, "Data Structures and Program Design using C", Laxmi Publications, Indian adapted edition from Mercury Learning and Information-USA, First edition, 2018.

RB4.   Y. Kanetkar " Data Structures through C", BPB Publication, Third Edition, 2019.

RB5.   R.F Gilberg, and B A Frouzan- "Data Structures: A Pseudocode Approach with C", Thomson Learning, Second Edition, 2004.

RB6.   A. K. Rath, and A.K. Jagadev, "Data Structures and Program Design Using C", Scitech Publications, Second Edition, 2011.

Course Code: BMCA204

Course Name: Database Management System

LEARNING OBJECTIVES:

The paper aims to introduce the concept of Back end, data storage in computers, design of a DBMS, Queries to construct database, store and retrieve data from the database.The objective of this course is to provide the learners expertise in the following:

1. Understanding of the requirement of database management System for storing data and its advantages over file management system.
2. Designing the database conceptually, physically and finally implementing the creation of database for any application.
3. Learning of queries in SQL for creating database and performing various operations for manipulating data in the database.
4. Knowledge of database utilities i.e. backup, recovery, transaction processing.

PREREQUISITE: Basic knowledge of data storage and file management system

UNIT-I

[No. of Hrs.: 10] Chapter/Book Reference: TB1 [Chapter 2]; TB2 [Chapter 1]

Introduction: An overview of database management system, Characteristics of database approach, DBMS architecture, client/server, data Models, Introduction to Distributed Data processing, schema and instances, data independence,

Data Modelling using Entity Relationship Model: Basic introduction about the terminologies like Entity, Entity types, entity set, notation for ER diagram, attributes and keys, Types of attributes (composite, derived and multivalued attributes) and keys (Super Key, candidate key, primary key), relationships, relation types, weak entities, enhanced E-R, specialization and generalization.

UNIT – II

[No. of Hrs.: 13] Chapter/Book Reference: TB1 [Chapter 8]; TB2 [Chapter 2];

Introduction to SQL: Overview, Characteristics of SQL. Advantage of SQL, SQL data types and literals.

Types of SQL commands: DDL, DML, DCL. Basic SQL Queries.

Logical operators: BETWEEN, IN, AND, OR and NOT

Null Values: Disallowing Null Values, Comparisons Using Null Values

Integrity constraints: Primary Key, Not NULL, Unique, Check, Referential key

Introduction to Nested Queries, Correlated Nested Queries, Set-Comparison Operators, Aggregate Operators: The GROUP BY and HAVING Clauses,

Joins: Inner joins, Outer Joins, Left outer, Right outer, full outer joins.

Overview of other SQL Objects: Views, Sequences, Indexes, Triggers and stored procedure.

UNIT – III

[No. of Hrs.: 12] Chapter/Book Reference: TB1 [Chapter 7 & 15]; TB2 [Chapter 3];

Relational Data Models: Relational model terminology domains, Attributes, Tuples, Relations, characteristics of relations, relational constraints domain constraints, key constraints and constraints on null, relational DB schema. Codd's Rules

Relational algebra: Basic operations selection and projection,

Set Theoretic operations: Union, Intersection, set difference and division (Order, Relational calculus: Domain, Tuple, Well Formed Formula, specification, quantifiers)

Join operations: Inner, Outer, Left outer, Right outer, and full outer join

ER to relational mapping: Steps to map ER diagram to relational schema

Data Normalization: Functional dependencies, Armstrong's inference rule, & Normalization (Upto BCNF)

UNIT – IV

[No. of Hrs.: 9] Chapter/Book Reference: TB1 [Chapter 19 & 20]; TB2 [Chapter 5]; Transaction Processing: Definition of Transaction, Desirable ACID properties

Database recovery and Database Security: System failure, Backup & recovery Techniques, Authentication, Authorization.

Overview of Query by Language, NoSql databses

TEXT BOOKS:

TB1. R. Elmarsi and SB Navathe, "Fundamentals of Database Systems", Pearson, 5th Ed.

TB2. Singh S.K., "Database System Concepts, design and application", Pearson Education [TB3] **TB3.** Ramakrishnan and Gherke, "Database Management Systems", TMH.

TB4. Bipin Desai, "An Introduction to Database Systems", Galgotia Publications, 1991.

REFERENCE BOOKS:

RB1. Abraham Silberschatz, Henry Korth, S. Sudarshan, "Database Systems Concepts", 6th Edition, McGraw Hill, 2010.

RB2. Jim Melton, Alan Simon, "Understanding the new SQL: A complete Guide", Morgan Kaufmann Publishers, 1993.

RB3. A. K. Majumdar, P. Battacharya, "Database Management Systems', TMH, 2017.

Course Code: BMCA205

Course Name: Environmental Studies

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to the following:

1. Development of critical thinking for shaping strategies (scientific, social, economic, administrative, and legal) for environmental protection, conservation of biodiversity, environmental equity, and sustainable development.

2. Acquisition of values and attitudes towards understanding complex environmental economic-social challenges, and active participation in solving current environmental problems and preventing the future ones.

3. Encouraging adoption of sustainability as a practice in life, society, and industry.

PRE-REQUISITES: Basic awareness about the natural environment.

UNIT–I

No. of Hours: 10 Chapter/Book Reference: TB1 [Chapters 1, 6]; TB2 [Chapters 8, 11, 25]; TB3

[Chapters 1, 35]

Introduction to Environmental Studies

- Multidisciplinary nature of environmental studies; components of environment: atmosphere, hydrosphere, lithosphere, and biosphere.
- Scope and importance; Concept of sustainability and sustainable development
- Emergence of environmental issues: Climate change, Global warming, Ozone layer depletion, Acid rain etc.
- International agreements and programmer: Earth Summit, UNFCCC, Montreal and Kyoto protocols, Convention on Biological Diversity(CBD), Ramsar convention, The Chemical Weapons Convention (CWC), UNEP, CITES, etc

UNIT–II

No. of Hours: 10 Chapter/Book Reference: TB1 [Chapters 2, 3]; TB2 [Chapters 2, 15, 16, 17]; TB3

[Chapters 2, 7, 11, 12]

Ecosystems and Natural Resources

- Definition and concept of Ecosystem
- Structure of ecosystem (biotic and abiotic components); Functions of Ecosystem: Physical (energy flow), Biological (food chains, food web, ecological succession), ecological pyramids and homeostasis.
- Types of Ecosystems: Tundra, Forest, Grassland, Desert, Aquatic (ponds, streams, lakes, rivers, oceans, estuaries); importance and threats with relevant examples from India
- Ecosystem services (Provisioning, Regulating, Cultural, and Supporting); Ecosystem preservation and conservation strategies; Basics of Ecosystem restoration
- Energy resources: Renewable and non-renewable energy sources; Use of alternate energy sources; Growing energy needs; Energy contents of coal, petroleum, natural gas and bio gas; Agro-residues as a biomass energy source

UNIT–III

No. of Hours: 10 Chapter/Book Reference: TB1 [Chapter 4]; TB2 [Chapters 4, 5, 6]; TB3 [Chapters 22, 23, 24]

Biodiversity and Conservation

- Definition of Biodiversity; Levels of biological diversity: genetic, species and ecosystem diversity
- India as a mega-biodiversity nation; Biogeographic zones of India; Biodiversity hotspots; Endemic and endangered species of India; IUCN Red list criteria and categories
- Value of biodiversity: Ecological, economic, social, ethical, aesthetic, and informational values of biodiversity with examples.
- Threats to biodiversity: Habitat loss, degradation, and fragmentation; Poaching of wildlife; Man-wildlife conflicts; Biological invasion with emphasis on Indian biodiversity; Current mass extinction crisis
- Biodiversity conservation strategies: in-situ and ex-situ methods of conservation (National Parks, Wildlife Sanctuaries, and Biosphere reserves.
- Case studies: Contemporary Indian wildlife and biodiversity issues, movements, and projects (e.g., Project Tiger, Project Elephant, Vulture breeding program, Project Great Indian Bustard, Crocodile conservation project, Silent Valley movement, Save Western Ghats movement, etc)

UNIT–IV

No. of Hours: 9 + 5 for field visit Chapter/Book Reference: TB1 [Chapter5]; TB2 [Chapters7, 20, 21, 23]; TB3 [Chapters25, 26, 27, 28, 30, 31]

Environmental Pollution and Control Measures

- Environmental pollution (Air, water, soil, thermal, and noise): causes, effects, and controls; Primary and secondary air pollutants; Air and water quality standards
- Nuclear hazards and human health risks
- Solid waste management: Control measures for various types of urban, industrial waste, Hazardous waste, E- waste, etc.; Waste segregation and disposal
- Environmental Impact Assessment and Environmental Management System
- **Field work/ Practical's (any one)**
- Field visit to any of the ecosystems found in Delhi like Delhi Ridge/ Sanjay lake/Yamuna river and its floodplains etc., or any nearby lake or pond, explaining the theoretical aspects taught in the class room
- Visit to any biodiversity park/ reserve forest/ protected area/ zoo/ nursery/ natural history museum in and around Delhi, such as Okhla bird sanctuary/ Asola Bhatti Wildlife Sanctuary/ Yamuna Biodiversity Park/ Sultanpur National Park, explaining the theoretical aspects taught in the classroom
- Visit to a local polluted site (urban/rural/industrial/agricultural), wastewater treatment plants, or landfill sites, etc

TEXT BOOKS:

TB1.   Sanjay Kumar Batra , Kanchan Batra ,Harpreet Kaur; Environmental Studies; Taxmann's, Fifth Edition.

TB2.   M.M. Sulphey; Introduction to Environment Management; PHI Learning, 2019

TB3.   S.P. Mishra, S.N. Pandey; Essential Environmental Studies; Ane Books Pvt. Ltd. ; Sixth Edition.

RFERENCE BOOKS:

RB1.   Asthana, D. K. (2006).Text Book of Environmental Studies. S. Chand Publishing.

RB2. Basu, M., Xavier, S. (2016). Fundamentals of Environmental Studies, Cambridge University Press, India

RB3. Bharucha, E. (2013). Textbook of Environmental Studies for Undergraduate Courses. Universities Press.

RB4. Mahapatra, R., Jeevan, S.S., Das, S. (Eds) (2017). Environment Reader for Universities, Centre for Science and Environment, New Delhi.

RB5. Masters, G. M., & Ela, W. P. (1991).Introduction to environmental engineering and science. Englewood Cliffs, NJ: Prentice Hall.

RB6.   Odum, E. P., Odum, H. T., & Andrews, J. (1971).Fundamentals of ecology. Philadelphia: Saunders.

RB7.   Sharma, P. D., & Sharma, P. D. (2005).Ecology and environment. Rastogi Publications

Course Code: BMCA206

Course Name: WBP Lab

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to:

1. Understand the syntax and semantics of PHP language
2. Design and develop web applications using PHP as a server side language
3. Perform database connectivity using MYSQL as database server.

PRE-REQUISITES:

1. Knowledge of HTML, CSS, Javascript, bootstrap and XML.
2. Able to Design Static Website.

S. No.	Detailed Statement
1.	Write regular expressions including modifiers, operators, and metacharacters.
2.	Write a program to show the usage of nested if statement.
3.	Write a Program in PHP for type Casting Of a Variables
4.	Write a program to create a menu driven program and show the usage of switch-case.
5.	Write a program to show the usage of for/while/do while loop
6.	Write a program to perform all four types of sorting
7.	Write a program to implement Array-pad(),aaray_slice(),array_splice(),list() functions.(use foreach wherever applicable)
8.	Write a program to show the application of user defined functions.
9.	Write a program that Passes control to another page (include, require, exit and die functions)
10.	Write a program to validate the form data using Filter_var() function.
11.	Write a program to show the usage of Cookie.

12.	Write a program to show the usage of Session
13.	Write a program to implement oops concepts.
14.	Do Form handling In PHP Design a personal Information form , then Submit & Retrieve the Form Data Using $_GET(), $_POST() and $_REQUEST() Variables
15.	Design A Login Form and Validate that Form using PHP Programming
16.	Create Admin Login ,Logout form using session variables
17.	Write a program to create a file.
18.	Write a program that use various PHP library functions, and that manipulate files and directories.
19.	Write a program to read and display the content of previously created file.
20.	Write a program to modify the content of an existing file.
21.	Create a web page and which provides File uploading and downloading a file.
22.	Design a from which upload And Display Image in PHP
23.	Use phpMyAdmin and perform the following: import, review data and structure, run SQL statements, create users and privileges
24.	Write a program to create a mysql database.
25.	Write a program to create a table and insert few records into it using form.
26.	Write a program to select all the records and display it in table.
27.	Write a program to modify (delete/modify/add) a table.
28.	Write a PHP script, to check whether the page is called from 'https' or 'http'.

29.	Write a program to verify text data as per the pattern.
30.	Create a dynamic website by incorporating the following functionalities: Implement a basic registration and login system, with styling, Make the database connection Make a connection to a MySQL database, and log in with valid credentials. Create Dynamic, interactive and database - Driven web application using php & mysql Perform some validation check. If any of these operations cause an error, stop execution and print the error message. The script should respond differently depending on the situation. Add a "Log Out" button to logout from the system

Course

Code:BMCA207

Course Name: DS Lab

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to:

1. Implement various types of data structures using C
2. Implement different operations on linear and non-linear data structures

PRE-REQUISITES:

C Programming Skills

S. No.	Detailed Statement
1.	WAP to implement following operation on one dimensional array (i) Insertion (ii) Deletion (iii) Traversal (iv) Reverse (v) Merge
2.	WAP to Sort an array using menu driven: (i) BUBBLE SORT (ii) MERGE SORT(iii) INSERTION SORT (iv) SELECTION SORT
3.	WAP to implement a Singly Linked List.
4.	WAP to implement a Circular Linked Lists
5.	WAP to implement Doubly Linked Lists
6.	Write a menu driven program to implement (i) Static Stack (ii) Dynamic Stack.
7.	WAP to implement a (i) Static (ii) Dynamic Circular Queue
8.	WAP to implement a (i) Static (ii) Dynamic De-Queue.
9.	Implement recursive algorithms for the following operations on Binary Search Tree a) Insertion b) Searching
10.	Implement recursive algorithms for BST traversal- Inorder, Preorder, Postorder.
11.	WAP to search & display the location of an element specified by the user, in an array using (i) Linear Search (ii) Binary Search technique.
12.	WAP to accept a matrix from user, find out matrix is sparse or not and convert into triplex matrix.

13.	WAP to implement Polynomial addition operation using linked list.
14.	Write a C program to create two linked lists from a given list in following way
	INPUT List:- 1 2 3 4 5 6 7 8 9 10 OUTPUT:-
	First List:- 1 3 5 7 9
	Second List:- 2 4 6 8 10
15.	WAP to implement Student Database using Linked List with the following structure
	- Name - Rollno - Marks of 5 subjects - Average - Result, If the average < 50, then print 'Fail', otherwise 'Pass'
16.	Write a program to convert Infix to equivalent (i) Prefix expression (ii)
	Postfix expression
17.	Write a program to evaluate (i) Prefix Expression (ii) Postfix Expression
	using stack.
18.	Let us assume a Patient's coupon generator for the Doctors' clinic. The patients are given the coupons on first-come-first-serve basis. After the visit of a patient, patient-ID is kept stack-wise. At the end of the day, the count is generated from the stack. Construct a menu-based program for
	patients' coupons generator using an appropriate data structure.
19.	WAP to implement an expression tree. (For example: (a + b / (c * d) –
	e))
20.	Sometimes a program requires two stacks containing the same type of items. Suppose two stacks are stored in separate arrays, then one stack might overflow while there is considerable unused space in the other. A neat way to avoid this problem is to put all spaces in one stack and let this stack grow from one end of the array, and the other stack starts from the other end and grows in the opposite direction, i.e., toward the first stack. In this way, if one stack turns out to be large and the other small, then they will still both fit, and there will be no overflow until all space is used. Declare a new structure that includes these two stacks and perform various
	stack operations.

Course Code: BMCA208

Course Name: DBMS Lab

LEARNING OBJECTIVES:

The course is to provide the basics of SQL. To understand RDBMS and construct queries using SQL to design a database and manipulate data in it.

PRE-REQUISITES: NIL

List of Practicals		
S. No.	**Detailed Statement**	
Core Practicals (Implement All the mentioned practicals)		
The following are two suggestive databases. The students may use any one or both databases for their core practicals. However, the instructor may provide any other databases for executing these practical. **1. COLLEGE DATABASE:** STUDENT (USN, SName, Address, Phone, Gender) SEMSEC (SSID, Sem, Sec) CLASS (USN, SSID) SUBJECT (Subcode, Title, Sem, Credits) IAMARKS (USN, Subcode, SSID, Test1, Test2, Test3, FinalIA) **2. COMPANY DATABASE:** EMPLOYEE (SSN, Name, Address, Sex, Salary, SuperSSN, DNo) DEPARTMENT (DNo, DName, MgrSSN, MgrStartDate) DLOCATION (DNo,DLoc) PROJECT (PNo, PName, PLocation, DNo) WORKS_ON (SSN, PNo, Hours)		
1	Draw an E-R diagram from given entities and their attributes	
2	Convert the E-R diagram into a Relational model with proper constraints.	

3	Write queries to execute following DDL commands : CREATE :Create the structure of a table with at least five columns ALTER:Changethesizeofa particular column. Add a new column to the existing table. Remove a column from the table. DROP: Destroythetablealongwithitsdata.
4	Write queries to execute following DML commands : INSERT: Insertfiverecordsineachtable. UPDATE: Modify data in single and multiple columns in a table DELETE: Delete selective and all records from a table
5	Write queries to execute following DML command : SELECT: Retrievetheentirecontentsofthetable. Retrievetheselective contents (based on provided conditions) from a table. Retrieve contents from a table based on various operators i.e. string operators, logical operators and conditional operators,Boolean operators. Sort the data in ascending and descending order in a table on the basis of one column or more than one column.
6	Create table using following integrity constraints: Primary Key Unique Key Not Null Check Default Foreign Key
7	Write queries to execute following Aggregate functions Sum,Avg,Count,Minimum and Maximum value of a numeric column of a table using aggregate function
8	Retrieve data from a table using alias names .
9	Retrieve data of a table using nested queries.
10	Retrieve data from more than one table using inner join, left outer, right outer and full outer joins
11	Create view from one table and more than one table.
12	Create index on a column of a table.

13	Consider the Insurance company's Database given below. The primary keys are underlined and the data typesare specified.
	
	PERSON(driver_id# : string, name : string, address : string) CAR(regno : string, model : string, year : int) ACCIDENT(report_number : int, acc_date : date, location : string) OWNS(driver_id# : string, regno : string)
	
	PARTICIPATED(driver_id# : string, regno : string, report_number : int, damage_amount
	
	:number(10,2))
	
	    (i) Create the above tables by properly specified the primary key and the foreign key
	
	    (ii) Enter at least five tuples for each relation
	
	    (iii) Demonstrate how you can
	
	        a. Update the damage amount for the car with a specific regno, the accident with report number 12 to 25000.
	
	        b. Add a new accident to the database.
	
	    (iv) Find the total number of people who owned cars that were involved in accident in2002.
	
	(iv) Find the number of accident in which cars belonging to a specific models were involved

14	Consider the following schema of a library management system.Write the SQL queries for the questions given below; **Student(Stud_no : integer, Stud_name: string)** **Membership(Mem_no: integer, Stud_no: integer) Book_(book_no: integer, book_name:string, author: string)**

	lss_rec_(iss_no:integer, iss_date: date, Mem_no: integer, book_no: integer)
	
	    (i) Create the tables with the appropriate integrity constraints
	
	    (ii) Insert around 10 records in each of the tables
	
	    (iii) Display all records for all tables
	
	    (iv) List all the student names with their membership numbers
	
	    (v) List all the issues for the current date with student and Book names
	
	    (vi) List the details of students who borrowed book whose author is Elmarsi & Navathe
	
	    (vii) Give a count of how many books have been bought by each student
	
	    (viii) Give a list of books taken by student with stud_no as 1005

	(ix) Delete the List of books details which are issued as of today
	(x) Create a view which lists out the iss_no, iss _date, stud_name, book name
15	Use the relations below to write SQL queries to solve the business problems specified. CLIENT (clientno#,name, client_referred_by#) ORDER (orderno#, clientno#, order_date, empid#) ORDER_LINE (orderno#, order line number#, item_number#, no_of_items, item_cost,shipping_date) ITEM (item_number#, item_type, cost) EMPLOYEE (empid#, emp_type#, deptno, salary, firstname, lastname) Notes: a. Column followed by # is the primary key of the table. b. Each client may be referred by another client. If so, the client number of the referring client is stored in referred_by. c. The total cost for a particular order line = no_of_items * item_cost.c. Write queries for the following (i) Create all the above tables. (ii) Insert at least five records. (iii) Display all the rows and columns in the CLIENT table. Sort by client name in reverse alphabetical order. (iv) Display the item number and total cost for each order line (total cost = no of items X item cost). Name the calculated column TOTAL COST. (v) Display all the client numbers in the ORDER table. Remove duplicates. (vi) Display the order number and client number from the ORDER table. Output the result in the format. Client <clientno> ordered <orderno> (vii) Display full details from the ORDER_LINE table where the item number is (first condition) between 1 and 200 (no > or < operators) OR the item number is greater than1000 AND (second condition) the item cost is not in the list 1000, 2000, 3000 OR the order number is not equal to 1000.

	(viii) Display the client name and order date for all orders.
	(ix) Repeat query (6) but also display all clients who have never ordered anything.
	(x) Display the client name and order date for all orders using the join keywords.
	(xi) Display the client name and order date for all orders using the JOIN method.
	(xii) Display the client number, order date and shipping date for all orders where the shipping date is between three and six months after the order date.
	(xiii) Display the client number and name and the client number and name of the person who referred that client.
	(xiv) Display the client name in upper case only and in lower case only.
	(xv) Display the second to fifth characters in each client name.

Note:

1. In total 15 practicals to be implemented.

2. This is a suggestive list of practicals. However, the instructor may add or change any other database for executing queries the requirement.

REFERENCEBOOKS:

RB1. Abraham Silberschatz, Henry Korth, S. Sudarshan, "Database Systems Concepts", 6th Edition, McGraw Hill, 2010.

BCA+MCA THIRD SEMESTER EXAMINATION SCHEME AND SYLLABUS

PAPERS CODE	PAPERS NAME	INTERNAL	EXTERNAL	TOTAL
BMCA301	Computer Network	40	60	100
BMCA302	Computer Organization and Architecture	40	60	100
BMCA303	Object Oriented Programming with C++	40	60	100
BMCA304	Cyber Security	40	60	100
BMCA-305	Human Values and Ethics	40	60	100
BMCA-306	Principles of Management & Organizational Behaviour	40	60	100
PRACTICAL				
BMCA-307	C++ LAB	60	40	100
BMCA-308	Cyber Security Lab.	60	40	100
Total		**360**	**440**	**800**

Course Code: BMCA-301

Course Name: Computer Networks

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to the following: -

1. To study different types of media, multiplexing, switched networks, the Internet, TCP/IP suite, fiber- optic communications and the state-of-art networking applications.
2. To develop an understanding of different components of computer networks, various protocols, modern technologies and their applications.
3. Identify and discuss the underlying concepts of IPv4 & IPv6 protocols, along with their characteristics and functionality.
4. Details of IP operations in the Internet and associated routing principles

5. Analyzing various layering protocols in computer networks.

PRE-REQUISITES:

1. Fundamentals of Computers and IT

UNIT – I

No. of Hours: 10 Chapter/Book Reference: TB1[Chapter-1], TB2[Chapter-1, 2]

Basic Concepts: Components of data communication, distributed processing, Line configuration, topology, transmission mode, and categories of networks. **OSI and TCP/IP Models:** Layers and their functions, comparison of models. **Transmission Media:** Guided and unguided, Attenuation, distortion, noise, throughput, propagation speed and time, wavelength, Shannon Capacity.

UNIT – II

No. of Hours: 12 Chapter/Book Reference: TB1[Chapter-2, 3], TB2[Chapter-3, 9]

Telephony: Multiplexing, WDM, TDM, FDM, circuit switching, packet switching and message switching. **Data Link Layer:** Types of errors, Framing (character and bit stuffing), error detection & correction methods; Flow control; Protocols: Stop & wait ARQ, Go-Back- NARQ, Selective repeat ARQ.

UNIT – III

No. of Hours: 12 Chapter/Book Reference: TB1[Chapter-5], TB2[Chapter-18, 19, 20, 22]

Network Layer: Internetworking & Devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway, Modems; Addressing: IPv4 and IPv6 addressing, IPv4 subnetting; Routing: Unicast Routing Protocols: RIP, OSPF, BGP; Routing: Routing Methods- Static and Dynamic Routing, Routing basic commands, Distance vector protocol, Link state protocol

UNIT – IV

No. of Hours: 10 Chapter/Book Reference: TB1[Chapter-6,7], TB2[Chapter-23, 24,25]

Transport and upper layers in OSI Model: Transport layer functions and Protocols, connection management, functions of session layers, Presentation layer, and Application layer.

TEXT BOOKS:

TB1. A. S. Tenanbaum, "Computer Networks"; Pearson Education Asia, 4th Ed., 2003.

TB2. Behrouz A. Forouzan, "Data Communication and Networking", 2nd edition, Tata Mc Graw Hill.

REFERENCES:

RB1. D. E. Comer, "Internetworking with TCP/IP", Pearson Education Asia, 2001.

RB2. William Stallings, "Data and computer communications", Pearson education Asia, 7th Ed., 2002.

RB3. Leinwand, A., Pinsky, B. (2001). Cisco router configuration. United Kingdom: Cisco Press.

Course Code: BMCA-302

Course Name: Computer Organization and Architecture

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to the following:

1. To study the various logic gates and design principles of different digital electronic circuits
2. To design different combinational and sequential circuits.
3. Identify the functional units of the processor and the factors affecting the performance of a computer
4. To learn about the Input –Output organization of a typical computer

PRE-REQUISITES:

Fundamentals of Computer

UNIT – I

No. of Hours: 11 Chapter/Book Reference: TB2[Chapter-2, 4], RB1 [Chapter-5, 6]

Boolean Algebra and Logic: Basics Laws of Boolean Algebra, Logic Gates, Simplifications of Boolean equations using K-maps SOP and POS, Don't Care condition.

Arithmetic Circuits: Adder, Subtractor, Parallel binary adder/Subtractor.

UNIT – II

No. of Hours: 11 Chapter/Book Reference: TB2 [Chapter-5, 6], RB1[Chapter-6,7]

Combinational Circuits: Multiplexers, De-Multiplexers, Decoders, Encoders.

Flip-flops: S-R, D, J-K, T, Clocked Flip-flop, Race around condition, Master slave Flip-Flop, Realisation of one flip-flop using other flip-flop, Applications of flip flop: Latch, Registers, Counters (elementary treatment to be given).

UNIT – III

No. of Hours: 11 Chapter/Book Reference: TB1[Chapter-5, 9], RB3[Chapter-11]

Data Transfer Operations: Register Transfer, Bus and Memory Transfer, Registers and micro-operations. **Basic Computer Organizations and Design**: Instruction Codes, Computer Registers, Instruction Cycle, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes,

UNIT – IV

No. of Hours: 11 Chapter/Book Reference: TB1[Chapter-12, 13], RB3[Chapter-7]

Input-Output Organization: Peripheral Devices, Input-Output Interfaces, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA)

Memory Organization: Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.

TEXT BOOKS:

TB1.   Morris Mano, Computer System Architecture, 3rd Edition, Prentice-Hall of India Private Limited, 1999.

TB2.   Moris Mano, "Digital Logic and Computer Design", PHI Publications, 2002

REFERENCES:

RB1.   R. P. Jain, "Modern Digital Electronics", TMH, 3rd Edition, 2003.

RB2.   WIliam Stallings, Computer Organization and Architecture, 4th Edition, Prentice Hall of India Private Limited, 2001

RB3.   Subrata Ghosal," Computer Architecture and Organization", Pearson 2011

RB4. Malvino, "Digital Computer Electronics: An Introduction to Microcomputers", McGraw Hill

Course Code: BMCA-303

Course Name: Object Oriented Programming with C++

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to the following:

1. Gain knowledge and develop a broad understanding of bottom up approach
2. Construct object oriented solutions for real world scenarios

PRE-REQUISITES:

1. Knowledge of C programming
2. Basic Programming Skills

UNIT – I

No. of Hours: 10 Chapter/Book Reference: TB1 [Chapters 1, 2], TB2 [Chapters 1, 2, 3]

Object Oriented Paradigm: Procedural vs. object-oriented development, basic concepts of object-oriented programming, applications and benefits of OOP, comparison between C and C++.

Beginning with C++: Stream based I/O, literals- constant qualifiers, operators in C++, reference variable, functions, default arguments, parameter passing by value, reference and pointer, inline functions, type conversion, basic C++ programs, new, delete operators- basic use and dynamic memory allocation for arrays.

UNIT – II

No. of Hours: 11 Chapter/Book Reference: TB1 [Chapters 10, 11], TB2 [Chapters 5, 6]

Classes and Objects: C++ class declaration, access specifiers, member functions, arrays within a class, array of objects, memory allocation of objects, passing objects as arguments, returning objects from functions, function overloading, static data and member functions, friend function and friend class, this pointer

Constructors &Destructors: Introduction to constructor and destructor, parameterized constructor, constructor with default arguments, multiple constructors in a class, copy constructor.

UNIT – III

No. of Hours: 12 Chapter/Book Reference: TB1 [Chapters 13, 14, 15], TB2 [Chapters 7, 8, 9]

Inheritance: Types of inheritance, derivation – public, private & protected, ambiguity resolution (function overriding), aggregation, composition v/s classification, virtual base class, constructor and destructor in derived classes.

Polymorphism: Types of polymorphism, early v/s late binding, Virtual Functions: Need for virtual functions, pointer to derived class objects, pure virtual functions, abstract classes**.**

Operator Overloading: Overloading unary operators, nameless objects, overloading binary operators, overloading with friend functions, conversion between basic types and user-defined types.

UNIT – IV

No. of Hours: 11 Chapter/Book Reference: TB1 [Chapters 16, 17, 18, 19],TB2 [Chapters 11, 12, 13]

Parametric polymorphism: Generic Programming with Templates, Introduction, function templates/generic functions, characteristics, overloading of template functions, class templates, template arguments.

Exception Handling: Exception-handling model, types of exception, catching and handling exceptions, generic catch, rethrowing an exception, specifying exceptions for a function.

Streams &Files: C++ Streams, basic stream classes, C++ predefined streams, I/O operations, unformatted console I/O operations, manipulators, opening and closing a file- different modes and methods, error handling during file operations, file pointers and their manipulations, sequential access to file, random input and output operations, persistent objects, command line arguments.

TEXT BOOKS:

TB1.   K.R. Venugopal, Rajkumar, T. Ravishanker, "Mastering C++", TMH

TB2.   E. Balagurusamy, "Object Oriented Programming with C++", McGraw-Hill Education

REFERENCE BOOKS:

RB1.   Ashok N. Kamthane, "Object-Oriented Programming with ANSI And Turbo C++", Pearson Education.

RB2.   Schildt Herbert, "C++: The Complete Reference", Tata McGraw Hill.

RB3.   R. Lafore, "Object Oriented Programming using C++", Galgotia Publications**.**

Course Code: BMCA-304

Course Name: Human Values and Ethics

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to the following:

1. To distinguish between values and skills, and understand the significance of values in personal and professional life
2. To understand harmony at all the levels of human living, and live accordingly.
3. To understand the role of a human being in ensuring harmony in society and nature.
4. To apply the understanding of harmony in existence in their profession and lead an ethical life

PRE-REQUISITES:

None

UNIT – I

No. of Hours: 10 Chapter/Book Reference: TB1 [Chapters-1, 2], TB2 [Chapters-1] Introduction to human values:

- Understanding the need, basic guidelines, process of value education
- Understanding the thought provoking issues- continuous happiness and prosperity
- Right understanding- relationship and physical facilities, choice making- choosing, cherishing and Acting
- Understanding values- Personal Values, Social values, Moral values and spiritual values, Self- Exploration and Awareness leading to Self-Satisfaction; Tools for Self-Exploration.

UNIT-II

No. of Hours: 10 Chapter/Book Reference: TB2 [Chapters 5-10]

Harmony and role of values in family, society and human relations

- Understanding harmony in the Family- the basic unit of human interaction; Understanding values in human-human relationship; Understanding harmony in the society-human relations.

- Interconnectedness and mutual fulfilment; Coexistence in nature.
- Holistic perception of harmony at all levels of existence-universal harmonious order in society. Visualizing a universal harmonium order in society- undivided society (Akhand Samaj), universal order (Sarvabhaum Vyawastha)- from family to world family.

UNIT-III

No. of Hours: 11 Chapter/Book Reference: TB1 [Chapters-2, 3] Coexistence and role of Indian Ethos:

- Interconnectedness and mutual fulfilment among the four orders of nature-recyclablity and self- regulation in nature
- Ethos of Vedanta; Application of Indian Ethos in organizations in management; Relevance of Ethics and Values in organizations in current times.

UNIT-IV

No. of Hours: 11 Chapter/Book Reference: TB1 [Chapters-4, 5], TB2 [Chapters-12, 13] Professional ethics

- Understanding about Professional Integrity, respect and equality, Privacy, Building Trusting relationships, Co-operation, respecting the competence of other profession.
- Understanding about taking initiative, promoting the culture of openness, depicting loyalty towards goals and objectives.
- Ethics at the workplace: - cybercrime, plagiarism, sexual misconduct, fraudulent use of institutional resources, etc.;

Ability to utilize the professional competence for augmenting universal human order.

TEXT BOOKS:

TB1.   A Textbook on Professional Ethics and Human Values by R S Naagarazan.

TB2.   A Foundation Course in Human Values and Professional Ethics by R.R. Gaur, R. Sangal, G.P. Bagaria.

TB3.   Indian Ethos and Modern Management by B L Bajpai New Royal Book Co., Lucknow., 2004, Reprinted 2008.

REFERENCE BOOKS:

RB1.   A N Tripathy, 2003, Human Values, New Age International Publishers

RB2.   Human Values and Professional Ethics by Vaishali R Khosla, Kavita Bhagat

RB3.   I.C. Sharma. Ethical Philosophy of India Nagin & co Julundhar

Course Code: BMCA-305
Course Name: Cyber Security

Students will be able to understand and learn the concept, layers of Cyber Security.
1. Students will be able to learn about cybercrime and types of attack.
2. Students will be able to learn about how many tools and methods available of cybercrime.
3. To study about cybercrime real life examples and cases.
4. Students will be able to understand and learn about Ethical Hacking.
5. Students will be able to understand and learn about Cyber Forensics.

PRE-REQUISITES:
1. Fundamentals of Information Technology

UNIT – I
No. of Hours: 12Chapter/Book Reference: TB1 [Chapters – 1, 2], TB2[Chapters - 1, 2]

Introduction to Cyber Security: Basic Cyber Security Concepts, Layers of Cyber Security, Cybercrimes, Cybercriminals, Cyberspace, Cyber threats, Cyberwarfare, Classification of Cybercrimes, Categories of Cyber Crime, Types of criminal attack, cyberstalking, botnet, cybercrime and cloud computing.

UNIT – II
No. of Hours: 10Chapter/Book Reference: TB1 [Chapters – 2, 3], TB2 [Chapter - 3, 4, 11]

Cybercrime attacks on Mobile/Cell Phones, Introduction to Cybercrime Tools and Methods: phishing and its working, password cracking and its types, Keyloggers and its types, viruses, Trojan horse and backdoor, steganography, DoS & DDoS attack,

UNIT – III
No. of Hours: 10 Chapter/Book Reference: TB1 [Chapter – 4], TB3 [Chapter - 2, 21]

Cryptography: Introduction to Cryptography, Symmetric-key Cryptography, Asymmetric-key Cryptography, User Authentication, Password Authentication, Message Authentication, Digital Signature.
Securing Web Application, Services: Introduction, Basic security for HTTP Applications, Email Security, Backupissues, Identity Management and Web Services, Authorization Patterns, Firewall

UNIT – IV
No. of Hours: 12Chapter/Book Reference: TB1 [Chapter – 6], TB2 [Chapter - 7]

Introduction to Cyber Forensics: Need of Cyber Forensics, Digital Evidence and its rules, RFC2822, Life cycle of Digital Forensics, process of Digital Forensics, Phases of Computer Forensics/Digital Forensics, Computer Forensics Investigation, Computer Forensics and Steganography, OSI 7-layer model to Computer Forensics.

TEXT BOOKS:
TB1. Supriya Madan and Rajan Gupta, "Security in Cyber Space and its LegalPerspective", 1st Edition, AGPH Books.
TB2. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics andLegal Perspectives, Wiley.
TB3. Kevin Beaver, Hacking for Dummies Wiley Publishing, Inc.
TB4. Stallings and Brown, Computer Security: Principles and Practice, Fourth Edition, Publisher: Pearson,2018.

REFERENCE BOOKS:
RB1. Cyber Security Essentials, James Graham, Richard Howar and Ryan Otson, CRC Press.
RB2. Introduction to Cyber Security: Jeetendra Pande.
RB3. Certified Ethical Hacker STUDY GUIDE Kimberly Graves Sybex.

Course Code: BMCA-306
Course Name: Principles of Management & Organizational Behaviour
UNIT – I
No. of Hours: 12 Chapter/Book Reference: TB1 [Chapters – 1, 2, 4]

Management: Meaning & concept, Management principles (Fayol & Taylor), Management process

(in brief), Managerial levels, Skills, Roles and Functions of a manager, Management Theories (Classical, Neo classical, Behavioral, Systems & Contingency).

UNIT – II
No. of Hours: 10 Chapter/Book Reference: TB1 [Chapters – 7, 8, 10, 16, 17, 27, 28]

Planning: Meaning, Purpose & process, Decision making: Concept & process, Organizing: Process,Departmentation, Authority & Responsibility relationships, Decentralization.

Staffing: Concept, nature & importance of staffing and Directing.

UNIT – III
No. of Hours: 12 Chapter/Book Reference: TB1 [Chapters – 13, 18, 32, 33]

Motivation: concept & theories (Maslow's, Herzberg Two factor, McGregor's theory X & Y),Leadership: Concepts & styles. Controlling: Nature, Importance, significance & Process of control.

Organizational Behavior: concept and Nature of Organisational Behaviour, Importance, Challenges and Opportunities.Organizational culture: Meaning, importance and characteristics of organization culture.

UNIT – IV
No. of Hours: 10 Chapter/Book Reference: TB1 [Chapters –34, 35, 36, 40, 41]

Managing People - Meaning, Need of understanding human behavior in organization, Models of OB, Major concepts in OB (elementary) - Personality, Learning, concept of perception & perception theories, Attitude Building and Leadership.

TEXT BOOKS:
TB1. Dr. C.B Gupta "Management concepts & practices" S.Chand & Sons, 2009.

REFERENCES BOOKS:
RB. Stoner, Freeman & Gilbert, "Management" 6th Edition, Pearson International.
RB2. Ankur Chhabra, "Organisational Behaviour", Sun India Publications, 2009 **RB3.**Robbins, Stephen P, "Organisational Behaviour". PHI, 2010

Course Code: BMCA -307
Course Name: Practical – VII C++ Lab

LEARNING OBJECTIVES:
In this course, the learners will be able to:
1. Develop concepts related to Object Oriented Programming
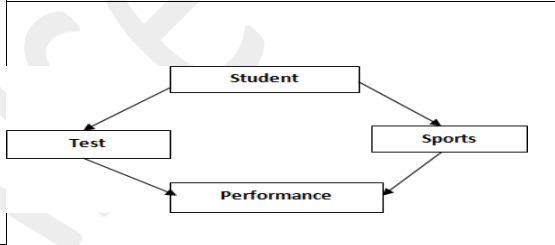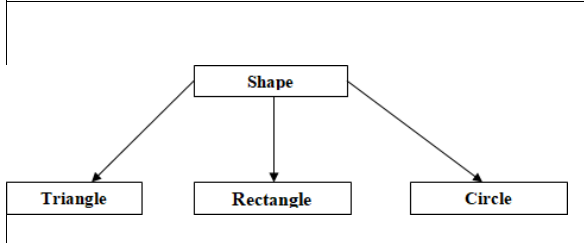2. Construct object oriented solutions in real world scenarios

PRE-REQUISITES:
1. Knowledge of C programming
2. Basics of Programming

S. No.	Detailed Statement
1	WAP to implement '*Inline function*'

2	WAP to implement call by reference and return by reference using class. [Hint. Assume necessary functions]
3	WAP to implement friend function by taking some real life example
4	WAP to implement *'Function Overloading'*
5	WAP to implement *Parameterized Constructor, Copy Constructor* and *Destructor*
6	WAP to show the usage of constructor in base and derived classes, in multiple inheritance
7	WAP to show the implementation of *'containership'*
8	WAP to show swapping using template function (Generic)
9	WAP to implement *'Exception Handling'*
10	WAP to read and write values through object using file handling

11	Create a class employee which have name, age and address of employee, include functions getdata() and showdata(), getdata() takes the input from the user, showdata() display the data in following format: *Name:* *Age:* *Address:*
12	Write a class called **CAccount** which contains two private data elements, an integer **accountNumber** and a floating point **accountBalance,** and three member functions: • A constructor that allows the user to set initial values for **accountNumber** and **accountBalance** and a default constructor that prompts for the input of the values for the above data numbers. • A function called **inputTransaction**, which reads a character value for **transactionType**('D' for deposit and 'W' for withdrawal), and a floating point value for **transactionAmount**, which updates **accountBalance**. A function called **printBalance**, which prints on the screen the **accountNumber** and

	accountBalance.
13	Define a class *Counter* which contains an int variable *count* defined as static and a static function Display () to display the value of *count*. Whenever an object of this class is created *count* is incremented by 1. Use this class in main to create multiple objects of this class and display value of count each time
14	WAP to add and subtract two complex numbers using classes
15	Write program to overload Binary + to add two similar types of objects. (Both with and without using friend functions)
16	WAP to implement += and = operator
17	Implement the following class hierarchy considering appropriate data members and member functions
18	Implement the following hierarchy considering appropriate data members and member functions (use Virtual functions).
19	WAP to convert meter to centimeter and vice versa, using data conversions

	and operator
	overloading
20	WAP to count digits, alphabets and spaces, stored in a text file, using streams

Course Code: BMCA-308

Course Name: Cyber Security

This is the associated practical paper. The learning outcomes are same as the corresponding theory paper**.**

List of Practicals

S.No.	Problem Statement
1	Install and configure any Antivirus software on System
2	Implement prevention mechanisms to protect PC from Cyber Attack
3	Implement Steganography Algorithms
4	Implement and install the keyloggers to understand their working.
5	Implement hiding of Data in image using tools.
6	Apply security to Files/ Folder/ Application using access permissions
7	Study of System threat attacks - Denial of Services.

8	Study of Techniques uses for Web Based Password Capturing.
9	Study of Anti-Intrusion Technique – Honey pot.
10	Study of Sniffing and Spoofing attacks.

BCA+MCA FOURTH SEMESTER EXAMINATION SCHEME AND SYLLABUS

PAPERS CODE	PAPERS NAME	INTERNAL	EXTERNAL	TOTAL
BMCA401	Java Programming	40	60	100
BMCA402	Software Engineering	40	60	100
BMCA403	Introduction to Management & Entrepreneurship Development	40	60	100
BMCA404	Introduction to Data Science	40	60	100
BMCA405	Digital Marketing	40	60	100
PRACTICAL				
BMCA406	Practical –XII Java Lab	60	40	100
BMCA407	Practical – IX SE Lab	60	40	100
BMCA408	Introduction to Data Science Lab.	60	40	100
Total		380	420	800

Course Code: BMCA401

Course Name: Java Programming

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to the following:

1. Learn how to implement Object Oriented concepts through Java.
2. Identify and apply the Java thread model to program Java applications.
3. Develop GUI applications using Java swings

PRE-REQUISITES:

1. Programming fundamental
2. Object-Oriented concepts

UNIT–I

No. of Hours: 12 Chapter/Book Reference: TB1 [Chapters – 1, 2, 3, 5, 6], TB2[Chapters - 2, 3, 4, 5, 6, 7, 8]

Java Basics: Java as Object-oriented Programming Language History of Java, Features of Java, Difference between Java and C++, Java Architecture (JDK, JVM, JRE), Java Tokens: Data types, Literals, Variables, Scope and lifetime of variables, Operators. Control Structures, Arrays.

Introducing Classes: Creating a Class: properties, methods and constructors. Object Access modifiers, Method Overloading, Garbage collection, this keyword, Static (variable, method, block), final keyword, Wrapper Classes, String class and methods.

UNIT – II

No. of Hours: 12 Chapter/Book Reference: TB1 [Chapters – 7, 8, 9], TB2[Chapters - 9, 10, 11] Inheritance: Types, Super keyword, method overriding, covariant return type, abstract CLASS **Interfaces and Packages:** Creation and implementing an interface, difference between abstract class and interface, Packages, and importing a package.

Exception Handling: Exception Class, built-in checked and unchecked exceptions, user-defined exceptions, use of try, catch, throw, throws, finally

UNIT – III

No. of Hours: 10 Chapter/Book Reference: TB1 [Chapters – 11, 12], TB2[Chapters - 13]

Using I/O: Elementary concepts of Input/Output, using the byte streams, reading and writing using byte streams, automatically closing a file, using the character-based streams, File I/O using character streams (using a File Writer and using a File Reader)

Multi-threaded programming: Multithreading fundamentals, Thread class, and Runnable interface, the life cycle of thread, creation of single and multiple threads, implementation of Thread methods, Synchronization (using Synchronized methods, synchronized statement).

UNIT – IV

No. of Hours: 10 Chapter/Book Reference: TB1 [Chapters – 17, 18]

Swings Fundamentals: Components (JLabel and ImageIcon, using swing Buttons (JButton, JToggleButton, JCheckBox, JRadioButton), JTextField, JScrollPane, JList, JComboBox) and Containers, Layout managers, event delegation Model, event handling (event sources, event listeners, event classes and interfaces, adapter classes). **JDBC:** JDBC Architecture, JDBC Drivers, Connection, Statement, Prepared Statement, Result set, Connecting to the Database using JDBC.

TEXT BOOKS:

TB1. Herbert Schildt, "Java 2 -The Complete Reference" – Tata McGraw Hill Education Private Limited, 2010

TB2. Trilochan Tarai, "Java Core Concepts and Applications", I.K. International Publishing house pvt. Ltd., 2015

REFERENCEBOOKS:

RB1. E.Balaguruswamy,"Programming with Java A Primer", McGraw Hill Education Private Limited, 5th Edition,2015.

RB2. Herbert Schildt, Dale Skrien, "Java Fundamentals A Comprehensive Introduction" – Tata McGraw Hill Education Private Limited, 2013

RB3. Cay S. Horstmann, "Core Java Volume 1 – Fundamentals", 10th edition, Pearson, 2017

RB4. Ken Arnold, Davis Holmes, James Gosling, Prakash Goteti, "The Java Programming Language", 3rd edition, Pearson, 2008.

Course Code: BMCA403

Course Name: Software Engineering

LEARNING OBJECTIVES:

The paper aims to understand the importance, limitations and challenges of processes involved in software development. In this course, the learners will be able to develop expertise related to the following:

1. To gain knowledge of various software models.
2. To gain knowledge of various software design activities.
3. To learn cost estimation, software testing, Maintenance and debugging.

PRE-REQUISITES:

NONE

UNIT – I

No. of Hours: 12 Chapter/Book Reference: TB1 [Chapters - 1, 3], TB2 [Chapters - 3, 5]

Introduction of software engineering: Software Crisis, Software life cycle models, Waterfall, Prototype, Spiral Models, Agile model.

Software Requirements analysis & specifications: Requirement engineering, requirement elicitation techniques like FAST, QFD, Requirement analysis using (DFD use-case, sequence and class diagram (with case studies), ER Diagrams, Requirements documentation: SRS, Characteristics & organization of SRS

UNIT – II

No. of Hours: 10 Chapter/Book Reference: TB1 [Chapter - 1, 4]

Software Project Planning: Software Metrics-Definition and Need, Types of Metrics-Product, Process and Project Metrics, Size Estimation like lines of Code & Function Count, Halstead Software Science measure, Cost Estimation: Need, Models COCOMO: Basic model, Intermediate model

Risk Management: Software Risks, Types of risk, risk management activities: risk assessment, risk control

UNIT 3

No. of Hours: 10 Chapter/Book Reference: TB1 [Chapter - 5, 6], TB2 [Chapter - 24]

Software Design: Cohesion & Coupling, Classification of Cohesiveness & Coupling,

Quality management: Quality concept, software quality assurance, Total Quality Management (TQM), software review, software inspection

Software Implementation: Structured coding techniques, coding style, Standards and guidelines, documentation guidelines. Reverse Engineering, Software Re-engineering, Configuration Management.

UNIT – IV

No. of Hours: 12 Chapter/Book Reference: TB1 [Chapter 8, 9], TB2 [Chapter 8]

Software Testing: Testing Process, Levels of Testing: Unit testing, Integration testing and system testing. Types of Testing: Manual testing, Automation Testing. Methods of Testing- , Black box, White box and Grey Box Testing. Validation, Verification, Alpha-Beta testing, Acceptance testing, Functional Testing and its types, Structural Testing Difference between: Testing and Debugging

Software Maintenance: Management of Maintenance, The Maintenance Process and Types of maintenance: Preventive, Perceptive, Adaptive and Corrective Maintenance.Maintenance tools and techniques.

TEXT BOOKS:
TB1. K. K. Aggarwal & Yogesh Singh, "Software Engineering", 2nd Ed., New Age International, 2005.
TB2. I. Sommerville, "Software Engineering", 9th Edition, Pearson Edu.

REFERENCE BOOKS:
RB1. Jibitesh Mishra and Ashok Mohanty, "Software Engineering", Pearson
RB2. R. S. Pressman, "Software Engineering – A practitioner's approach", 5th Ed., McGraw Hill Int. Ed., 2001.
RB3. James Peter, W. Pedrycz, "Software Engineering: An Engineering Approach", John Wiley & Sons.

Course Code: BMCA403

Course Name: Introduction to Management and Entrepreneurs Development

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to the following:

1. Development of critical thinking and to inspire students to developed an entrepreneurial mind-set.
2. Acquisition of values and attitudes towards understanding complex business problems
3. Promoting active participation in solving current business problems and preventing the future ones.
4. Encouraging students to understand the fundamentals of management

PRE-REQUISITES:
Basic awareness about the Entrepreneurship Development

UNIT–I
No. of Hours: 10 Chapter/Book Reference: TB1 [Chapters - 1, 2], TB2 [Chapters - 1, 2, 3], TB3 [Chapter - 1]

Introduction to Entrepreneurship: Meaning and concept of entrepreneurship, the history of entrepreneurship development, Role of entrepreneurship in economic development, General characteristics and personality traits of entrepreneurs. Factors affecting entrepreneurship, Agencies in entrepreneurship development in India.

UNIT–II

No. of Hours: 10 Chapter/Book Reference: TB1 [Chapter - 11], TB2 [Chapters - 6, 7], TB3 [Chapter - 4]

Creativity: Necessity of Creativity in the development of entrepreneur, Steps in Creativity, Defining Innovation, importance of innovation. Identification of opportunities for problem solving with innovation. Decision making and Problem Solving (steps indecision making). Example from industry, day to day operations

UNIT–III

No. of Hours: 10 Chapter/Book Reference: TB1 [Chapter - 7], TB2 [Chapters - 10, 2, 1]

Role of an Entrepreneur: The Entrepreneur's role in the context of contribution to society; Examples from industry; the role of changing the mindset and the development of out of box thinking. Introduction to Design Thinking. Entrepreneurs as role models, mentors and influencers. Entrepreneurial success stories.

Historical Perspective, Global Indian Entrepreneurs, Institutions, Modern Entrepreneurs

UNIT–IV

No. of Hours: 10 Chapter/Book Reference: TB3 [Chapters - 21, 22]

Fundamentals of Management: Meaning of Business and its management the role and importance of leadership in entrepreneurship. Difference between Management and Leadership. The importance of planning in entrepreneurship venture. The role and importance of business plan in entrepreneurship venture

TEXT BOOKS:

TB1. S.S Khanka, Entrepreneurship Development, S.Chand

TB2. Sangram Keshari Mohanty, Fundamentals of Entrepreneurship, PHI Learning Private Limited 2018

TB3. Abha Mathur; Entrepreneurship Development, Taxman, Fifth Edition

REFERENCE BOOKS

RB1. Srivastava S. B: A Practical Guide to Industrial Entrepreneurs; Sultan Chand and Sons, New Delhi.

RB2. Prasanna Chandra: Protect Preparation, Appraisal, Implementation; Tata McGraw Hill. New Delhi.

RB3. Chabbra, T.N, Entrepreneurship Development, Sun India

Course Code: BMCA404

Course Name: Introduction to Data Science

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to the following:

1. Apply mathematical principles to the analysis of data.
2. Analyze data sets in the context of real world problems.
3. Develop and implement data analysis strategies base on theoretical principles, ethical considerations, and knowledge of the underlying data

PRE-REQUISITES:

None

UNIT–I

No. of Hours: 11 Chapter/Book Reference: TB1 [Chapters - 1, 2]

Introduction to data Science, Evolution of Data Science, Data Science Roles, Stages in a Data science Project, Applications of Data Science In various fields, Data security Issues.

Data Collection Strategies, Data Pre-processing overview- Data Cleaning- Data Integration and transformation- Data Reduction- Data Discretization.

UNIT–II

No. of Hours: 11 Chapter/Book Reference: TB2 [Chapters - 4, 6, 7, 14]

Statistics for Data Science: Describing a Single Set of Data, Central Tendencies and Dispersion. Descriptive Statistics- Mean, standard Deviation, Skewness and Kurtosis, Box plots, Pivot Table, Linear Regression.

UNIT–III

No. of Hours: 11 Chapter/Book Reference: TB1 [Chapter - 5, 6, 7]

Why Python? - Essential Python libraries

Introduction to NumPy: NumPy Basics: Arrays and Vectorized Computation- The NumPyndarray- Creating ndarrays- Data Types for ndarrays- Arithmetic with NumPy Arrays- Basic Indexing and Slicing

Data handling using Pandas in python: Series (creation from ndarray, dictionary; mathematical operations; Head and Tail functions), DataFrames (creation from dictionary of series, operations on rows and columns).

Statistical functions using pandas like min, max, count, sum, quartile, standard deviation, variance & DataFrame operations like aggregation, group by, Sorting, Deleting, Renaming Index, Pivoting.

UNIT–IV

No. of Hours: 11 Chapter/Book Reference: TB2 [Chapters - 15, 20, 23]

Case Studies: Checking different patterns in data, Forecasting demand, investigating clinical data

TEXT BOOKS:

TB1. McKinney, "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython", O'Reilly, 2nd Edition,2018

TB2. Agile tools for real world data : Python for Data Analysis by Wes McKinney, O'Reilly

TB1. Applying Data Science Business Case Studies Using SAS By Gerhard Svolba · 2017

REFERENCE BOOKS:

RB1. Python: The Complete Reference by Martin Brown

RB2. Programming Python, 4th Edition by Mark Lutz Released December 2010 Publisher(s): O'Reilly Media, Inc

Course Code: BMCA406
Course Name: Practical – VIII Java Lab

LEARNING OBJECTIVES:
In this course, the learners will be able to develop expertise related to:
1. Basic understanding of Object-Oriented Programming Concepts and create classes.
2. Learn Inheritance, exception handling in Java.
3. Understand and implement multithreading programming.
4. Learn building GUI applications using various controls in Swings.

PRE-REQUISITES: Prior knowledge of programming language is mandatory.

S. No.	Detailed Statement
1.	Write a program declaring a class Rectangle with data member's length and breadth and member functions Input, Output and CalcArea.
2.	Write a program to demonstrate use of method overloading to calculate area of square, rectangle and triangle.
3.	Write a program to demonstrate the use of static variable, static method and static block.
4.	Write a program to demonstrate concept of ``this``.
5.	Write a program to demonstrate multi-level and hierarchical inheritance.
6.	Write a program to use super() to invoke base class constructor.
7.	Write a program to demonstrate run-time polymorphism.
8.	Write a program to demonstrate the concept of aggregation.
9.	Write a program to demonstrate the concept of abstract class with constructor and ``final`` method.
10.	Write a program to demonstrate the concept of interface when two interfaces have unique methods and same data members.
11.	Write a program to demonstrate checked exception during file handling.
12.	Write a program to demonstrate unchecked exception
13.	Write a program to demonstrate creation of multiple child threads.
14.	Write a program to use Byte stream class to read from a text file and display the content on the output screen.
15.	Write a program to demonstrate any event handling.

16.		Create a class employee which have name, age and address of employee, includemethods getdata() and showdata(), getdata() takes the input from the user, showdata() display the data in following format: Name : Age: Address:
17.		Write a Java program to perform basic Calculator operations. Make a menudriven program to select operation to perform (+ - * /). Take 2 integers andperform operation as chosen by user.
18.		Write a program to make use of BufferedStream to read lines from the keyboarduntil 'STOP' is typed.
19.		Write a program declaring a Java class called SavingsAccount with members ``accountNumber`` and ``Balance``. Provide member functions as ``depositAmount ()`` and ``withdrawAmount ()``. If user tries to withdraw anamount greater than their balance then throw a user-defined

S.No.	Detailed Statement
	exception.
20.	Write a program creating 2 threads using Runnable interface. Print your name in ``run ()`` method of first class and "Hello Java" in ``run ()`` methodof second thread.
21.	Write program that uses swings to display combination of RGB using 3 scrollbars.
22.	Write a swing application that uses atleast 5 swing controls
23.	Write a program to implement border layout using Swing.
24.	Write a java program to insert and update details data in the database.
25.	Write a java program to retrieve data from database and display it on GUI.

Course Code: BMCA407
Course Name: Practical-IX SE Lab

LEARNING OBJECTIVES: Students will be capable to acquire the generic software development skill through various stages of software life cycle. Students will also be able to ensure the quality of software through software development with various protocol based environment. After completion of course student will be able to prepare SRS, analysis the requirement, design the requirements and generate test cases to test the project. Students will also be able to handle software development models through rational method. Rational Rose Enterprise Edition software is used to serve the objectives.

PRE-REQUISITES:
None

List of Practicals

S.No.	Detailed Statement
1.	Select and Write down the problem statement for a real time system of relevance.
2.	Analyze requirement for a system and develop Software Requirement Specification Sheet (SRS) for suggested system.
3.	To create the function oriented diagram: Data Flow Diagram (DFD)
4.	To perform the user's view analysis for the suggested system: Use case diagram.
5.	To draw the structural view diagram for the system: Class diagram
	To draw the behavioral view diagram : State-chart diagram or Activity diagram
	To perform the behavioral view diagram for the suggested system : Sequence diagram

8.		Draw the component diagram
9		Draw the Deployment diagram.
10		Perform Measurement of complexity with Halstead Metrics for chosen system.

Suggested Applications

(i)	Inventory Management
(ii)	Library Management
(iii)	Result Management
(iv)	Hotel Management System
(v)	Any Website
(vi)	Any mobile application
(vii)	E-Commerce website
(viii)	Any other application

Note:

1. **Students are required to identify an application in the beginning of the semester and conduct all practicals for the same application.**
2. **In total 10 practicals to be implemented.**
3. **Students may use any open source software i.e. argoUML for drawing the above diagrams.**
4. **Students may Use testing tool such as junit.**
5. **Student may Use configuration management tool-libra.**

Course Code: BMCA408

Course Name: Introduction to Data Science

This is the associated practical paper. The learning outcomes are same as the corresponding theory paper.

S. No.	Detailed Statement
1.	Create a pandas series from a dictionary of values and an ndarray.
2.	Create a Series and print all the elements that are above 75th percentile.
3.	Perform sorting on Series data and DataFrames
4.	Write a program to implement pivot() and pivot-table() on a DataFrame.
5.	Write a program to find mean absolute deviation on a DataFrame.
6.	Two Series object, Population stores the details of four metro cities of India and another object AvgIncome stores the total average income reported in four years in these cities. Calculate income per capita for

	each of these metro cities.
7.	Create a DataFrame based on E-Commerce data and generate mean, mode, median.
8.	Create a DataFrame based on employee data and generate quartile and variance.
9.	Program to implement Skewness on Random data.
10.	Create a DateFrame on any Data and compute statistical function of Kurtosis.
11.	Series objects Temp1, temp2, temp3, temp 4 stores the temperature of days of week 1, week 2, week 3, week 4. Write a script to:- a. Print average temperature per week b. Print average temperature of entire month
12.	Write a Program to read a CSV file and create its DataFrame.
13.	Consider the DataFrame QtrSales where each row contains the item category, item name and expenditure and group the rows by category, and print the average expenditure per category.
14.	Create a DataFrame having age, name, weight of five students. Write a program to display only the weight of first and fourth rows.
15.	Write a program to create a DataFrame to store weight, age and name of three people. Print the DataFrame and its transpose.

BCA+MCA FIFTH SEMESTER EXAMINATION SYLLABUS & SCHEME

PAPERS CODE	PAPERS NAME	INTERNAL	EXTERNAL	TOTAL
BMCA501	Operating System	40	60	100
BMCA502	Computer Graphics	40	60	100
BMCA503	Cloud Computing	40	60	100
BMCA504	Data Visualization & Analytics	40	60	100
BMCA505	Minor Project	40	60	100
PRACTICAL				
BMCA506	Practical – Linux - OS Lab	60	40	100
BMCA507	Practical – CG Lab	60	40	100
BMCA508	Data Visualization & Analytics Lab.	60	40	100
Total		380	420	800

Paper Code: BMCA-501

Paper: Operating System

Pre-requisite: None

Aim: To introduce an operation System and describe the functionalities of Operating System.

Objectives

- To Understand the services provided by an operating system.

UNIT – I

Introduction: What is an Operating System, Simple Batch Systems, Multiprogrammed Batches systems, Time-Sharing Systems, Personal-computer systems, Parallel systems, Distributed Systems, Real-Time Systems**Memory Management:** Background, Logical versus Physical Address space, swapping, Contiguous allocation, Paging, Segmentation

Virtual Memory: Demand Paging, Page Replacement, Page-replacement Algorithms,

Performance of Demand Paging, Allocation of Frames, Thrashing, Other Considerations **[No. of Hrs.: 12]**

UNIT – II

Processes: Process Concept, Process Scheduling, Operation on Processes

CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Multiple- Processor Scheduling,

Process Synchronization: Background, The Critical-Section Problem, Synchronization Hardware, Semaphores, Classical Problems of Synchronization   **[No. of Hrs.: 10]**

UNIT – III

Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock

Device Management: Techniques for Device Management, Dedicated Devices, Shared Devices, Virtual Devices; Input or Output Devices, Storage Devices, Buffering, Secondary- Storage Structure: Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management, Disk Reliability   **[No. of Hrs.: 10]**

UNIT – IV

Information Management: Introduction, A Simple File System, General Model of a File System, Types of File System File-System Interface: File Concept, Access Methods, Directory Structure, Protection: Goals of protection, Domain of protection, Access rights, Consistency Semantics Security: Authentication, Program threats, System threats, Encryption. **[No. of Hrs.: 12]**

TEXT:

[T1] Silbersachatz and Galvin, "Operating System Concepts", John Wiley & Sons, 7th Ed. 2005 [T2] Haldar/Aravind, "Operating System", Pearson Edu.

REFERENCES:

[R1] Madnick E., Donovan J., "Operating Systems", Tata McGraw Hill, 2001 [R2] Tannenbaum, "Operating Systems", PHI, 4th Edition, 2000

[R3] An Introduction to Operating Systems: Concepts & Practice, Bhatt, PHI

Paper Code: BMCA502

Paper: Computer Graphics

Pre-requisites: None

Aim: To understand the graphics applications and its use.

UNIT – I

Introduction: The Advantages of Interactive Graphics, Representative Uses of Computer Graphics, Classification of Applications, Development of Hardware and Software for Computer Graphics, Conceptual Framework for Interactive Graphics. Overview, Scan Converting Lines, Scan Converting Circles, Scan Converting Ellipses.

Graphics Hardware

Hardcopy Technologies, Display Technologies, Raster-Scan Display Systems, The Video Controller, Random-Scan Display Processor, Input Devices for Operator Interaction, Image Scanners, Antialiasing.

Clipping

Cohen- Sutherland Algorithm, Cyrus-Beck Algorithm, Midpoint Subdivision algorithm. [T1][T2]**[No. of Hrs.: 12]**

UNIT – II

Geometrical Transformations

2D Transformations, Homogeneous Coordinates and Matrix Representation of 2D Transformations, Composition of 2D Transformations, The Window-to-Viewport Transformation, Efficiency, Matrix Representation of 3D Transformations, Transformations as a Change in Coordinate System.[T1][T2][R3]**[No. of Hrs.: 10]**

UNIT – III

Representing Curves & Surfaces Polygon Meshes, Parametric Cubic Curves **Solid Modeling**

Representing Solids, Regularized Boolean Set Operations, Primitive Instancing, Sweep Representations, Boundary Representations, Spatial Partitioning Representations, Constructive Solid Geometry, Comparison of Representations, User Interfaces for Solid Modeling. [T1][T2]**[No. of Hrs.: 10]**

UNIT – IV

Three Dimensional Viewing: Introduction, Representation of Three-dimensional objects, Projections, Parallel projections: Orthographic Projections, Oblique Projections. Perspective Projection, Three dimensional clipping, Three-dimensional Cohen-Sutherland clipping algorithm**.**

Hidden Surface Removal: Depth-Buffer(z-buffer) method, Depth-sorting Method(Painter's algorithm)[T1][T2]**[No. of Hrs.: 12]**

TEXT BOOKS:

[T1] Foley, Van Dam, Feiner, Hughes, Computer Graphics Principles & Practice, 2000, Pearson [T2] Chennakesava R. Alavla "Computer Graphics", PHI Learning Pvt. Limited

REFERENCES BOOKS:

[R1] D. Hearn & Baker: Computer Graphics with OpenGL, Pearson Education, Third Edition, 2009.

[R2] Foley, J.D. & Van Dam, A: Fundamentals of Interactive Computer Graphics.

[R3] Rogers & Adams, "Mathematical Elements for Computer Graphics", McGraw Hill, 1989.

SUBJECT CODE & NAME BMCA503 (CLOUD COMPUTING)

Course Objective:

This course gives students an insight into the basics of cloud computing along with virtualization, cloud computing is one of the fastest growing domain from a while now. It will provide the students basic understanding about cloud and virtualization along with it how one can migrate over it.

Course Contents:

UNIT 1: Cloud Computing Overview

Origins of Cloud computing – Cloud components - Essential characteristics – On-demand self- service, Broad network access, Location independent resource pooling ,Rapid elasticity , Measured service, Comparing cloud providers with traditional IT service providers, Roots of cloud computing.

UNIT II: Cloud Insights

Architectural influences – High-performance computing, Utility and Enterprise grid computing, Cloud scenarios – Benefits: scalability ,simplicity ,vendors ,security, Limitations – Sensitive information - Application development- security level of third party - security benefits, Regularity issues: Government policies.

UNIT III: Cloud Architecture- Layers and Models

Layers in cloud architecture, Software as a Service (SaaS), features of SaaS and benefits, Platform as a Service (PaaS), features of PaaS and benefits, Infrastructure as a Service (IaaS), features of IaaS and benefits, Service providers, challenges and risks in cloud adoption.

Cloud deployment model: Public clouds – Private clouds – Community clouds - Hybrid clouds - Advantages of Cloud computing.

UNIT IV: Cloud Simulators- CloudSim and GreenCloud

Introduction to Simulator, understanding CloudSim simulator, CloudSim Architecture(User code, CloudSim, GridSim, SimJava) Understanding Working platform for CloudSim, Introduction to GreenCloud

UNIT V: Introduction to VMWare Simulator

Basics of VMWare, advantages of VMware virtualization, using Vmware workstation, creating virtual machines-understanding virtual machines, create a new virtual machine on local host, cloning virtual machines, virtualize a physical machine, starting and stopping a virtual machine.

Text & References:

Text:

- Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw-Hill , New Delhi – 2010
- Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online - Michael Miller - Que 2008

References:

- Cloudcomputing for dummies- Judith Hurwitz , Robin Bloor , Marcia Kaufman ,Fern Halper, Wiley Publishing, Inc, 2010
- Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc. 2011

BCA 6TH SEMESTER EXAMINATION SCHEME AND SYLLABUS

PAPERS CODE	PAPERS NAME	INTERNAL	EXTERNAL	TOTAL
BMCA601	Data Ware Housing & Data Mining	40	60	100
BMCA602	E- Commerce	40	60	100
BMCA603	Internet of Things	40	60	100
BMCA604	Machine Learning	40	60	100
BMCA605	Major Project	-	-	100
BMCA606	Seminar/ Conference Presentation	-	-	100
PRACTICAL				
BMCA607	Practical – IOT Lab	60	40	100
BCMA608	Machine Learning LAB	60	40	100
Total		**280**	**320**	**800**

Paper Code: BMCA601

Paper: Data warehouse and data miningPre-requisites:

- **Information System Concepts**

Objectives: This course is an attempt to provide you with the basic information about data ware house and their development. This course also provides the basic conceptual background necessary to design and develop data ware house applications.

UNIT – I

Data mining: Inttroduction, Data mining – on what kind of data, data mining functionalities – what kind of patterns to be mined, Classification of data mining systems, data mining task primitives, integration of a data mining systems with a database or data warehouse systems,major issues in data mining.

Data preprocessing: Descriptive data summarization, data cleaning, data integration and transformation, data reduction, data descretization and concept hierarchy generation.

UNIT – II

Data warehouse and OLAP technology: What is data warehouse, A multidimensional data model, data warehouse architecture, data warehouse implementation, data warehouse usage, OLAP, OLAM

Mining frequent patterns, association and correlation, efficient and scalable frequent itemset mining methods, From association mining to correlation analysis.

[No. of Hrs: 11]

UNIT – III

Classification and prediction: Introduction, issues, classification by decision tree induction, rule based classification, classification by back propagation, lazy learners, other classification methods, Prediction: accuracy and error measures, evaluating the accuracy of a classifier or predictor.

Cluster Analysis: Types of data in cluster analysis, a categorization of major clustering methods, partitioning methods.

[No. of Hrs: 11]

UNIT – IV

Mining complex types of data: Multidimensional analysis and descriptive mining of complex data objects, mining spatial database, multimedia database, mining world wide web.

Applications and trends in data mining: Data mining applications, data mining system products and research prototypes, social impact of data mining, trends in data mining.

TEXT BOOKS:

[T1] Kamber and Han, "Data Mining Concepts and Techniques", Hartcourt India P.Ltd.,2001.

[T2] Paul Raj Poonia, "Fundamentals of Data Warehousing", John Wiley & Sons, 2003

REFERENCE BOOKS:

[R1] Margaret Dunham, " Data Mining: Introductory and Advanced Topics, 1/e", Pearson

[R2] G. K. Gupta, "Introduction to Data Mining with Case Studies", PHI, 2006.

[R3] W. H. Inmon, "Building the Operational Data Store",2nd Ed., John Wiley, 1999

[R4] B. M. Shawkat Ali, Saleh A. Wasimi, "Data Mining Methods and Techniques", Cengage Learning, 2009

Paper Code: BMCA602

Paper: E-commerce Pre-requisites: None

Aim: To understand the process of Electronic commerce and Business strategy involved in it.

UNIT-I

An Overview of E-Commerce: Trade Process & Trade Cycles their linkages with information exchange; Definitions of E-commerce & E-business & their difference; Problems with Manual Systems, Aims of E-

commerce, Functions of E-commerce, Applications of E-commerce in business functions, Tools & Technologies for E-commerce,Types of E-commerce,Operational & Strategic benefits of E-commerce, Issues & Challenges in E-commerce .

Electronic Data Interchange (EDI): Definition, Concept & Evolution of EDI, Traditional versus EDI enabled system for document exchange, EDI Layered Architecture, Process of EDI Message Exchange, Components of EDI, UNEDIFACT Standards & Message Structure, EDI in India, EDI enabled procurement process, EDI Implementation, UN '**Model Interchange Agreement**' for international commercial use of EDI**.**

Web based E-Commerce: Need for web based business, Choosing the right format of website: Characteristics of PR site, Marketing site, Sales site/web-store and vertical & horizontal portals; Steps in setting up business on Internet: Selection & registration of domain name, Websitedevelopment-client & server side tools, web authoring tools, catalogue & web store tools, Website hosting considerations-own versus rented server; Website Maintenance Online Promotion tools & techniques: Getting links to your site, banner advertisements & measuring advertisement effectiveness, Web Traffic Analysis: Various measures, structure of log file data at server side & its analysis for promotion and tools for analysis, Search Engine optimization techniques, Payment Gateways for online payment, Security of transactions on Web: Selling through Secure Servers, use of digital certificates and international standards.

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UNIT – II

Intranet, Extranet and VPN: Architecture of Intranet, Intranet Software, Applications of Intranets, Intranet Application Case Studies, Considerations in Intranet Deployment; The architecture of Extranets, Extranet Products & Services, Applications of Extranets, BusinessModels of Extranet Applications; Virtual Private Network (VPN): Architecture of VPN - service provider dependent & service provider independent configurations, VPN Security- User authentication & Data Security.

Electronic Payment Systems: E-cash: Purchasing & using of e-cash; Electronic Purses their loading with cash and use; E-cheque payment system; Online Third Party Verified Payment System through Credit & Debit Cards & encryption mechanism; ATM based cash disbursement system; Electronic Bill Payment System; 6. Inter bank clearing system.

Security E-Commerce Transactions: Security issues: confidentiality, integrity, authentication, non-repudiation & access control their objectives & techniques; Types of security attacks; Cryptography & Digital Signatures: Symmetric & asymmetric cryptography, Public-Private Key Cryptography, Digital signatures & their use, Public Key Infrastructure (Digital Certificate, Certification Authority, Registration Authority, Key Repository), SSL and SET, Legal issues in cryptography   **[No. of Hrs: 12]**

UNIT – III

Business Strategy in an Electronic Age: Impact of Internet on Competition - Porter's Five Forces Model & Business Strategies in Digital Economy; Impact of IT Enabled Systems on Value Chain - Porter's Value Chain Model; Supply Chain & Supply Chain Management: Definition & flows in a supply chain, Evolution of supply chain-JIT & Quick Response Retailing, Push, Pull and Built-to-order model of supply chains, E-commerce enabled supply chain management using Internet, Intranet & Extranet.

Business Process Management: Concepts of Business Process Management & Business Process Reengineering; Call Centre operations: Purpose & functions, mode of operations, Components (Telephony, Web, Application servers & middle ware, Desktop applications); Customer Relationship Management (CRM).   **[No. of Hrs: 10]**

UNIT – IV

Technology & Legal Issues in E-Commerce: Technological Issues: Availability of telecom infrastructure, interoperability, bandwidth issues, technical standards & spectrum management, Expansion of Internet: 128 bit IP addressing issue; Legal Issues: Uniform Commercial code for E-commerce (**'Model Law on Electronic Commerce'** by United Nations Commission on International Trade Law, IT Act 2000 by Govt of India), Intellectual Property Protection (Copyrights, Patents, Trademarks & Domain Names), Privacy, Security (storage of electronic messages & their evidence value), Customs & Taxation laws, Role of governments & regulatory bodies, Jurisdiction issues.

Applications of E-Commerce & Case Studies: 1. Case studies & applications of e-commerce in Retailing, Banking, Manufacturing, Airlines & Railway reservation & e-governance; 2. Cyber Crimes.   **[No. of Hrs: 10]**

TEXT BOOKS:

[T1] e-commerce: Strategy, Technologies and Applications, David Whiteley, Tata McGraw Hill
[T2] E-Commerce: The Cutting Edge of Business, KK Bajaj & Debjani Nag, McGraw Hill.

REFERENCES:

[R1] The Complete Reference: Internet, Margaret Levine Young, Tata McGraw Hill.
[R2] e-Commerce: Concepts, Models, Strategies, CSV Murthy, Himalayas Publishing House.
[R3] Frontiers of Electronic Commerce, Ravi Kalakota & Andrew B. Wilson, Addison-Wesley (An Imprint of Pearson Education)
[R4] Network Security Essentials: Applications & Standards, William Stallings, Pearson

Paper Code: BMCA603
Paper: INTERNET OF THINGS

1 Introduction: Objective, scope and outcome of the course.

2 Introduction to IoT: Definition and characteristics of IoT, Design of IOT: Physical design of IOT, Logical Design of IOT- Functional Blocks, communication models, communication APIs, IOT enabling Technologies- Wireless Sensor Networks, Cloud computing, big data analytics, embedded systems. IOT Levels and deployment templates. 08

3 IoT Hardware and Software: Sensor and actuator, Humidity sensors, Ultrasonic sensor, Temperature Sensor, Arduino, Raspberry Pi, LiteOS, RIoTOS, Contiki OS, Tiny OS. 07

4 Architecture and Reference Model: Introduction, Reference Model and architecture, Representational State Transfer (REST) architectural style, Uniform Resource Identifiers (URIs). Challenges in IoT- Design challenges, Development challenges, Security challenges, Other challenges. 08

5 IOT and M2M: M2M, Difference and similarities between IOT and M2M, Software defined networks, network function virtualization, difference between SDN and NFV for IoT. 08

6 Case study of IoT Applications: Domain specific IOTs- Home automation, Cities, environment, Energy, Retail, Logistics, Agriculture, Industry, Health and Lifestyles.

Paper Code: BMCA604
Paper: MACHINE LEARNING

Contents	Hours
Introduction: Objective, scope and out come of the course.	**01**
Supervisedlearningalgorithm: Introduction,typesoflearning,application,Supervise dlearning:LinearRegressionModel,NaiveBayesclassifierDecisionTree,Knearestneig hbor,LogisticRegression,SupportVectorMachine,Randomforestalgorithm	**09**
Unsupervised learning algorithm: Grouping unlabelled items using k means clustering, Hierarchical Clustering, Probabilistic clustering, Association rule mining, A priori Algorithm, fp growth algorithm, Gaussian mixture model.	**08**
Introduction to Statistical Learning Theory, Feature extraction - Principalcomponentanalysis,Singularvaluedecomposition.Featureselection– feature ranking and subset selection,filter,wrapper and embedded methods, Evaluating Machine Learning algorithms and Model Selection.	**08**
Semi supervised learning, Reinforcement learning: Markov decision process (MDP), Bellman equations, policy evaluation using Monte Carlo, Policy iteration and Value iteration, Q-Learning, State-Action-Reward-State-Action(SARSA),Model-basedReinforcementLearning.	**08**
Recommendedsystem,Collaborativefiltering,Content-basedfilteringArtificialneuralnetwork,Perceptron,Multilayernetwork,Backpropag ation,IntroductiontoDeeplearning.	**08**
Total	**42**

PRACTICAL . INTERNET OF THINGS BMCA605

List of Experiments
Start Raspberry Pi and try various Linux commands in command terminal window: *ls,cd,touch,mv,rm,man,mkdir,rmdir,tar,gzip,cat,more,less,ps,sudo,cron,chown, chgrp, ping etc.*

Run some python programs on Pi like:

a) Read your name and print Hello message with name

b) Read two numbers and print their sum, difference, product and division.

c) Word and character count of a given string.

d) Area of a given shape(rectangle, triangle and circle)reading shape and appropriate values from standard input.

Run some python programs on Pi like:

a) Print a name 'n'times, where name and n are read from standard input, using for and while loops.

b) Handle Divided by Zero Exception.

c) Printcurrenttimefor10timeswithanintervalof10seconds.

d) Read a file line by line and print the word count of each line.

a) Light an LED through Python program

b) Get input from two switches and switch on corresponding LEDs

c) FlashanLEDatagivenontimeandofftimecycle,wherethetwotimesaretakenfroma
file.

a) Flash an LED based on cron output (acts as an alarm)

b) Switch on a relay at a given time using cron, where the relay's contact terminal sare
Connected to a load.

c) Get the status of a bulb at a remote place (on the LAN) through web.

The student should have h ands 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.

PRACTICALS -MACHINE LEARNING BMCA606

List of Experiments
Implement and demonstrate the FIND- S algorithm for finding the most specific Hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.

Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample
Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate datasets
Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a . CSV file. Compute the accuracy of the classifier, Considering few test datasets.
Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
Apply EM algorithm to cluster a set of data stored in a.CSV file. Use the same dataset for clustering using k-Means algorithm. Compare the results of the set two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
Write a program to implement k-Nearest Neighbour algorithm to classify there is dataset. Print both correct and wrong predictions. Java/Python ML library Classes can be used for this problem.
Implement the non-parametric Locally Weighted Regression algorithm in order To fit data points. Select appropriate data set for your experiment and draw graphs.

Semester-VII

Course Code	Course Title	Type of Paper	Internal Assessment	End Term Exam	Total
BMCA701	Object Oriented Programmingthrough C++ / Java	Theory	20	80	100
BMCA702	Database ManagementSystems	Theory	20	80	100
BMCA703	Web Application Development	Theory	20	80	100
BMCA704	Software Engineering	Theory	20	80	100
BMCA705	Mathematical Foundations ofComputer Science	Theory	20	80	100
BMCA706	Object Oriented ProgrammingLab	Practical	60	40	100
BMCA707	Database ManagementSystems Lab	Practical	60	40	100
BMCA708	Mini Project in Web Design	Practical	60	40	100
BMCA709	Communication & Soft SkillsLab	Practical	60	40	100

Semester VIII

CourseCode	Course Title	Type of Paper	Internal Assessment	End Term Exam	Total
BMCA801	Programming through Python	Theory	20	80	100
BMCA802	Operating Systems	Theory	20	80	100
BMCA803	Data Structures and AlgorithmDesign	Theory	20	80	100
BMCA804	Computer Networks & InternetArchitectures	Theory	20	80	100
BMCA805	Cloud Computing	Theory	20	80	100
BMCA806	Python Programming Lab	Practical	60	40	100
BMCA807	Linux Programming Lab	Practical	60	40	100
BMCA808	Data Structures and AlgorithmDesign Lab	Practical	60	40	100
BMCA809	Human Values& ProfessionalEthics	Practical	60	40	100

Semester IX

CourseCode	Course Title	Type of Paper	Internal Assessment	End Term Exam	Total
BMCA901	Mobile Application Devlopment	Theory	20	80	100
BMCA902	Computer Graphics	Theory	20	80	100
BMCA903	Data Science	Theory	20	80	100
BMCA904	Artificial Intelligence And Machine Leaning	Theory	20	80	100
BMCA905	Information Security	Theory	20	80	100
BMCA906	Mobile Application Devlopment Lab	Practical	60	40	100
BMCA907	Computer Graphics Lab	Practical	60	40	100
BMCA908	Data Science Lab	Practical	60	40	100
BMCA909	Research Paper				100

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Course Code:
Course Code: Computer Fundamentals and Programming in C

Unit	Contents
I	**Introduction to Computers** Introducing and Interacting with Computers, Computer Organization, Number System &Computer codes, Computer Arithmetic, Boolean Algebra and IO Devices.
II	**Introduction to Memory and Languages** Processor And Memory,Types of Storage Devices, Computer Software and types, Basics ofProgramming, Programming Languages. Language Elements, Algorithms and Flowcharts.
III	**Problem Solving with C Programming** History, Execution of C Program, Constants, Variables and Keywords, Data types, Expressions, constants, variables, Operators, Operator Precedence and associativity, data input and output, Formatted Console I/O Functions, Conversion Specifications, assignment statements, conditional statements, Looping Statements, Storage Classes
IV	**Array and Modular Programming** Introduction to Function, Functions with Simple Output Parameters, Passing Values between Functions, Multiple Calls to a Function, Parameter Passing by Value v/s Parameter Passing by Reference, Recursion **Arrays:** Declaring and Referencing Arrays, Array Subscripts, Using for Loops for Sequential Access, Multidimensional Arrays, Passing arrays as arguments
V	**Structures , Unions , Strings and Pointers** Structures & Unions- definition, Processing structures – Passing structures to a function.Pointers: Operations on Pointers – Pointers to Functions, Functions Returning Pointers, Arrays of pointers.String handling

Text Books:
- Peter Norton," Introduction to Computers", 6th Edition,2009.
- YashvantKanetkar,"Let Us C", BPB Publications, 13th edition, 2012.
- S Prasad, K.R Venugopal, "Mastering C", Tata McGraw Hill, 2006.
- E.Balaguruswamy, "Programming in ANSI C", Tata McGraw Hill, 6th edition, 2012.

Reference Books:
- Pradeep K Sinha ,PritiSinha, "Computer Fundamentals", 6th Edition, 2003.
- Bayron Gottfried, "Schaum's Outline of Programming with C", 4th Edition, 2018 (Paper Back).
- Kernighan and Ritchie, "The C Programming Language", Prentice Hall, 2015 (Paper Back).

Contents
Simple C Programs to Learn • Data types & Expressions, Constants & Variables • Operators, Operator Precedence and associativity • Keywords & Identifiers • Storage Classes • Conditional statements • Looping Statements
Array and Modular Programming • Basic Array programs using for loop • User defined functions • Recursion • Programs on Two dimensional Arrays , Passing arrays as arguments
String handling • Programs based on String Functions and Character Operation • Programs based on an array of Pointers to Strings
Structure and Pointers • Programs based on Structures & Unions • Programs based on pointers (arithmetic operations on Pointer, arrays with pointers). • Programs of Pointers to structures and Array of structures

Course Code:

Course Title: Object Oriented Programming through C++ / Java

Unit	Contents
I	Evolution of OOP, OOP Paradigm, advantages of OOP, Comparison between functional programming and OOP Approach, characteristics of object oriented language. Introduction to C++, Identifier and keywords, constants, C++ operators, type conversion, Variable declaration, statements, expressions, input and output.
II	Conditional expression, loop statements, breaking control statements,Classes and objects, constructors and destructors, function and operator overloading, inheritance, Virtual Function, friend function, this pointer, dynamic type information and polymorphism
III	C++ streams, console stream classes, formatted and unformatted console I/O operations, manipulators, File streams, classes file modes file pointers and manipulations file I/O, Exception handling, dynamic memory allocation.
IV	OOP in Java – Characteristics of Java – The Java Environment – Java Source File -Structure – Compilation. Fundamental Programming Structures in Java – Defining classes in Java – constructors, methods -access specifiers – static members -Comments, Data Types, Variables, Operators, Control Flow, Arrays , Packages – JavaDoc comments.
V	Inheritance – Super classes- sub classes, abstract classes and methods- final methods and classes – Interfaces, Exception Handling, Threads, Thread Life-Cycle, Basics of event handling

Text Books:
- K.R.Venugopal, Raj KumarBuyya, "Mastering C++", McGraw-Hill, 2017.
- Rajaram R, Object Oriented Programming and C++", 2nd Edition, New Age International, 2013.
- Herbert Schildt, "Java: The Complete Reference", 11th Edition, McGraw-Hill, 2019.
- E. Balagurusamy, "Programming with Java: A Primer", 6th Edition, Tata McGraw-Hill, 2019.

Reference Books:
- John R. Hubbard, AtulKahate , "Programming with C++", TMH, 2017.
- SouravSahay, "Object Oriented Programming with C++", 2nd Edition, Oxford University Press, 2012

Course Title: Database Management Systems

Unit	Contents
I	**Introduction:** Overview of DBMS, Advantages of DBMS, Basic DBMS terminology, Database System v/s File System, Data Independence, Architecture of DBMS, Introduction to data models: Relational Model, Network Model, Hierarchical Model, Entity-Relationship Model.
II	**Data modeling using the Entity Relationship Model:** ER model concepts, Types of Relationships, notation for ER diagram, Reduction of ER-Diagrams to Relational Model, mapping constraints, Generalization, Aggregation, Specialization, Extended ER model, relationships of higher degree.
III	**Relational model:** Storage Organizations for Relations, Relational Algebra, Set Operations,Relational Calculus, Concepts of Alternate key, Candidate key, Primary key, Foreign key, Integrity Rules, Data Dictionary.
IV	**Normalization:** Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependencies, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design. Transactions: Transaction Concept, State, ACID properties, basic understanding of Concurrency & Recovery.
V	**Introduction to SQL:** Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL commands: DDL, DML, TCL, DCL, SQL operators, Tables, Views and Indexes, Constraints, Group By and Having Clause, Order By Clause, Queries and sub queries, Aggregate Functions, Numeric Functions, String Functions, Date & Time Functions, Insert, Update and Delete operations, Unions, Intersection, Minus, Joins: Equi-Join, Natural Join, Self Join, Inner Join, Outer Join.

Text Books:
- Elmasri, Navathe, "Fundamentals of Database Systems", Addison Wesley, 7th Edition, 2016.
- Korth, Silberschatz, Sudarshan, "Database Concepts", McGraw Hill, 6th Edition, 2010.

Reference Books:
- Thomas Connolly and Carolyn Begg, "Database Systems: A Practical Approach to Design,Implementation, and Management, Addison Wesley, 6th Edition, 2014.
- Ramakrishnan, Gehrke, "Database Management System", McGraw Hill, 3rd Edition, Jan 2007
- Date C J, "An Introduction to Database System", Addision Wesley, 8th Edition 2003
- Bipin C. Desai, "An Introduction to Database Systems", Galgotia Publication, Revised Edition,2010
- Majumdar& Bhattacharya, "Database Management System", TMH, 2005.
- Paul Beynon Davies, "Database Systems", Palgrave Macmillan, 3rd Edition, 2003

Course Code:

Course Title: Web Application Development

Unit	Contents
I	**HTML:**Internet standards, WWW Architecture, Generation of dynamic web pages, Generation of static webpages using HTML, Elements of HTML syntax, Head and Body sections, Building HTML documents, Inserting text, images, hyperlinks, Backgrounds and Color Control, meta tags, ordered and unordered lists, Table Handling: Table layout & presentation, constructingtables in a web page, Frames: Developing Web pages using frames, IFrames. Forms and its elements, special tags.
II	**Cascading Style Sheet (CSS):** Introduction to CSS, Basic syntax and structure, Inline Styles, Embedding Style Sheets, Linking External Style Sheets, Backgrounds, Manipulating text, Margins and Padding, Border, Positioning using CSS, Selectors, Tag selectors, class selectors, ID Selector, Styling Groups within tags, Formatting Tables and Forms, CSS3 Specific Properties: Alpha Color Space, Opacity, Box Shadow & Border Radius.
III	**JavaScript:** JavaScript Variables and Data Types, Statement and Operators, Control Structure, Functions, Executing deferred scripts, Objects, Messaging in a JavaScript, Dialog Boxes, Alert Boxes, Confirm Boxes, Prompt Boxes, JavaScript with HTML, Events, Events Handlers, Forms, Forms array, Forms Handling and Validations.
IV	**Ajax and jQuery:** Introduction to Ajax, Cross-Browser DOM, Advantages and Disadvantages, Ajax the jQuery way: using load, post, get functions, jQuery: jQuery Basics, Selecting Element with jQuery, Managing Events, Hiding and Showing Elements, Toggling visibility using jQuery.
V	**PHP:** Introduction, How web works, setting up the environment (XAMPP Server), Programming Basics, Print/echo, Variables and Constants, Strings and Arrays, Operators, Control Structures and Looping Structures, Functions, Embedding PHP with HTML, Establishing connectivity with MySQL database, **WordPress:** Introduction & Installations

Text Books:
- Harvey & Paul Deitel& Associates, Harvey Deitel and Abbey Deitel, "Internet and World WideWeb - How To Program", Fifth Edition, Pearson Education, 2011.
- Achyut S Godbole and AtulKahate, "Web Technologies", Second Edition, Tata McGraw Hill,2012.
- PHP and MySQL Web Development (Developer's Library) 5th Edition, Luke Welling Laura Thomson,2016
- Anthony T. Holdener III, Ajax: The Definitive Guide, O'Reilly Media, First edition, 2008.Mike McGrath, "PHP & MySQL in easy Steps", Tata McGraw Hill, 2012.

Reference Books:
- Thomas A Powell, Fritz Schneider, "JavaScript: The Complete Reference", Third Edition, TataMcGraw Hill, 2013.
- David Flanagan, "JavaScript: The Definitive Guide, Sixth Edition", O'Reilly Media, 2011
- Steven Holzner, "The Complete Reference - PHP", Tata McGraw Hill, 2008
- David Sawyer McFarland, CSS3- The Missing Manual, O'Reilly Media, Third Edition, 2013
- David Sklar and Adam Trachtenberg, PHP Cookbook, Third Edition, O'Reilly Media, 2014.

Course Code

Title: Software Engineering

Unit	Contents
I	**Introduction to Software and Software Engineering** Software: A Crisis on the Horizon and Software Myths, Software Engineering: A Layered Technology, Software Process Models, The Linear Sequential Model, The Prototyping Model,The RAD Model, Evolutionary Process Models, Agile Process Model, Component-Based Development.
II	**Software Project Requirement Analysis and Specification** Software Metrics (Process, Product and Project Metrics), Software Project Estimations, Software Project Planning, Project Scheduling & Tracking, Basic idea of behavioral modeling in UML. State diagrams, Interaction diagrams, Use case diagrams. Understanding the Requirement, Requirement Modeling, Requirement Specification (SRS), Requirement Analysis and Requirement Elicitation.
III	**Project Planning & Scheduling** Size Estimation, Cost Estimation, Models, Static, single variable models, Static, MultivariableModels, COCOMO, Risk Identification and Projection: Project scheduling and Tracking. Object- oriented concepts and principles.software risks, Risk identification, Risk projection, risk refinement, risk mitigation, monitoring and management.
IV	**Software Design & Quality Management** Design Concepts and Design Principal, Design Documentation, Design Methods: Data Design, Architectural Design, Interface Design, Component Level Design ,User Interface Design, Web Application Design. **Quality Planning**: Quality Concepts, Procedural Approach to Quality Management, Software Quality assurances, software reviews, formal technical reviews, Formal approaches to SQA, Statistical Software Quality assurances.
V	**Software Testing** Fundamentals, White Box Testing, Black Box Testing, software testing strategies, verification and Validation, System Testing, Unit testing, Integration testing and Debugging. **Software Maintenance and Configuration Management:** Types of Software Maintenance, Re- Engineering, Reverse Engineering, Forward Engineering, The SCM Process, Identification of Objects in the Software Configuration, Risk-Related Monitoring.

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Text Books:
- Roger S Pressman, Bruce R Maxim, "Software Engineering: A Practitioner's Approach", 8th edition,Tata McGraw Hill, 2014.
- Ian Sommerville, "Software engineering", 9th edition, Addison Wesley Longman, 2014.
- James Rumbaugh. MichealBlaha, "Object oriented Modeling and Design with UML", 2nd Edition,2007.

Reference Books:
- Simon Bennett, Steve McRobb and Ray Farmer, " Object-Oriented Systems Analysis and DesignUsing UML" 4thEdition,McGraw Hill Education, 2010
- Charles Ritcher, "Designing Flexible Object Oriented systems with UML", Tech Media, 2008.
- Grady Booch, James Rumbaugh, IvarJacobson., "The Unified Modeling Language User Guide", 2ndEdition, Pearson, 2007.

Course Code:

Course Title: OOPS Lab

LIST OF EXPERIMENTS:
C++: 1. program using functions • functions with default arguments • implementation of call by value, address, reference 2. simple classes for understanding objects, member functions & constructors • classes with primitive data members, • classes with arrays as data members • classes with pointers as data members • classes with constant data members • classes with static member functions 3. compile time polymorphism • operator overloading • function overloading 4. run time polymorphism • inheritance • virtual functions • virtual base classes • templates 5. file handling • sequential access • random access
JAVA: 6. simple java applications • for understanding references to an instant of a class • handling strings in JAVA 7. simple package creation • developing user defined packages in java 8. interfaces • developing user defined interfaces • use predefined interfaces 9. threading • creation of threading in java applications • multi-threading 10. exception handling mechanism in java • handling predefined exceptions • handling user defined exceptions

Course Code:

Course Title: DBMS LAB

Contents
1. SQL data types, Operators, Literals, Constraints
2. DDL Commands: Create Tables/Create Synonym /Create index /Views / Alter / Drop/Truncate/Comment/Rename/DBCC (Database Console Commands)
3. DML Commands: Insert / Update / Delete / Merge/Lock Table
4. TCL Commands: Commit / Rollback / Save-Points /Set Transaction
5. DCL Commands: Grant / Revoke/Deny
6. Simple Queries: Select / From / Where
7. Group By/Having Clause/ Order By clause
8. SQL Operators: Arithmetic / Logical /In / Like / Between
9. Functions: Aggregate / Numeric / String / Date & Time / Logical
10. Joins: Equi-Join / Natural Join / Self Join / Inner Join / Outer Join
11. Unions / Intersection / Minus
12. Subqueries or Nested Queries
13. PL/Sql : Basic/Cursor/Trigger

Course Title: Mini Project in Web Design

Project Evaluation:
Continuous Assessment Evaluation for Mini Project:
- Regularity
- Software Design Specification
- Midterm Assessment Presentation (to be filled in by the Project Guide)

Semester End Evaluation for the Mini Project:
- Project Demo
- Project Presentation
- Project Report
- Viva-voce
- Adherence to Specifications
- System Knowledge and Understanding
- Innovation and Originality

General instructions for preparation of project report

 1. Introduction
Cover Page
Title Page
Certificate
Acknowledgement
Table of Contents

 2. Project Specifications
Project Overview
       Project Need

 3. Specific Requirements
External Interface Requirements
       Hardware Interfaces
       Software Interfaces
       Communications Protocols
       Security / Maintainability / Performance

 4. Software Product
       Features
System Architecture
       Database Requirements
       ER Diagram
       Data Flow Diagram
       User Interfaces
       Report Formats

 5. Drawbacks and Limitations
 6. Proposed Enhancements
 7. Conclusion
 8. Bibliography
 9. Annexure:
User Interface Screens (Optional)

Output Reports with Data (if any)
Program Code

Course Code:

Course Title: Communication and Soft Skills Lab

Contents
Verbal & Non-verbal Communication Listening, Speaking, Reading and Writing. Verbal and Non-verbal Communication. Intra, inter- personal and group communication skills. Gestures, postures, Proxemics, Kinesics. Listening toLectures, Discussions, Talk Shows, News Programs.
Writing Skills Formal & Informal writings, report writing, creative writing. Composition, Resume Writing, Coverletters, Business Letter Writing, Persuasive Letters, Job Applications and Official Correspondence, E- Mail etiquette, Precise writing.
Presentation Skills Elements of effective presentation, structure of presentation, external factors and content.Debates, Seminar, Speeches, Lectures, Interviews, Mock Interviews, Commonly asked questions in interviews.
Group Discussion Structure of GD, Moderator led and other GDs, Strategies in GD, Team work body language, Mock GD, Problem solving, Reflective thinking, Critical thinking, Negotiation skills.
Career Skills SWOT Analysis, IQ, EQ and SQ, Art of giving feedback, Decision making, Time Management,Team Management and Leadership Skills, 8 habits of successful people.

Course Title: Programming through Python

Unit	Contents
I	**Introduction and overview** Introduction to Python, Origin, Comparison, Comments, Operators, Variables, Classes, ModulesSyntax and Style Statements, Variable Assignment, Identifiers, Basic Style Guidelines, Memory Management,
II	**Python Objects** Python Objects, Standard Types, Other Built-in Types, Internal Types, Standard Type Operators, Standard Type Built-in Functions, Categorizing the Standard Types, Unsupported Types.Numbersand Strings. Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions. Sequences: Strings, Lists, and Tuples, Sequences, Strings, Strings and Operators, String-only Operators, Built-in Functions, String Built-in Methods, Special Features of Strings
III	**Lists and Dictionaries** Operators, Built-in Functions, List Type Built-in Methods, Special Features of Lists, Tuples, Tuple Operators and Built-in Functions, Special Features of Tuples Introduction to Dictionaries, Operators, Built-in Functions, Built-in Methods, Dictionary Keys, Conditionals and Loops: if statement, else Statement, while Statement, for Statement, break Statement, continue Statement, pass Statement, else Statement
IV	**Files, Regular Expression and Exception Handling** File Objects, File Built-in Function, File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, Persistent Storage Modules. Regular Expression: Introduction/Motivation, Special Symbols and Characters for REs, REs and Python. What Are Exceptions? Exceptions in Python, Detecting and Handling Exceptions, Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions
V	**Database Interaction** SQL Database connection using python, creating and searching tables, Reading and storing config information on database, Programming using database connections, Python Multithreading: Understanding threads, Forking threads, synchronizing the threads, Programming using multithreading

Text Books:
- Core Python Programming, R. NageswaraRao, Dreamtech Press, Second Edition, 2018
- Python Programming, Dr. M. Suresh Anand, Dr. R. Jothikumar, Dr. N. Vadivelan, Notion Press, FirstEdition, 2020
- The Complete Reference Python, Martin C. Brown, McGraw Hill Education, Fourth Edition, 2018

References:
- Think Python, Allen B. Downey, O'Reilly Media, 2016
- Programming and Problem Solving with Python, Amit Ashok Kamthane, Ashok NamdevKamthane,McGraw Hill HED, First Edition, 2017
- Advanced Python Programming, SakisKasampalis, Quan Nguyen,Dr Gabriele Lanaro, Ingram shorttitle, 2019

Course Code
Course
Title: Operating Systems

Unit	Contents
I	**Introduction to Operating System & Process Management**: Definition and types of operating systems,Operating system components and services, System calls. Process and Thread Management: Process concept, Process scheduling, operations on processes, Threads, Inter-process communication, CPU scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Real-time scheduling and evaluation.
II	**Memory Management**: Swapping, Contiguous Allocation, Paging, Segmentation with paging virtual Memory, Demand paging , Page replacement algorithms, Allocation of frames, Thrashing, Page Size and other considerations, Demand segmentation, File systems, secondary Storage Structure, File concept, access methods, directory implementation, Efficiency and performance, recovery.
III	**Concurrency Control**: The Critical-Section problem, Semaphores, Classical problems of synchronization, Critical regions, Monitors, Dining philosopher and producer consumer problem using semaphores or monitors. Deadlocks-System model, Characterization, Deadlock prevention, Avoidance and Detection, Banker's Algorithm.
IV	**Disk Management:** Disk structure, Disk scheduling methods, Disk management, Recovery, Disk structure, Disk scheduling methods, Disk management, Swap-Space management. Protection and Security-Goals of protection. **UNIX/LINUX Operating System:** Introduction, Features of UNIX/LINUX operating system, Structure: Kernel and Shell, Basic commands, Accessing help options, Filenames and using wild cards, Types of files, File systems: four block of file systems, directory hierarchy, Operations and utilities for directory and files. User & Group file access permissions.
V	**Shell Programming**: Introduction to vi and Emacs editor. Basic of shell programming, meta characters, shell variable: predefined variables and user defined variable, storing value in variable and accessing it, unsetting variables, storing filenames, content and command in variable, Input: reading word by word, line by line and from file, Expression, Decisions and repetition, Special parameters and variables, shell programming in bash, read command, conditional and looping statements, case statements, changing positional parameters and argument validation, string manipulation. **Simple filter commands** – pr, head, tail, cut, paste, sort, uniq, tr, Regular expressions: atoms and operators, grep.

Text Books:
- Silberschatz and Galvin, "Operating System Concepts", 10th edition, Wiley India, 2018.
- Andrew S. Tanenbaum, Albert S. Woodhull, "Operating Systems Design & implementation", 3rdedition, Pearson Education, 2006.
- Sumitabha Das, "UNIX – Concepts & Applications", Tata McGraw Hill Publications, 4th edition,2006.
- Graham Glass & King Ables, "Linux for programmers and users", Pearson Education India, 3rd
  edition, 2006.

Reference Books:
- William Stallings, "Operating Systems Internals and Design Principles", 5th edition, PrenticeHall, 2000.
- Fadi P. Deek, James A. M. McHugh, "Open Source Technology and Policy", Cambridge University Press, 1st edition, 2008.
- Forouzan B. A., Gilberg R. R., "UNIX and Shell Programming", TMH, 2nd edition, 2008.

Course Code:
Course Title: Data Structure and Algorithm Design

Unit	Contents
I	**Introduction** - algorithm definition and specification – Design of Algorithms, and Analysis ofAlgorithms, Asymptotic Notations. **Linked lists** – Searching, Insertion, Deletion, Sorted Linked List, Circular List, Two wayList.
II	**Stacks** – Array representation & Implementation, Operations on Stacks: Push & Pop, Linked representation of stack, Conversion of infix to prefix and postfix expressions, Evaluation of postfix expression using stack, **Queues** - Array and linked representation and implementation, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, **Searching:** Linear and Binary Search Methods **Sorting:** Bubble Sort, Selection Sort, Insertion Sort
III	**Trees:** Binary tree, Terminology & Representation, Binary Search Trees (BST)-Insertion andDeletion **Graphs:** Terminology & Representations, Graphs & Multi-graphs, Directed Graphs, ElementaryGraph algorithms, Representation of Graphs, BFS, DFS. **Divide and Conquer Method:**Merge Sort, Quick Sort
IV	**The Greedy Method:-** Knapsack Problem, Minimum Cost Spanning Tree, Single SourceShortest Path **Dynamic Programming**: Multistage Graphs, All Pair Shortest Path, Optimal Binary SearchTrees , 0/1 Knapsack Problem, Traveling Salesman Problem
V	**Backtracking:-** general method – 8-Queens Problem, Sum of Subsets, Hamiltonian Cycles **Branch and Bound :-** The Method– Knapsack Problem

Text Books:
- AnanyLevitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, PearsonEducation, 2012.
- Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction toAlgorithms", Third Edition, PHI Course Private Limited, 2012.
- Thomas H Coremen, Charles E Leiserson, Ronald L Rivest, Clifford Stein, "Introduction toAlgorithms", Mc-Graw Hill, 2006
- D.S Malik, "Data Structures using C++", Cengage Learning, 2nd edition, 2009
- A. Tannenbaum, "Data Structure Using C", Pearson Education, 2019.

Reference Books:
- Donald E. Knuth, "The Art of Computer Programming", Volumes 1& 3 Pearson Education,2009.
- Steven S. Skiena, "The Algorithm Design Manual", Second Edition, Springer, 2008.
- E. Horowitz &Sahni, "Fundamental Data Structure", Galgotia Book Source, 1983.

Course Title: Computer Networks & Internet Architectures

Unit	Contents
I	Introduction:Overview of Computer Networks, Categories of Computer Networks, PhysicalTopologies, SevenLayerArchitecture, TCP/IP Protocol Suite, Network Models. Transmission media: Fiber Optics; Wireless Transmission:Radio, Microwave, Infrared, Millimeter Waves, Light wave; Satellite; Mobile Telephone System
II	Data link layer: Multiple Access and LAN Technologies: Random Access, ALOHA,CSMA,CSMA/CD,CSMA/CA, Ethernet, IEEE Standards, IEEE802.11:Architecture, MAC Sublayer. Wireless LANs, Broadband Wireless, Bluetooth, Bridges. Network Layer:Routing: Broadcast, Multicast, Routing for Mobile Hosts, AdHoc Networks;Congestion;Quality of Service.IP Addressing: Network layer level protocols:IPv4,IPv6.
III	Advanced Internet working and Routing:CircuitSwitching, PacketSwitching,Routing Protocols, Address Mapping:ARP,RARP,ICMP,IGMP.TransportLayer: User Data gramProtocol(UDP),TransmissionControlProtocol(TCP),WirelessTCPandUDP.Congestio nCo ntrol,Quality of Service(QOS),Integrated Services.
IV	Network Applications: Electronic Mail Representation and Transfer, World Wide Web; Multimedia: Digital Audio; Audio Compression; Streaming IP Telephony (VoIP),VideoCompression; Video on Demand; Multicast Backbone; File Transfer and Remote File Access,Network Management (SNMP).
V	Internet Architectures-Flow of traffic and routing behavior within Internet, Application of Qosmodels, application of new resilient designs. Understanding of control and data planes in high end Internet core routers, CEF, hardware packet flows. MPLS, labels, label stacking, packet analysis, RSVP, label allocation, distribution models. MPLS-VPNs-Detailed understanding of MPLS L3 VPNS, routing model employed, forwarding of mplsvpn packets, VRF tables, application scenarios

Text Books:

1. Forouzan, B.A, 2009, Data Communications and Networking, 4thEdition, Tata McGrawHill Education.
2. Tanenbaum, A.S , 2010,ComputerNetworks, 3rd Edition, Pearson Education.
3. Douglas E. Comer, Internet Workingwith TCP/IP Volume –I,Fifth Edition, PrenticeHall,2008.
4. W. Richard Stevens, Bill Fenner and Andrew M.Rudoff, Unix Network Programming, Vol.1:The Sockets Networking API, Third Edition, Addison-Wesley Professional, 2003.

Course Code:

Course Title: Cloud
Computing

Unit	Contents
I	**Introduction of Cloud Computing**: Nutshell of cloud computing, Enabling Technology, Vision, feature Characteristics and components of Cloud Computing. Challenges, Risks and Approaches of Migration into Cloud. , Layer and Types of Clouds, Services models, Cloud Reference Model.
II	**Cloud Computing Architecture:** Data center Design and interconnection Network, Architectural design of Compute and Storage Clouds. Cloud Programming and Software: Features of cloud programming, Parallel and distributed programming paradigms- MapReduce, Hadoop , High level Language for Cloud. Service Oriented Architecture – REST and Systems of Systems – Web Services – Publish Subscribe Model
III	**Virtualization Technology**: Definition, Understanding and Benefits of Virtualization. Implementation Level of Virtualization, Virtualization Structure/Tools and Mechanisms, Hypervisor VMware, KVM, Xen. Virtualization: of CPU, Memory, I/O Devices, Virtual Cluster and Resources Management, Virtualization of Server , Desktop, Network, and Virtualization of data-center.
IV	**Securing the Cloud**: Cloud Information security fundamentals, Cloud security services, Design principles, Policy Implementation, Cloud Computing Security Challenges, Cloud Computing Security Architecture. Legal issues in cloud Computing. Data Security in Cloud: Risk Mitigation , Understanding and Identification of Threats in Cloud, SLA-Service Level Agreements, Trust Management
V	**Cloud Platforms in Industry**: Amazon web services, Google AppEngine, Microsoft Azure Design, Aneka: Cloud Application Platform -Integration of Private and Public Clouds Cloud applications: Protein structure prediction, Data Analysis, Satellite Image Processing, CRM and ERP, Social networking. Cloud Application- Scientific Application, Business Application.

Text Books:
- Cloud Computing ,Principle and Paradigms, Edited By RajkumarBuyya, JemesBroberg, A. Goscinski, Pub.- Wiley-2016
- Kumar Saurabh, "Cloud Computing" , Wiley Pub 2016
- Distributed and Cloud Computing, Kai Hawang , GeofreyC.Fox, Jack J. Dongarra Pub: Elservier,2013

Reference Books:
- Krutz , Vines, "Cloud Security " , Wiley Pub,2010
- Velte, "Cloud Computing- A Practical Approach" ,TMH Pub,2009
- Katarina Stanoevska-Slabeva, Thomas Wozniak, SantiRistol, "Grid and Cloud Computing – ABusiness Perspective on Technology and Applications", Springer,2010

Course Code:

Course Title: Python Programming Lab

Sr. No.	Contents
1	Installation of Python, and learning interactively at command prompt and writingsimple programs.
2	Learning the conditions and iterations in Python by writing and running simpleprograms.
3	Random number generations, and problems based on random numbers.
4	Handling tuples and exercises based on tuples.
5	Functions and files
6	Linear and binary search
7	Handling tokens
8	Finding unique, and duplicate items of a list.
9	Matrix addition, multiplications, and unity matrix.
10	Text processing using python
11.	Programs related to python libraries like Numpy, Pandas, Scipy etc.

Course Code:

CourseTitle: Linux Programming

Lab

Contents
Compilation and Execution of C Programs through Linux/UNIX

Shell Programs:

1. Implementation of Shell Programming Concepts:
    - Shell programming in bash
    - Shell Variables Input concepts
    - Expression
    - Decisions and repetition
    - Special parameters and variables
    - Command line arguments
    - Case statements
    - Changing positional parameters and argument validation
    - String manipulation
    - File Operations
    - Base conversion
2. User defined functions.

Administration:
1. Installing Linux through bootable media/ through NFS
2. Creating & Managing User Accounts
3. Creating & Managing Groups.

Course Code:
Course Title: Data Structure and Algorithm Design Lab

Contents

1. Linear search & binary search , Sorting Techniques
2. Stacks and queues operations (with arrays and pointers)
3. Link List and Trees operations (with arrays and pointers)
4. graphs – basic traversal and search techniques
5. Greedy method:-knapsack problem
6. Greedy method minimum cost spanning tree
7. Dynamic Programming – 0/1 Knapsack
8. Dynamic Programming – traveling salesman problem
9. Backtracking 8-Queens problem
10. Backtracking Sum of Subsets
11. Branch and Bound -0/1 Knapsack problem
12. Sequential and Dynamic Implementations

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Course Code:

Course Title: Human Values & Professional Ethics

Need, Basic Guidelines, Content And Process For Value Education:

Understanding the need, basic guidelines, Self Exploration-its content and process; 'Natural Acceptance' and Experiential Validation, Continuous Happiness and Prosperity-Human Aspirations, Right understanding, Relationship and Physical Facilities, Understanding Happiness and Prosperity correctly-Acriticalappraisalofthecurrentscenario.Methodtofulfilltheabov human aspirations: understand in gland living in harm on yet various levels

Understanding Harmony in the Human Being- Harmony in Myself:

Understanding human being as ace-existence of the sent isn't 'I 'and thematerial'Body' Understanding the needs of Self ('I') and 'Body'-Sukh and Suvidha Understanding the Body as an instrument of 'I', Understanding the characteristics and activities of 'I'and harmony in 'I' Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya.

Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship:

Understanding harmony in the Family, Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect(Samman),meaning of Vishwas; Difference between in tention and competence, meaning of Samman, Difference between respect and differentiation; the other salient value sin relationship, harmony in the society,Samadhan,Samridhi,Abhay,Sah-astitva as comprehensive Human Goals,Visualizing a universal harmonious order in society-Undivided Society (AkhandSamaj),Universal Order(SarvabhaumVyawastha)-from family to world family.

Understanding Harmony in the Nature and Existence- Whole Existence as Coexistence:
Understanding the harmony in the Nature. Inter connectedness and mutual fulfillment among thefour order so fnature-recyclability and self-regulation in nature. Understanding Existenceas Co-xistence (Sah-astitva) of mutually in teracting units in all pervasive Space. Holistic perception ofharmony at all levels of existence

Implications of the Above Holistic Understanding of Harmony on Professional Ethics – Natural Acceptance of Human Values:

Definitiveness of Ethical Human Conduct. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in Professional Ethics: a)Ability to utilize the professional competence for augmenting universal human order,b)Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models. Strategy for transition from the present state to Universal Human Order: At the level of individual: as socially and ecologically responsible engineers, technologists and managers. Case studies related to values in professional life and individual life.

SuggestedReadings:

1. R.R.Gaur, RSangal, GP Bagaria, A Foundation Course in Human Values and ProfessionalEthics, Excel Books, 2009.ISBN: 978-9-350-62091-5
2. R. Subramanian, Professional Ethics includes Human Values, Oxford Univ. Press.
3. A. N. Tripathy, 2003, Human Values, New Age International Publishers.
4. MGovindrajran, SNatrajan & V.S.Senthil Kumar,Engineering Ethics (includingHumanValues), Eastern Economy Edition, Prentice Hall of India Ltd.
5. BP Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
6. BL Bajpai, 2004, Indian Ethos and Modern Management, New Royal BookCo., Lucknow. Reprinted 2008.

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MCA :Mobile Application Development

Unit-1
INTRODUCTION
Introduction to mobile applications, Market and business drivers for mobile applications, Difficulties in Mobile Development, Mobile Myths, When to Create an App, Types of Mobile App. Design Constraints for mobile applications, both hardware and software related, Architecting mobile applications, user interfaces for mobile applications, touch events and gestures.
Unit-2
ADVANCED DESIGN
Designing applications with multimedia and web access capabilities. Integration with GPS and social media networking applications, Accessing applications hosted in a cloud computing environment, Design patterns for mobile applications, Understanding Application users, Information Design, Achieving quality constraints.
Unit-3
TECHNOLOGY I ANDROID
Establishing the development environment   Android architecture Android ApplicationStructure, Emulator, Android virtual device, UI design, Fragments, Activity, Services, broadcast receiver, Intents/Filters, Content provider-SQLite Programming, SQLITEopen, Helper, SQlite Database, Interaction with server side applications
Unit-4
Advanced ANDROID
Using Google Maps, GPS and Wi-Fi Integration, Android Notification, Audio Manager,Bluetooth, Camera and Sensor Integration, Sending SMS, Phone Calls, Publishing Android Application.Introduction to KOTLIN
Unit-5
TECHNOLOGY II IOS
Introduction to Objective C iOS features UI implementation Touch frameworks Data persistence using Core Data and SQLite, Action and Outlets, Delegates and Storyboard, Location aware applications using Core Location and Map Kit, Integrating calendar and address book with social media application Using Wifi iPhone marketplace.
Text Books: RetoMeier , "Professional Android app development", Wiley, 2019. Matt Neuburg, "IOS 13 Programming Fundamentals with Swift: Swift, Xcode, and Cocoa Basics", O'Reilly, 2019. Michael Dippery, "Professional Swift", Wiley, 2015. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012. Charlie Collins, Michael Galpin and Matthias Kappler, "Android in Practice", DreamTech, 2012.
Reference Books: Reto Meier, Ian Lake,"Professional Android, 4th Edition", Wiley, 2018. Neil Smyth "Android studio 2.2 Development Essentials 7th Edition" Payload Media 2017.Murat Yener, OnurDundar, "Expert Android Studio", Wiley, 2016. Jerome Dimarzio "Beginning Android Programming with Android Studio" Wiley Publication, 2016. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, "Beginning iOS 6 Development: Exploringthe iOS SDK", Apress, 2013. James Dovey and Ash Furrow, "Beginning Objective C", Apress, 2012. Paul Deitel, Harvey Deitel, Abbey Deitel and Michel Morgano, "Android for Programmers an App-DrivenApproach", Pearson, 2012.

Introduction: Elements of graphics workstation. Video Display Devices.Raster Scan Systems. Random Scan systems. Input devices. Graphics Software Coordinate Representations, Fundamental Problems in Geometry.

Algorithms: Line drawing algorithms- DDA Algorithm. Bresenham's Line Algorithm. Frame buffers. Circle and Eclipse generating algorithms. Midpoint Circle Algorithm. Sean-line polygon fill algorithm. Inside-Outside tests. Sean- Line fill of curved Boundary Areas. Boundary fill Algorithm. Flood fill Algorithm. Character generation. Attributes of lines, curves, filling, characters. etc.

Graphics Primitives: Primitive Operations, The display file interpreter-Normalized Device Coordinates. Display- File structure. Display – file algorithm. Display control and Polygons-polygon representation.

Attributes of output primitives: Line attributes - Line type. Line width. Pen and Brush options.Line Color. Color and gray scale levels. Color-tables. Gray scale. Area- Fill Attributes- Fill styles. Pattern fill. Soft fill. Character Attributes. Text attributes.

Geometric Transformations: Matrices. Scaling Transformations. Sin and Cos Rotation. Homogeneous Co-ordinates and Translation. Co-ordinate Translations. Rotation about an arbitrary point. Inverse Transformations, Transformations Routines.

2-D Viewing- The viewing pipeline. Viewing co-ordinate, Reference Frame. Windows to view ports . co-ordinate transformation 2-D Viewing functions. Clipping operations point clipping. Line clipping. Cohen- Sutherland. Line Clipping. Polygon clipping. Sutherland Hodge man clipping.

Display Methods concepts Three dimensional Parallel projection. Perspective projection. Visible line and surface identification. Surface rendering. Three Dimensional Object representations. Bezier curves and surfaces. B-Spline curves and surfaces.

Visibility , Image and object precision Z- buffer algorithm. Floating horizons.

Computer Animation: Design of Animation Sequences. General Computer Animation Functions-Raster Animations. Key Frame Systems. Morphing Simulating Accelerations. Motion Specifications. Kinematics and Dynamics.

Text/References:

1. J. Foley, A. Van Dam, S. Feiner, J. Hughes: Computer Graphics- Principles andPractice, Pearson

2. Hearn and Baker: Computer Graphics, PHI.

CONTENTS
Unit-1
General Issues and overview of AI Concept of AI, AI technique, Characteristics of AI applications Problem Solving, Search and Control Strategies General Problem solving, Production systems, and Control strategies, forward and backward chaining Exhaustive searches: Depth first and Breadth first search.
Unit-2
Heuristic Search Techniques Hill climbing, Branch and Bound technique, Best first search and A* algorithm, AND/OR Graphs,Problem reduction and AO* algorithm, Constraint Satisfaction problems, Game Playing Min Max Search procedure.
Unit-3
Knowledge Representation First Order Predicate Calculus, Resolution Principle and Unification, Inference Mechanisms Horn'sClauses, Semantic Networks, Frame Systems , Scripts, ConceptualDependency AI Programming Languages.
Unit-4
Natural Language Processing: Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM – RegularExpressions, Finite-State Automata – English Morphology, Tokenization, Part-of- Speech Tagging, Issues in Part-of-Speech tagging.Semantics and pragmatics-Requirements for representation, Syntax-Driven Semantic analysis, Introduction to syntactic analysis.
Unit-5
Expert Systems Introduction to Expert Systems, Architecture of Expert Systems, Expert System Shells,Knowledge Acquisition, Case Studies of Expert System. **Learning**: Concept of learning, Types of learning.
Text Books: 1. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill, 3 rd edition, 2009. 2. Dan W. Patterson, "Introduction to Artificial Intelligence and Expert Systems", Prentice Hall of India, 1st edition, 1997. 3. Winston, Patrick, Henry, "Artificial Intelligence", Pearson Education, 3 rd edition, 2004 4. SubhasreeBhattacharjee, "Artificial Intelligence for Student" Shroff Publishers and DistributorsPvt.LTD., 1 st Edition, 2016
ReferenceBooks: 1. Nils J. Nilsson, "Principles of Artificial Intelligence (Symbolic Computation / Artificial Intelligence)",reprint edition, 2014. 2. Stuart Russell, Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education, 3 rdedition, 2010. 3. Daniel Jurafsky, James H. Martin Speech and Language Processing: An Introduction to Natural LanguageProcessing, Computational Linguistics and Speech, Pearson Publication, 2014.

CONTENTS
Unit-1
Introduction to Information Security : Attacks, Vulnerability, Security Goals, Security Services and mechanisms. Conventional substitution and transposition ciphers, One-time Pad, Block cipher and Stream Cipher, Steganography. Classical Encryption Techniques.
Unit-2
Symmetric and Asymmetric Cryptographic Techniques: DES, AES, RSA algorithms. Hash Functions Message Authentication & Hash Functions: Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions, Birthday Attacks, Security Of Hash Function & MACS, MD5 Message Digest Algorithm, Secure Hash Algorithm (SHA), Digital Signatures: Digital Signatures, Authentication Protocol, Digital Signature Standard (DSS), Proof Of Digital Signature Algorithm.
Unit-3
Program Security : Nonmalicious Program errors – Buffer overflow, Incomplete mediation, Time-of-check to Time-of- use Errors, Viruses, Trapdoors, Salami attack, Man-in-the- middle attacks, Covert channels.
Unit-4
Security in Networks : Threats in networks, Network Security Controls – Architecture, Encryption, Content Integrity, Strong Authentication, Access Controls, Wireless Security, Honeypots, Traffic flow security, Firewalls – Design and Types of Firewalls, Personal Firewalls, IDS, Email Security – PGP,S/MIME
Unit-5
Administering Security: Security Planning, Risk Analysis, Organizational Security policies. Legal Privacy and Ethical Issues in Computer Security: Protecting Programs and data, Information and the law, Rights of Employees and Employers, Software failures, Computer Crime, Ethical issues in Computer Security, case studies of Ethics.

Text Books:

- William Stallings, Network Security Essentials: Applications and Standards, Prentice Hall, 4th edition,2010.
- Michael T. Goodrich and Roberto Tamassia, Introduction to Computer Security, Addison Wesley, 2011.
- William Stallings, Network Security Essentials: Applications and Standards, Prentice Hall,4th edition,2010.

References:
- Alfred J. Menezes, Paul C. van Oorschot and Scott A. Vanstone, Handbook of AppliedCryptography, CRCPress, 2011.

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CONTENTS
Unit-1
Introduction What is data Science need for data science , components of data Science Big data,Facets of Data :Structured Data ,Un Structured Data, Natural Language, Machine Generated Data, Graph Based Data ,Audio, Image and video Streaming. The Need of Business Analytics ,Data Science Life Cycle, Application of data Science
Unit-2
Introduction to Big Data Classification of Digital Data ,Big Data and its importance Four Vs Drivers for Big Data, Big Data Analytics, classification of Analytics top challenges facing Big Data, responsibilities of data scientist, Big data Application in Healthcare, Medicine and advertising
Unit-3
Data Science Process Overview of Data Science Process, setting the research goal, Retrieving data cleansing , integrating and transforming data, Exploratory Data Analysis ,Data Modeling ,Presentation and Automation ,types of Analytics ,Descriptive Analytics, Predictive analytics, respective Analytics
Unit-4
Statistics Basics Terminologies ,Population,sample, Parameter,Estimate,Estimator, Sampling Distribution ,Standard Error ,Properties of Good Estinator,Measure of Cneters,Measure of Spread,Probability, Normal Distribution, Binary Distribution, Hypothesis testing,Chi Square Test,ANOVA
Unit-5
Data Science Tools and Algorithms Basic Data Science Language –R Python, Knowledge of Excel SQL Database, introduction to Weka Regression algorithm ,how regression algorithm work, linear regression ,logistics Regression, K-Nearest Neighbor Algorithim, K means Algorithm
Text Books: 1. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill, 3 rd edition, 2009. 2. Dan W. Patterson, "Introduction to Artificial Intelligence and Expert Systems", Prentice Hall of India, 1st edition, 1997. 3. Winston, Patrick, Henry, "Artificial Intelligence", Pearson Education, 3 rd edition, 2004 4. SubhasreeBhattacharjee, "Artificial Intelligence for Student" Shroff Publishers and DistributorsPvt.LTD., 1 st Edition, 2016

Mobile Application Development

Lab Experiments
1. Develop an application that uses GUI components, Font and Colours.
2. Write an android program to implement activity life cycle using toast messageswith proper positioning
3. Develop an application that uses Layout Managers and event listeners.
4. Write an application that draws basic graphical primitives on the screen.
5. Write an application that basic graphical primitives and animations.
6. Develop an application that makes use of databases.
7. Develop an application that makes use of Notification Manager.
8. Develop a native application that uses GPS location information.
9. Implement an application that creates an alert upon receiving a message
10. Write a mobile application that makes use of feed.
11. Develop a mobile application to send an email.
12. Mini Project using Android Studio

All the candidates of MCA are required to submit a **Final Project Report** based on the work done by him/her during the project period.

PROJECT TIME
The MCA Major Projects would be at list 12 Weeks. The Project topicsshould be based on syllabus or as per the requirement of specific industry in sync with the course. Everystudent has to prepare and submit the project work in a group or separately (Max two students).
Plagiarism would not be accepted under any circumstances.

Project Report should compulsorily include the software development/ soft copy should also be submitted in CD along with Hard Bound Project report.

SUMMARY/ABSTRACT
All students must submit a summary/abstract separately with the project report. Summary, preferably, should be of about 3-4 pages. The content should be as brief as is sufficient enough to explain the objective and implementation of the project that the candidate is going to take up. The write up must adhere to the guidelines and should include the following :

- Name / Title of the Project and about the Problems
- Why is the particular topic chosen?
- Objective and scope of the Project
- Methodology (including a summary of the project)
- Hardware & Software to be used
- Testing Technologies used
- What contribution would the project make?

TOPIC OF THE PROJECT- This should be explicitly mentioned at the beginning of the Synopsis. This being the overall impression on the future work, the topic should be able to corroborate the work.

OBJECTIVE AND SCOPE: This should give a clear picture of the project. Objective should be clearly specified. What the project ends up to and in what way this is going to help the end user has to be mentioned.

PROCESS DISCRIPTION: The process of the whole software system proposed, to be developed, should be mentioned in brief. This may be supported by DFDs / Flowcharts to explain the flow of the information.

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RESOURCES AND LIMITATIONS: The requirement of the resources for designing and developing the proposed system must be given. The resources might be in form of the hardware/software or the data from the industry. The limitation of the proposed system in respect of a larger and comprehensive system must be given.

CONCLUSION: The write-up must end with the concluding remarks-briefly describing innovation in the approach for implementing the Project, main achievements and also any other important feature that makes the system stand out from the rest.

The following suggested guidelines must be followed in preparing the Final Project Report:

The industrial project as part of the curriculum will be held in the institute as one of the laboratories. This may be in continuation to the project under taken by the student during industrial training and/or of industrial nature and/or have good industrial significance and/or may be done in collaboration with industry (as per suitability at the institute level). The evaluation will be done in the institute by one internal examiner and one external examiner (from outside the institute) appointed by RTU.

The Project study and development should be on the following lines:

FORMAT OF THE STUDENT PROJECT REPORT ON COMPLETION

1. Cover Page as per specified format
2. Declaration Certificate
3. Acknowledgement
4. Certificate of the Company /Institute
5. Main Report

1. Introducton

            Objectives
            Problem description
            About Organization

2. System Study

            System with limitations
            Significance of the Project
            Beneficiaries of the System
            Feasibility study

3. System Analysis
            Requirement Specification
        i.   Functional Requirement.
        ii. Non Functional Requirement.
        iii. User Requirement
        iv. System Requirement

4. System Design

        a) Data Flow Diagram

        b) E-R Diagrams

        c) Use Case Diagrams

d) Flow Charts

e) Database Tables

f) Input output

Forms

c) Coding Techniques
d) Coding

6. Testing

a. Test cases

7. System Security

b. Checks and Control
c. Encryption, secure

8. Conclusion/Future Enhancement

9. Bibliography

The reports prepared by the students MUST NOT have only definitions of the above mentioned topics but should explicitly state these in the context of the project undertaken. They should submit the actual work done in details.

General instructions about preparation of report

Paper: A4

Font: Times New Roman, Bookman Old Style

Chapter Heading: 16pt, Sub heading: 14, Sub-Sub Headings: 12

Bold Running Matter: 12 pt

Paragraph Gap: 6 Pt Maximum

Line Gap: 1.5

Margins: Left 1.5, Right, Top and Bottom 1 inch

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Submission of Project Report to the University:

The student will submit his/her project report in the prescribed format. The Project Report should include:

- Copy of the Summary/Abstract. To be mailed to college/Institute well in advance mentioning the about future project which would be undertaken.
- Three Hard Bound Copies of the Project Report which is around 80 to 120 pages.
- Soft copy of project on CD/DVD/Pen Drive pasted inside of the back cover of the project report.

Cover page

An

Industrial Project Report
on
<"Write title of Project>

SubmittedtotheRajasthanTechnicalUniversity,Kotain

Partialfulfillmentoftherequirementforthedegreeof

MASTER OF COMPUTER APPICATIONS

<University logo>

Supervisor	Submitted By:
<Name>	<Name of Candidate >
Designation	Enrolment No.: .....

SunRise University,Alwar
(Rajasthan)

Month and Year

I hereby declare that the work, which is being presented in the MCA-451, Instrial Project , entitled

". ....(Title).."in partial fulfilment for the award of Degree of

"Master of Computer Applications" in Deptartment of Computer Applications **submitted to the**

...........(Name of College)..............., Sunrise University is a record of my own work carried under the

Guidance of Shri/ Dr.............................., Deptartment of Computer Applications,**.**

I have not submitted the matter presented in this Project Report any where for the award of any other

Degree.

<Name and Signature of Candidate>

Enrolment No.: ....

........(Name of College).......................**,**

Name(s) of Supervisor(s)

....

....

<college Name>

<name of Department >

Certificate

Date:

This is to certify that the Industrial Project work entitled "*name of the project*'' submitted by"*name of student*" (Roll No ....)to the Department Of Computer Science and Application of Sunrise University has been examined and evaluated.

The Project work has been prepared as per the regulations of Sunrise University, Alwa andqualifies to be accepted in partial fulfillment of the requirement for the degree of MCA (Master of Computer Applications).

Signature of the student   Supervisor/Guide

                                                                                   (Name with Designation)

 External Examiner

(Name with Designation)   Head of Institution/Principal

Sunrise University ,Alwar
MCA

On Original Company Letter Head

Ref No……………….. Date:

Certificate

This is to certify that **your name (Roll No.)** is/was undertraining from _____

(**startdate**) to_____(**enddate**)undermysupervisioninpartialfulfillmentof

therequirementforthe awardof the Degree of **Master of Computer Applications**.

During this period he /she has workedon........(**"Project Name"**) as

a ..... (**Role of student**).

TrainingIncharge/Project Leader/HR

(Seal/Sign and Name with Designation)