LINGAYA'S VIDYAPEETH

SCHOOL OF COMPUTER SCIENCE & INFORMATION TECHNOLOGY

SCHEME & SYLLABUS

OF

BACHELOR OF COMPUTER APPLICATION (BCA)
BATCH (2023-2026)

SEMESTER- I				
SN	**Cate-gory**	**Course Code**	**Course Name**	**Credits**
1	PCC	BCA-109	Programming in C	3
2	PCC	BCA-103	Internet and Web Development	3
3	PCC	BCA-105	Computer Fundamentals & Emerging Technology	3
4	PCC	BS-107	Mathematics-I	4
5	PCC	HSS-107	English & Communication Skills	3
6	PCC	MG-111	Accounting and Financial Management	3
7	PCC	BCA-159	Programming in C Lab	1
8	PCC	BCA-153	Internet and Web Development Lab	1
9	PCC	BCA-157	Computer fundamentals & emerging Technology Lab	1
10			YOGA	0
			Total---->	**22**

SEMESTER- II				
SN	**Cate-gory**	**Course Code**	**Course Name**	**Credits**
1	PCC	BCA-102	Data Structures using C	3
2	PCC	BCA-108	Object Oriented Programming using Java	3
3	PCC	BCA-106	Discrete structure	4
4	PCC	EC-108	Digital Electronics	3
5	PCC	BS-118	Computational Mathematics-II	4
6	PCC	CE-108	Environmental Science and Ecology	2
7	PCC	BCA-152	Data Structures Using C Lab	1
8	PCC	BCA-158	Object Oriented Programming using Java Lab	1
9	PCC	EC-158	Digital Electronics Lab	1
			Total---->	**22**

SEMESTER – III				
SN	**Cate-gory**	**Course Code**	**Course Name**	**Credits**
1	PCC	BCA-201	Operating Systems	4
2	PCC	BCA-203	Computer Architecture & Organization	4
3	PCC	BCA-205	Multimedia Technologies	3
4	PCC	BCA-207	Computer Networks	4
5	PCC	BCA-308	Python Programming	3
6	PCC	BCA-211	Database Management System	4
7	PCC	BCA-255	Multimedia Technologies Lab	1
8	PCC	BCA-358	Python Programming Lab	1
9	PCC	BCA-261	Database Management System Lab	1
10		RA-101	Reasoning & Aptitude	1
11	VAC	VAC-101	Value Added-I	0
			Total---->	**26**

***MOOC/NPTEL:** Student is required to do certification on any MOOC Course of his/her choice running during the time period of semester on SWAYAM portal & submit the certificate.

SEMESTER - IV				
SN	**Cate-gory**	**Course Code**	**Course Name**	**Credits**
1	PCC	BCA-202	Computer Graphics	3
2	PCC	BCA-204	Design and Analysis of Algorithms	4
3	PCC	BCA-216	Software Engineering & Testing	4
4	PCC	BCA-303	Programming in C#	3
5	PCC	BCA-305	Artificial Intelligence	3
6	PCC	BCA-252	Computer Graphics & MATLAB Lab	1
7	PCC	BCA-353	Programming in C# Lab	1
8	PCC	BCA-355	Artificial Intelligence Lab	1
9	PEC		Elective - I (A1/B1/D1)	3
10	PROJ	PROJ-202	PROJECT	2
11	VAC	VAC-202	Value Added - II	
			Total---->	**25**

***Students need to go for 4 Weeks Internship after semester.**

***EDU SKILL :** Student is required to do certification on any EDU Skill Course of his/her choice running during the time period of semester submit the certificate.

SEMESTER - V				
SN	**Cate-gory**	**Course Code**	**Course Name**	**Credits**
1	PCC	BCA-314	Android Programming	3
2	PCC	BCA-315	Digital Marketing	4
3	PCC	BCA-317	Statistical Learning Theory	4
4	PEC		Elective - II Bucket (A2)/ Bucket (B2)/ Bucket (D2)	3
5	PEC			3
6	PEC			1
7	PEC			1
8	PCC	BCA-364	Android Programming Lab	1
9	PROJ	PROJ-301	Internship Evaluation	4
			Total---->	**24**

***MOOC/NPTEL:** Student is required to do certification on any MOOC Course of his/her choice running during the time period of semester on SWAYAM portal & submit the certificate.

SEMESTER - VI				
SN	**Cate-gory**	**Course Code**	**Course Name**	**Credits**
1	PCC	BCA-302	Software Project Management	4
2	PCC	BCA-309	Network Security Management	4
3	PEC		Elective – III Bucket (A3)/ Bucket (B3)/ Bucket (D3)	3
4	PEC			3
5	PEC			3
6	PEC			1
7	PEC			1
8	PEC			1
9	PROJ	BCA-372	Major Project	5
			Total---->	**25**

***EDU SKILL :** Student is required to do certification on any EDU Skill Course of his/her choice running during the time period of semester submit the certificate.

TOTAL CREDITS

SEM I	SEM II	SEM III	SEM IV	SEM V	SEM VI	TOTAL
22	22	26	25	24	25	144

Elective-I		
S.No	**Course Code**	**Course Name**
1	BCA-220	Pattern Recognition (A1)
2	BCA-222	Cyber Security (B1)
3	BCA-224	Data Mining and Data Warehousing (D1)

BUCKETS (Electives)

Elective –II Bucket A2	**Elective –II Bucket B2**	**Elective –II Bucket D2**
Machine Learning – (BCA-319)	Cloud Computing – (BCA-321)	Machine Learning – (BCA-319)
Machine Learning Lab – (BCA-369)	Cloud Computing Lab – (BCA-371)	Machine Learning Lab –(BCA-369)
NN – (BCA-304)	Ethical Hacking – (BCA-323)	Big Data Analytics – (BCA-327)
NN Lab –(BCA-354)	Ethical Hacking Lab – (BCA-373)	Big Data Analytics Lab – (BCA-377)
Elective –III Bucket A3	**Elective –III Bucket B3**	**Elective –III Bucket D3**
IoT –(BCA-316)	OOAD – (BCA-322)	Time Series Analysis & Forecasting –(BCA-328)
IoT Lab – (BCA-366)	OOAD Lab – (BCA-372)	Time Series Analysis & Forecasting Lab – (BCA-378)
Natural Language Processing – (BCA-318)	Distributed Database Management System – (BCA-324)	Data Handling & Visualization – (BCA-330)
Natural Language Processing Lab – (BCA-368)	Distributed Database Management System Lab – (BCA-374)	Data Handling & Visualization Lab – (BCA-380)
Soft Computing – (BCA-320)	Programming .Net – (BCA-326)	Business Intelligence –(BCA-332)
Soft Computing Lab – (BCA-370)	Programming .Net Lab– (BCA-376)	Business Intelligence Lab – (BCA-382)

SYLLABUS OF SEMESTER - I

CA-109	PROBLEM SOLVING IN C	L-T-P	Cr
		3-0-0	3

OBJECTIVE

To introduce the students the basic of C and Logic behind the implementation of different features of C like different data types, function, array, control statements, pointers, structures, file processing and recursion.

COURSE OUTCOMES

The student after undergoing this course will be able:

CO1: To know the different programming languages
CO2: To learn the basic concepts of C programming language
CO3: To learn the concepts of different control statements
CO4: To know about different data types and the ways of handling
CO5: To store the data in a file type and how to maintain it

UNIT I

COMPUTER FUNDAMENTALS AND OVERVIEW OF C PROGRAMMING: Computer Fundamentals: Algorithm, Flow charts and their symbols. Types of programming languages (Machine Language, Assembly Languages, High level Languages), Introduction to Compiler, Assembler, and Interpreter, Introduction to C, History of C Structure of C program, C character set, Identifier and Keywords, format specifiers, Data types, constants, variables, Declaration, expressions, Types of operators, Input and output functions in C, header files, Structure of C program

UNIT II

CONTROL STATEMENTS: Control Statements & loops: Sequencing, Selection: if, If-Else, Nesting and switch statements, Iteration: for loop, while loop, do while loop, break, continue and break statements, Recursion.

UNIT III

ARRAYS AND STRING HANDLING: Introduction to array, Declaring, Referencing and initializing arrays, array subscript, Types of Array, using for loop for sequential access, Using array element as a function argument, String basics, string library functions, assignment and substring, concatenation, string comparison.

UNIT IV

FUNCTION AND POINTERS: Defining a function, accessing a function, function prototypes, passing arguments to a function, call by value and call by reference, Types of storage classes, Scope of variable: Global, local, static variables, Pointer variables, Declaring & initializing pointers, operations on pointers, pointer expressions, pointers and arrays, pointer and functions, C's dynamic allocation functions.

UNIT V

STRUCTURE, UNION AND FILE PROCESSING: Declaration and Initialization of structure, accessing members of a structure, Union, Pre-processor directives, file processing: Introduction, streams and file types, opening and closing a data file, input and output operations, text mode versus binary mode, formatted input output operations with files, structures read and write in files

TEXT BOOK

1. Computer Fundamentals, P.K Sinha, 5th Edition, BPB Publications.
2. Yashwant kanitkar," Let Us C", by BPB Publication.

REFERENCE BOOKS

1. Dennis, M. Ritchie and Brian, W. Kernigham, "The C Programming Language, Prentice Hall of India, 2nd Edition, 1988
2. Hanly Jeri R, & E. B. Koffman , "Problem Solving and Program Design in C", Pearson Publication, 5th Edition, 2008.
3. Byron, C. Gottfried, "Theory and Problem of Programming with C", Tata McGraw Hill
4. E.Balagurusamy "C – programming" Tata McGray Hill.
5. Schildt, Herbert "The Complete Reference C", 4th Edition, Tata McGraw Hill, 2004

BCA-103	INTERNET AND WEB DEVELOPMENT	L-T-P	Cr
		3-0-0	3

OBJECTIVE

It aims to provide students will be familiarized with Internet Structure and with the basic protocols which provides knowledge of a proficiency in basic techniques for the development of Web-based applications.

Pre-Requisites:

Knowledge of Web, and basics of Computer and Internet.

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To know about the web and web hosting
CO2: To create their own website using HTML
CO3: To learn to make the dynamic website using CSS
CO4: To understand the client side programming using JavaScript
CO5: To aware about the search engine and its optimization

UNIT I

INTRODUCTION TO WEB AND HOSTING: The idea of hypertext and hyper media; how the browser works: MIME types, plug-ins and helper applications; XML, XHTML, XSLT and the W3C,Hosting and Domains: Choosing a domain name, Selecting a hosting company ,Blog hosting services and how they could work for your website; Hosting management tools through the browser such as cPanel.

UNIT II

HYPERTEXT MARKUP LANGUAGE: The anatomy of an HTML document; marking up for structure and style: ordered and unordered lists, Structuring content with HTML using natural divisions , *Marquee,* Anchor Tag, Email Link; embedding images and controlling appearance, table creation: Frames and Nesting, iframes, forms, Semantic elements of HTML5, HTML5 Form elements, Media tags in HTML5, HTML5 Data Storage

UNIT III

POWER OF CSS: Introduction to Cascading Style Sheet: Selector, Declaration and declaration block. Types of CSS: Inline, Internal and Internal style specifications within HTML. Types of Selector; Building & Applying Class Selectors; ID Selector using Div Tags; CSS Properties: Table, List, Fonts, Link, Margins, Background Colors.

UNIT IV

CLIENT SIDE PROGRAMMING: Introduction to JavaScript syntax: output, Comments, variables, functions, operators, conditions, switch, loop; JavaScript object model: Window, Location and History object model; HTML DOM: Introduction to DOM: methods, event handling, JavaScript Functions, Forms validation and regular expressions.

UNIT V

SEARCH ENGINE OPTIMIZATION: What is Search Engine Optimization? Natural vs. paid search and a look at how Google and other search engines work. Maximizing natural search with page titles, meta tags and page content; importance of inbound links in search rankings. Search engine marketing.

Textbook:
Uttam K. Roy, “Web Technology”, Oxford Publication

References Books:
1. Musciano Chuck, “HTML & XHTML: The Definitive Guide”, Bill Kennedy, 4th Edition, 2000.
2. Holzner Steven, “XHTML Black Book”, Paraglyph Press, 2000.
3. Guy W.Lecky-Thompson, “Web Programmin”, Cengage Learning, 2008.
4. Kamal Raj, “Internet and Web Technologies”, Tata McGraw Hill, 2002

Web References:
1. http://W3schools.com.
2. http://www.uniweb.be/
3. http://www.sagaciousindia.com/

BCA-105	COMPUTER FUNDAMENTALS & EMERGING TECHNOLOGY	L-T-P	Credits
		3-0-0	3

OBJECTIVE

To introduce the basic concepts of computers as well as different emerging technologies.

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To know the history, different types came into existence via generations of the computer
CO2: To understand the different hardware and their usage
CO3: To learn the different number systems and their conversions
CO4: To learn about the operating system and its need
CO5: To know about the different technologies to be emerged in different areas

UNIT 1

INTRODUCTION TO COMPUTERS: Basics of Computers What is Computer? Characteristics of Computer Data Processing Cycle (Data -Process -Information) Classification of Computer by Data Processed Analog, Digital and Hybrid Computers History and Generation of Computers First to Fifth Generation Computers Classification of Computers by Processing Capabilities Micro, Mini, Mainframe and Super Computer Simple Model of Computer Input Devices CPU (Central Processing Unit) Arithmetic & Logic Unit Control Unit Internal Memory Output Devices Secondary Storage Devices, Input and output devices

UNIT II

Internal / External parts used with Computer cabinet ,Introduction to Mother board ,Type of Processors Dual Core, Core 2 Duo, i2, i3, etc. ,Memory structure and Types of Memory ,RAM (SRAM, DRAM, SD, DDR, etc.) ,ROM (ROM, PROM, EPROM, EEPROM, etc.) ,Slots ,ISA Slots /PCI Slots / Memory Slots, Sockets ,Cables, Serial Cable / Parallel Cable / USB Cable. ,Ports, USB / Serial / Parallel / PS2, Graphic Cards., Data Storage :Introduction, Type of Magnetic Storage Devices, Floppy Disk / Hard Disk / Magnetic Tape / Magnetic Disks, Storage Mechanism of Magnetic Storage Devices, Tracks / Sectors / Clusters / Cylinders, Reading / Writing Data to and from Storage Devices, Seek Time / Rotational Delay – Latency / Access Time / Response Time, Other Storage Devices, USB – Pen Drive / CD / DVD / Blu-Ray Disk etc.

UNIT III

Numbering System and Codes, Introduction to Binary Codes, Nibble / Bit / Byte / Carry Bit / Parity Bit / Sign Bit, KB / MB / GB / TB / HB / etc., Type of Numbering System, Binary / Octal / Decimal / Hexa-Decimal, Conversion, Binary to Octal, Decimal and Hexa-Decimal, Decimal to Binary, Octal and Hexa-Decimal, Octal to Binary, Decimal and Hexa-Decimal, Hexa-Decimal to Binary, Octal and Decimal, Binary Arithmetic, Addition, Subtraction (1's Compliment and 2's Compliment), Division, Multiplication, Type of Code, ASCII / BCD / EBCDIC / Unicode, Parity Check, Event Parity System / Odd Parity System

UNIT IV

Languages, Operation System and Software Packages, Introduction, Types of Languages (Assembler / Compiler / Interpreter), Machine Level Language, Assembly Level Language, High Level Language (3GL, 4GL, 5GL, etc.), Type of Operation Systems, Batch Operating System,

Multi-Processing Operating System,. Time Sharing Operating System, Online and Real Time Operating System, Type of Software Packages, Word Processing Package,s, Spread Sheet Packages, Graphical Packages, Database Packages, Presentation Packages, Animation / Video / Sound Packages

UNIT V

Emerging Technologies and Virus, Introduction, Different Communication Methods, GIS / GPS / CDMA / GSM, Communication Devices, Cell Phones / modem / Infrared / Bluetooth / Wi-Fi, Virus, Introduction to Virus and related terms, Origin and History, Types of Virus, Problems and Protection from Virus,. Important Terms and Acronyms, ATM, Backup / Restore, Hard Copy / Soft Copy, Bus / Data Bus, Buffer and Types / Spooling, Cursor / Pointer / Icon, E-Mail / Attachment, CLI / GUI, Compiler and its types, Drive / Directory (Folder) / File / Path, Menu / Popup Menu / Toolbar, Shutdown / Reboo, / Restart, Syntax / Wild Card Characters, Optical Fibre (Fibre Optics), Net Meeting, UPS, Printing Speed (CPS, CPM, LPM, DPI, PPM) Peripherals

TEXT BOOKS

1. Computer Fundamentals By P.K.Sinha
2. Fundamental of IT for BCA By S.Jaiswal Engineering Physics

REFERENCE BOOKS

By V.K.Gaur 4 Teach Yourself Assembler By Goodwin. Web site References : ♣

WEB REFERENCES

1. https://www.javatpoint.com/computer-fundamentals-tutorial
2. https://www.tutorialspoint.com/computer_fundamentals/index.htm
3. https://www.tutorialspoint.com/computer_fundamentals/computer_fundamentals_tutorial.pdf
4. http://www.kvadilabad.org/admin/downloads/1788662251computer_fundamentals_tutorial.pdf

BS-107	MATHEMATICS-I	L T P	Cr
		3 1 0	4

OBJECTIVE

The objective of this subject is to understand the major problems of differential and integral calculus and to appreciate how calculus allows us to solve important practical problems in an optimal way.

PRE-REQUISITES: Knowledge of Basic Mathematics

COURSE OUTCOMES

CO1: Calculate limits, derivatives and indefinite integrals of various algebraic and trigonometric functions of a single variable.

CO2: Use the fact that the derivative is the slop of the tangent line to the curve at a given Point.

CO3: Use the properties of limits and the derivative to analyze graphs of various functions of a single variable

CO4: Apply derivative tests in optimization problems appearing in social sciences, physical sciences, life Sciences and a host of other disciplines.

Unit-:I LIMIT & CONTINUITY*: The* real line and its geometrical representation; *e-δ* treatment of limit and continuity; Properties of limit and classification of discontinuities; Properties of continuous functions.

Unit-II: MATRICES AND ITS APPLICATIONS: Elementary transformations; inverse of the matrix using elementary transformation; normal form of a matrix; rank of a matrix; solution of simultaneous linear equations; linear dependence and independence of vectors; linear and orthogonal transformations; eigen values, eigen vectors and properties; Cayley-Hamilton theorem and its applications; diagonalization of matrices.

Unit-III: INFINITE SERIES: Convergence and divergence; comparison test; D'Alembert's ratio test; Cauchy's root test; Raabe's test; logarithmic test; Gauss test; Cauchy's integral test; Leibnitz's alternate series test; absolutely convergent; conditionally convergent.

Unit IV: APPLICATIONS OF DIFFERENTIATION & PARTIAL DIFFERENTIATION: Asymptotes; Concavity, convexity and points of inflection; Curvature; Extrema; elementry curves, tangent and normal in parametric form; Polar Coordinates. Limits and continuity of functions of two variables; Partial derivatives; Taylor's theorem and Maclaurin's Theorem for function of two variable.

Unit V: MULTIPLE INTEGRATIONS: Double and triple integrals; Change of order in double integrals. Application of Integration: length of a curve; Arc length as a parameter; Evoute & Envelope; Volumes and surface areas of solids of revolution.

TEXT BOOK:

1. Grewal, B.S., "Higher Engineering Mathematics", 41st Edition,2010,Khanna Publishers.
2. Kreyszig, E., "Advance Engineering Mathematics", 10th Edition, 2011,Wiley India Publishers, New Delhi

REFERENCE BOOKS

1. Weir, M. D., Hass, J. and Giordano, F. R., "Thomas Calculus", 11th Edition, 2012, Pearson Education.
2. Jain, R.K. and Iyengar, S.R.K., " Advance Engineering Mathematics" ,3rd Edition,2002, Narosa Publishing House New Delhi.
3. H. Anton, I. Bivens and S. Davis, *Calculus,* 7th Ed., John Wiley and Sons (Asia) P. Ltd., Singapore, 2002.
4. G.B. Thomas and R.L. Finney, *Calculus*, 9th Ed., Pearson Education, Delhi, 2005

HSS-107	ENGLISH & COMMUNICATION SKILLS	L-T-P	Cr.
		3-0-0	3

OBJECTIVE

To make students understand the concepts related to language development communication skills.

COURSE OUTCOMES

The students undergoing the course will be able:

CO1: To know the basic structure of speech
CO2: To learn about oral communication and role of speech organs in it
CO3: To get knowledge about the writing skills
CO4: To be skillful in writing different applications as well as letters
CO5: To know all about comprehension

UNIT I

REMEDIAL ENGLIGH: Parts of Speech; Tenses and their application; Verbs and their various forms.

UNIT II

ORAL COMMUNICATION: Introduction to oral communication; Importance of pronunciation; Phonetics; Importance of phonetics; Basic introduction to speech organs, articulation and phonetic symbols.

UNIT III

WRITING SKILLS: Introduction to various types of writings including general writing, technical writing, picture composition, Slogan making; Movie review etc.

UNIT IV

LETTER WRITING: Types of letter writing; Structure & layout; Leave application; Letter of enquiry & response with respect to educational & official matters; Informal letter expressing or discussing social or educational issues.

UNIT V

COMPREHENSION: Listening comprehension & reading comprehension; Listening to recorded speeches, TV news and other audio materials to test listening comprehension; comprehension of unseen passages through reading.

TEXT BOOK:

1. Pal Rajendra, Korlaha, Hi, J,S., "Essentials of Business Communication", Sultan Chand & Sons

REFERENCE BOOKS

1. Rutherford, Andrea, J., "Basic Communication Skills for Technology", Pearson Education Asia.
2. Prasad, V., "Advanced Communication Skills", Atma Ram Publications, New Delhi.
3. Madhukar, R., K, "Business Communication", Vikas Publishing House Pvt. Ltd.

MG-111	ACCOUNTING AND FINANCIAL MANAGEMENT	L-T-P	Cr.
		3-0-0	3

COURSE OBJECTIVES:

1. To give an insight into the basics of Accounting Concepts
2. To study the principles of accounts.
3. To enable the students to prepare different kinds of Financial Statements
4. To learn to manage the financial accounts

UNIT I

Introduction to Accounting: Definition of Accounting and its advantages & limitations, Scope of accounting. Branches of Accounting - Financial Accounting - Cost Accounting - Management Accounting, users of Accounting information, Methods of Accounting, Double Entry Accounting System Types of Accounts and Rules for Debit and Credit Preparation of Journal, Ledger and Trial Balance.

UNIT II

Final Accounts: Preparation of Final Accounts (Sole Proprietorship only), Preparation of Trading A/c, Profit & Loss A/c and Balance Sheet covering simple adjustments.

UNIT III

Accounting Ratios: Meaning, Advantages and Limitations of Accounting ratios, Computation of profitability, liquidity, solvency, and turnover ratios. Cost Accounting: Meaning and definition of Cost Accounting – its Advantages & Limitations Marginal Costing: Meaning-Advantages-Limitations, Break Even Point, Margin of Safety, Profit Volume Ratio.

UNIT IV:

Introduction to Financial Management: Meaning of financial management, functions and objectives of financial management- Profit Maximization and wealth maximization, basic finance decisions, changing role of finance.

TEXT BOOKS

1. S.N. Maheswari, & S.K. Maheshwari, “Advanced Management Accounting”, Vikas Publishing House, 2010
2. M.Y. Khan and P.K. Jain, “Management Accounting”, Tata McGraw Hill, 2009
3. M Y. Khan and P.K. Jain , “Cost Accounting”, Tata McGraw Hill, 2008

REFERENCE BOOKS

1. Vijay Kumar , “Accounting for Management”, Tata McGraw Hill, 2015

2. Anthony, N. Robert, Hawkins and Merchant ,“Accounting: Text and Cases(SIB)”, McGraw Hill, 2013
3. Weston, John. Fred. Thomas, E.Copeland , “Managerial finance”, Dryden press, 1988

BCA-159	PROBLEM SOLING IN C LAB	L-T-P	Cr.
		0-0-2	1

OBJECTIVE

To implement different aspects of C Language using different control statements and loops as well as different storage structures like arrays, strings and files.

COURSE OUTCOMES

The student after undergoing this course will be able:

CO1: To implement the different control statements like sequential, conditional & loops
CO2: To learn the basic concepts of C programming language
CO3: To learn the concepts of different control statements
CO4: To know about different data types and the ways of handling
CO5: To store the data in a file type and how to maintain it

List of Experiments

BASIC

1. Write a program to print HELLO.
2. Write a program to add two numbers.
3. Write a program to calculate simple interest.
4. Write a program to calculate average of three numbers.
5. Write a program to illustrate mixed data types.
6. Write a program to find factorial of a number.
7. Write a program to print table of any number.
8. Write a program to enter the elements in a one-dimensional array.
9. Write a program to find the sum and average of five numbers.
10. Write a program to enter the marks of 50 students and calculate the average.
11. Write a program to calculate the length of string.
12. Write a program to concatenate 2 strings.
13. Write a program to reverse the string.
14. Write a program without using predefined functions to check whether the string is palindrome or not.
15. Write a program using function to find the largest of three numbers.
16. Write a program using function to swap two numbers using call by value.
17. Write a program using function to swap two numbers using call by reference.
18. Write a program using function to sum the digits of a number.
19. Write a program to illustrate the concept of chain of pointers.
20. Write a program to read an employee record using structure and print it.

MODERATE

1. Write a program to swap two numbers
2. Write a program to calculate area and circumference of circle.
3. Write a program to add digits of a four-digit number.
4. Write a program to find greatest of two numbers.
5. Write a program to sort the array elements.

6. Write a program to add 2 matrices.
7. Write a program to count the numbers of characters in a string.
8. Write a program to calculate factorial of a number using recursive function.
9. Write a program to calculate the area and perimeter of circle using pointers.

ADVANCE

1. Write a program to swap two numbers without using third variable.
2. Write a program to evaluate a polynomial expression.
3. Write a program to make a basic calculator.
4. Write a program to print Fibonacci up to the given limit.
5. Write a program to multiply 2 matrices.
6. Write a program that converts lower case characters to upper case.
7. Write a program to prepare salary chart of employee using array of structures.

PROJECT

1. Write a program to implement TIC-TAC-TOE game.

BCA-153	INTERNET AND WEB DEVELOPMENT LAB	L-T-P	Cr
		0-0-2	1

OBJECTIVE:
It aims to make students to make them skillful in creating and handling web based applications like websites etc.

COURSE OUTCOMES
The students undergoing this course will be able:
CO1: To know and use different HTML tags
CO2: To create different lists in a webpage or website
CO3: To create their own website
CO4: To learn to make the dynamic website using CSS
CO5: To understand the client side programming using Javascript

List of Practicals

1. Design a web page using: Physical and Logical tags of HTML.
2. Design a web page using
   2.2 Ordered List
   2.3 Unordered Lists
   2.4 Nested Lists
3. Design a web page to show the use of image as a hyperlink.
4. Design a web-page using frames and linking.
5. Code to create a bookmark.
6. Design a web-page showing the use of forms using HTML 4.01 and HTML 5 Tags.
7. Design a page using basic tags of HTML 5.0.
8. Design a web-page using style sheets (External, Internal and Inline)
9. Write a Program to print if the no is even or odd using JavaScript.
10. Input a number and find the difference of the sum of factors and non-factors.
11. WAP in JavaScript to print the pattern
    12345
    1234
    123
    12
    1
12. WAP to Accept an Array of 10 numbers and display the sum of elements.
13. WAP to find greatest of all elements of an array.
14. Design a web-page to show different validation checking using Java Script.
15. WAP in PHP code for calculating S.I.
16. WAP to Calculate factorial of a number.
17. WAP to print the table of 10.
18. WAP to print the sum of diagonal elements.
19. WAP to enter 5

BCA-155	COMPUTER FUNDAMENTALS & EMERGING TECHNOLOGY LAB	L-T-P	Cr
		0-0-2	1

OBJECTIVE

To make the students computer savvy via introducing different basic applications like MS-office

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To learn all windows-based commands.
CO2: To expertise in making documents using MS-Word.
CO3: To handle in handling database by creating spreadsheets using MS-Excel.
CO4: To manage the data via sorting, filtering etc.
CO5: To be expert in presentations using MS-PowerPoint.

LIST OF EXPERIMENTS/EXERCISES

1. All commands specified using windows
2. Introduction to MS-Word: introduction to word processing, its features.
3. MS Word: formatting documents, paragraph formatting, indents.
4. Page formatting, header and footer, bullets and numbering.
5. MS-Word: tabs, tables, formatting the tables, finding and replacing text, mail merging etc.
6. Introduction to MS-Excel, introduction to electronic spreadsheets, feature of MS-Excel
7. Entering data, entering series, editing data, cell referencing, ranges, formulae, functions, auto sum, copying formula
8. MS Excel: formatting data, creating charts, creating database, sorting data, filtering etc.
9. Introduction to MS PowerPoint, PowerPoint, features of MS-PowerPoint clipping, slide animation, slide shows, formatting etc.
10. MS-PowerPoint presentation (10-15 slides) on (i) evolution of computers (ii) search engines

SYLLABUS OF SEMESTER - II

BCA-102	DATA STRUCTURES USING C	L-T-P	Cr
		4-0-0	4

OBJECTIVE

To relay the theoretical and fundamental knowledge of most commonly used Data Structures.

PRE-REQUISITES

Knowledge of C programming language.

COURSE OUTCOMES

CO1: Understand the concept of data structures, algorithms, time and space complexity.
CO2: Understand basic data structures such as arrays and linked lists.
CO3: Describe the data structures such as stacks and queues.
CO4: Solve problems involving graphs and trees.
CO5: Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data

UNIT I

INTRODUCTION TO DATA STRUCTURES: Definition of data structure, data structure operations. Algorithms: Complexity, Time Space tradeoff, Complexity of Algorithms, Asymptotic Notations for Complexity of Algorithms, Variables.

UNIT II

ARRAYS AND LINKED LISTS: Introduction, Linear arrays, Representation of linear arrays in memory, Address calculation of using row and column major ordering, Traversing linear arrays, Inserting and Deleting, Multidimensional arrays, Linked Lists, Representation of Linear Lists in memory, Traversing a Linked List, Searching a linked List, Insertion into a linked list, Deletion from linked list, Circular linked lists, Doubly linked lists, Header linked lists, Memory allocation: Garbage collection, overflow and underflow.

UNIT III

STACK AND QUEUES: Stacks: Definition, Array representation of stacks, Linked representation of stacks, Polish notation, Evaluation of a Postfix Expression, Transforming Infix Expressions into Postfix Expressions, Queues: Definition, Array representation of Queues, Linked representation of Queues, Circular queues, Priority Queue, Double Ended Queue.

UNIT IV

TREES AND GRAPHS: Definition of trees and Binary trees; Properties of Binary trees and Implementation; Binary Traversal pre-order; post order; in- order traversal; Binary Search Trees, AVL trees, Balanced trees. Definition of Undirected and Directed Graphs; The Array based implementation of graphs; Adjacency matrix; path matrix implementation; The Linked List representation of graphs; Graph Traversal – Breadth first Traversal; Depth first Traversal.

UNIT V

SORTING AND SEARCHING ALGORITHMS: Introduction; Sorting by exchange; selection; insertions; bubble sort; Merge sort; Quick sort, Heap sort; Searching Algorithms: Straight Sequential Search; Binary Search (recursive & non–recursive Algorithms).

TEXT BOOKS

1.Aho, A.V, Hopcroft, J. E., Ullman, T. D., "Data Structures and Algorithms", Original Edition, Addison-Wesley, Low Priced Edition, 1999

2. Seymour Lipchutz, "Theory and Problems of Data Structures", Tata Mc Grew

REFERENCE BOOKS

1. M. Tenenbaum, Langsam, Moshe J. Augentem, "Data Structures using C", Prentice Hall of India
2. Ellis, Horowitz, SartajSahni, "Fundamentals of Data Structures", Addison-Wesley Pub, 1983
3. Mark Allen Weiss, "Data Structures and Algorithms Analysis in C",Pearson Education, 2000

BCA-108	Object Oriented Prorramming using Java	L T P	Cr
		3-0-0	3

OBJECTIVE

I. Understand the basic object oriented programming concepts and apply them in problem solving.
II. Illustrate inheritance concepts for reusing the program.
III. Demonstrate on the multi-tasking by using multiple threads.
IV. Understand the basics of java console and GUI based programming.

PRE-REQUISITES

Basic Knowledge of C programming language.

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: Understand the basic object oriented programming concepts and apply them in problem solving.

CO2: To know about the basics of Java programming language

CO3: Implementation of inheritance (multilevel, hierarchical and multiple) by using extend and implement keywords.

CO4: To learn how to create a package as well as handling of exceptions

CO5: To learn about the multithreading as well as synchronization of threads to ovoid deadlocks.

UNIT I

OBJECT ORIENTED PROGRAMMING CONCEPTS AND JAVA PROGRAMMING:

OOP concepts: Classes and objects, data abstraction, encapsulation, inheritance, benefits of inheritance, polymorphism, procedural and object oriented programming paradigm. Benefits of OOP, Application of OOP.

Java programming: History of java, Features of Java, Different types of data types, Literals, Variables, Type conversion and casting :Java's automatic type conversion, Casting incompatible types; Automatic type promotion in expression; Arrays: One-Dimensional Arrays, Multidimensional Arrays.

UNIT II

STRINGS, OPERATORS, EXPRESSION, CONTROL STATEMENTS:

String handling: String class, Different string operations, String comparison, Searching and modifying a string, Using string buffer class, Vector & Wrapper classes

Different types of operators: arithmetic, bitwise, logical, relational, Boolean, assignment, conditional, special operator, operator precedence and associatively, Solving an expression.

Control statements: if-else, nested if-else switch; Iteration statements: while, do-while, for, nested loops Jump Statements: using break, using continue, return.

UNIT III

INHERITANCE, INTERFACES:

Inheritance: Inheritance, types of inheritance, super and subclasses, member access rules, visibility control, super keyword, preventing inheritance: final classes and methods.
Polymorphism: dynamic binding, method overriding, abstract classes and methods.
Interface: Interfaces VS Abstract classes, defining an interface, implement interfaces, accessing implementations through interface references, extending interface, implementing multiple inheritance.

UNIT IV

PACKAGE & EXCEPTION & APPLET PROGRAMMING:

Packages: Defining, creating and accessing a package, understanding CLASSPATH, importing packages.
Exception Handling: Exception, Types of Exceptions, Exception Handling mechanism, multiple catch statements, using finally statements, throwing our own exception.
Applet: Local & Remote Applets ,Steps to write & running Applets, Applet life cycle, Passing parameters, Displaying numerical values, getting input from the user.

UNIT V

MULTITHREADING PROGRAMMING & FILE HANDLING: Java Thread Model, Understanding Threads, Creating a Thread: extending Thread and implementing Runnable, Creating Multiple Threads, life cycle of thread, and Thread Priorities.
Input/Output in Java: I/O Basic, Byte and Character Structure, I/O Classes, Reading Console Input, Writing to Console Output, Reading and Writing on Files, Random Access Files, Storing and Retrieving Objects from File. Stream Benefits.

TEXT BOOK:

1. Balaguruswamy , E., ""Programming with Java", Tata Mcgraw Hill.
2. Herbert Schildt, "Java the complete reference", McGraw Hill, Osborne.

REFERENCE BOOKS

1. Horetmann Cay and Cornell Gary, "Core JavaTM 2, Volume II – Advanced Features", 7th Edition, Pearson Publisher, 2004.
2. Horetmann Cay and Cornell Gary, "Core Java Volume – I", Pearson Education.
3. Callway Dustin R., "Inside Servlets", Pearson Education.
4. Goodwill James and Bryan Morgan, "Developing Java Servlets", Techmedia.
5. "Java Server Programming, Volume I and II", Wrox Press

BCA-106	DISCRETE STRUCTURE	L T P	Cr
		3 0 0	3

OBJECTIVE

To lay mathematical foundation for the fundamentals of various computational structures such as Boolean algebra, propositional logic, graph and trees.

PRE-REQUISITES: Knowledge of Data Structure

COURSE OUTCOMES

CO1: Perform operations on various discrete structures such as sets, functions, relations, and sequences.

CO2: Ability to solve problems using Counting techniques, Permutation and Combination, Recursion and generating functions.

CO3: Apply algorithms and use of graphs and trees as tools to visualize and simplify Problems.

CO4: Apply algorithms and use of graphs and trees as tools to visualize and simplify Problems.

CO5: Understand the various properties of algebraic systems like Rings, Monoids and Groups.

UNIT I

SET THEORY: Introduction to set theory; set operations; algebra of sets: duality, finite and Infinite sets, classes of sets, power sets, multi sets, Cartesian product, representation of relations, Types of relation, equivalence relations and partitions, partial ordering relations and lattices; Function and its types, composition of function and relations; cardinality and inverse relations

UNIT II

BOOLEAN OPERATIONS: Basic operations: AND (Λ), OR (V), NOT (~), truth value of a Compound statement, propositions, tautologies, contradictions.

UNIT III

COUNTING: Permutations with and without repetition, combination. Probabilities, Events, Sample Space, Conditional Probability, Additional and Multiplicative Probability.

UNIT IV

ALGEBRIC STRUCTURES: Definition and examples of a monoid, semi group, groups and Rings; homomorphism, isomorphism and auto Orphism; subgroups and normal subgroups; cyclic groups, integral domain and fields; co-sets; Lagrange's theorem

UNIT V

GRAPHS: Introduction to graphs, directed and undirected graphs; homomorphic and isomorphic Graphs; sub graphs; cut points and bridges; multigraph and weighted graph; paths and circuits, shortest path in weighted graphs; Eulerian path and circuits, Hamilton paths and circuits; planar Graphs; Euler's formula, Spanning tree

TEXT BOOK

1. Liu C. L., "Elements of Discrete Mathematics", McGraw Hill, 1989
2. Trembley and Manohar, "Discrete Mathematical Structures with Applications to Computers" McGraw Hill, 1995

REFERENCE BOOKS

1. Johnson Bough R., "Discrete Mathematics", 5th Edition, Pearson Education, 2001

2. Graham Ronald, Knuth Donald E. and Patashik Oren, “Concrete Mathematics: A Foundation for Computer Science”, Addison-Wesley, 1989
3. Gersting Judith L., “Mathematical Structures for Computer Science”, Computer Science Press, 1993
4. Chtewynd A. and Diggle P., “Discrete Mathematics”, Modular Mathematics Series,Edward Arnold, London, 1995
5. Lipshutz S., “Schaums Outline series: Theory and problems of Probability”, McGraw Hill Singapore,1986.
6. Kolman B. and Busby R. C., “Discrete Mathematical Structures”, Prentice Hall of India, 1996

EC-108	DIGITAL ELECTRONICS	L T P	CR
		3 0 0	3

Objective:

Modern world deals with digital conditioning of various signals. Digitally manipulating signals or using digital circuits have a lot of advantages in terms of accuracy etc. This subject introduces concept of basic digital electronics: gates; combinational and sequential circuits and their designing.

Course Outcomes: After studying this course the students would gain enough knowledge

CO1. Have a thorough understanding of the fundamental concepts and techniques used in digital electronics.

CO2. To understand and examine the structure of various number systems and its application in digital design.

CO3. The ability to understand, analyze and design various combinational and sequential circuits.

CO4. Ability to identify basic requirements for a design application and propose a cost effective solution.

CO5. The ability to identify and prevent various hazards and timing problems in a digital design.

UNIT-1 INTRODUCTION OF GATES, COMBINATIONAL DESIGN BY USING GATES AND SIMPLIFICATION

Digital signal; logic gates: AND; OR; NOT; NAND; NOR; EX-OR; EX-NOR; Boolean algebra. Review of Number systems. Binary codes: BCD; Excess- 3; Gray; EBCDIC; ASCII; Error detection and correction codes; Design using gates; Karnaugh map and Quine Mcluskey methods of simplification.

UNIT-2 COMBINATIONAL DESIGN USING MSI DEVICES:

Multiplexers and Demultiplexers and their use as logic elements; Decoders; Adders/Subtractors; BCD arithmetic circuits; Encoders; Decoders/Drivers fordisplay devices.

UNIT-3 SEQUENTIAL CIRCUITS: Flip Flops : S-R; J-K; T; D; master-slave; edge triggered; shift registers; sequence generators; Counters; Asynchronous and Synchronous Ring counters and Johnson Counter; Design of Synchronous and Asynchronous sequential circuits.

UNIT-4 DIGITAL LOGIC Families: Bipolar logic families:RTL; DTL; DCTL; HTL; TTL; ECL; MOS; and CMOS logic families. Tristate logic; Interfacing of CMOS and TTL families.

UNIT-5 A/D AND D/A CONVERTERS & PLD:

Sample and hold circuit; weighted resistor and R -2 R ladder D/A Converters; specifications for D/A converters. A/D converters : successive approximation; counting type;ROM; PLA; PAL; FPGA and CPLDs.

TEXT BOOK

Jain, R.P., “Modern Digital Electronics”, 4th Ed.; Tata McGraw Hill, 2003

REFERENCE BOOKS

1. Taub and Schilling, ”Digital Integrated Electronics” Tata McGraw Hill,1997
2. Malvino and Leach; ”Digital Principles and Applications”, 6th Edition, Tata McGraw Hill, 2006
3. Mano, Morris, “Digital Design”, 3rd Edition, Prentice Hall of India,1994
4. Gupta and Singhal, “Digital Electronics”, 2nd Edition, Dhanpat Rai and Sons, 2000.
5. Wakerly, John F, ”Digital Design Principles and Practices”, 4th Edition, Prentice Hall of India,2005

BS-118	COMPUTATIONAL MATHEMATICS-II	L T P	Cr
		3 1 0	4

OBJECTIVE

The objective of this course is to familiarize the students with arithmetic mean, harmonic mean, geometric mean, median and mode. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling various problems in the discipline.

PRE-REQUISITES: Knowledge of Computational Mathematics-I

COURSE OUTCOMES

CO1: To understand the concept of central tendency

CO2: To solve linear programming problem

CO3: To understand and use the Theory and approaches of probability

CO4: To introduce the concept of game theory

Unit 1: Measures of Central Tendency: Concept and properties of mathematical averages including arithmetic mean, geometric mean and harmonic mean, Mode and Median (and other partition values - quartiles, deciles, and percentiles) with graphic presentation.

Unit 2: Measures of Dispersion: Range, Quartile deviation, mean deviation, standard deviation, and their coefficients; Properties of standard deviation/variance, Moments: Calculation and significance;.

Unit 3: Theory and approaches of probability: Theory and approaches of probability, Probability Theorems: Addition and Multiplication (Proof not required). Conditional probability and Bayes' Theorem (Proof not required), Binomial distribution: Probability distribution function, Poisson distribution: Probability function (including Poisson approximation to binomial distribution)

Unit 4: Linear Programming Problem: Introduction to Linear Programming Problem, Some definitions, mathematical formulation Linear Programming Problem, Graphical method of solving of Linear Programming Problem. Corner Point method.

Unit 5: Game Theory: Two-person-zero sum games, Games of pure strategies and games of mixed strategies, Rule of dominance, Graphic solutions to games, Applications in computer science.

Recommended Books:

1. G.M. Clarke and D Cooke, A Basic Course in Statistics, Arnold, (2004).
2. W. Filler, An introduction to Probability theory and its applications, John Wiley, (1968)
3. A.M. Goon, M.K. Das and B. Dasgupta, Fundamentals of Statistics, World Press, (1997)
4. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, S. Chand and sons, 2002.
5. E.N. Barron, Game Theory: An Introduction, Wiley Student Addition, 2009
6. S. Tijs, INtroduction to Game Theory, Hindustan Book Agency

CE-108	ENVIRONMENTAL SCIENCE & ECOLOGY	L T P	CR
		2-0-0	2

OBJECTIVES

- The aim of the course is to make everyone aware of environment issues like continuing problems of pollution, loss of forest, solid waste disposal and degradation of environment.
- Issues like economic productivity and national security, global warming, the depletion of ozone layer and loss of biodiversity are other serious concerns before the mankind.

COURSE OUTCOMES

CO1: Conceptualize the processes and various factors involved in the formation of environment.
CO2: Recognize the importance of environment and the sustainable of natural resources.
CO3: Analyze interaction between social and environmental processes.
CO4: Use scientific reasoning to identify and understand environment problems and evaluate potential solutions.
CO5: Visualize the impacts of human activities on environment and role of society in these impacts.

UNIT I

THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES: Definition, scope and importance, Need for public awareness, Environment Impact Assessment.

UNIT II

NATURAL RESOURCES

RENEWABLE AND NON-RENEWABLE RESOURCES:

A. Natural resources and associated problems.

- Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
- Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
- Food resources: World food problems, changes caused by agriculture and
- overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water
- logging, salinity, case studies.
- Energy resources: Growing energy needs, renewable and non-renewable energy
- sources, use of alternate energy sources, case studies.
- Land resources: Land as a resource, land degradation, man induced landslides,
- soil erosion and desertification.

B. Role of an individual in conservation of natural resources.

C. Equitable use of resources for sustainable lifestyles.

UNIT III: ECOSYSTEMS

A. Concept of an ecosystem
B. Structure and function of an ecosystem
C. Producers, consumers and decomposers
D. Energy flow in the ecosystem
E. Ecological succession
F. Food chains, food webs and ecological pyramids
G. Introduction, types, characteristic features, structure and function of the following ecosystem:
   - Forest ecosystem
   - Grassland ecosystem
   - Desert ecosystem
   - Aquatic ecosystems (ponds, streams, lakes, rivers, ocean estuaries).

UNIT IV

BIODIVERSITY AND ITS CONSERVATIONS

A. Introduction – Definition: genetic, species and ecosystem diversity
B. Biogeographical classification of India
C. Value of biodiversity: consumptive use, productive use, social, ethical aesthetic and option values.
D. Biodiversity at global, national and local levels
E. India as a mega-diversity nation
F. Hot-spots of biodiversity
G. Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts
H. Endangered and endemic species of India
I. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT V: ENVIRONMENTAL POLLUTION

A. Definition
B. Causes, effects and control measures of:
   - Air pollution
   - Water pollution
   - Soil pollution
   - Marine pollution
   - Noise pollution
   - Thermal pollution
   - Nuclear pollution
C. Solid waste management: Causes, effects and control measures of urban and industrial wastes.
D. Role of an individual in prevention of pollution
E. Pollution case studies
F. Disaster management: floods, earthquake, cyclone and landslides.

BCA-152	DATA STRUCTURES USING C LAB	L-T-P	Cr
		0-0-2	1

OBJECTIVE

To relay the practical fundamental knowledge of most commonly used Data Structures.

PRE-REQUISITES

Knowledge of C programming language.

COURSE OUTCOMES

CO1 Be able to design and analyze the time and space efficiency of the data structure
CO2 Be capable to identity the appropriate data structure for given problem
CO3 Have practical knowledge on the applications of data structures

LIST OF EXPERIMENTS/EXERCISES

BASIC

1. Write code in C to find the maximum between N numbers, where N varies from 10, 100, 1000, and 10000. Calculate its time complexity as well
2. Write a program to find the average of n (n < 10) numbers using arrays
3. Write a program to find the sum of two matrices of order 2*2 using multidimensional arrays.
4. Design, develop and execute a program in C to implement a singly linked list where each node consists of integers. The program should support the following functions.
    a. Create a singly linked list
    b. Insert a new node
    c. Delete a node if it is found, otherwise display appropriate message
    d. Display the nodes of singly linked list
5. Write a program for static implementation of Stack

INTERMEDIATE

6. Write a program for static implementation of Queue using array
7. Design, develop and execute a program in C to evaluate a valid postfix expression using stack. Assume that the postfix expression is read as a single line consisting of non-negative single digit operands and binary arithmetic operators. The operators are +(add), -(subtract), *(multiply), /(divide)
8. Write a program to implement a binary search tree. (Insertion and Deletion in Binary Search Tree)
9. Write a program which simulates the various tree traversal algorithms.
10. Write a program to search an element in an array using linear search.
11. Using iteration & recursion concepts write programs for finding the element in the array using Binary Search Method
12. Write a program to implement bubble sort

13. Write a program to implement selection sort
14. Write a program to implement insertion sort

ADVANCED

15. Arrange a list of numbers in ascending order using Quick Sort. Take input from the user
16. Arrange a list of numbers in ascending order using Merge Sort. Take input from the user

PROJECT

Create a phone directory application using a doubly linked list.

TEXT BOOKS

1.Aho, A.V, Hopcroft, J. E., Ullman, T. D., "Data Structures and Algorithms", Original Edition, Addison-Wesley, Low Priced Edition, 1999
2. Seymour Lipchutz, "Theory and Problems of Data Structures", Tata Mc Grew

REFERENCE BOOKS

1. M. Tenenbaum, Langsam, Moshe J. Augentem, "Data Structures using C", Prentice Hall of India
2. Ellis, Horowitz, SartajSahni, "Fundamentals of Data Structures", Addison-Wesley Pub, 1983
3. Mark Allen Weiss, "Data Structures and Algorithms Analysis in C",Pearson Education, 2000

BCA-158	Object Oriented Programming using Java Lab	L T P	Cr
		0-0-2	1

OBJECTIVE

To relay the practical knowledge of Java programming language

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To learn about operators used in Java Programming

CO2: To know about loops implemented in Java programming language

CO3: To implement the arrays and strings

CO4: To learn about the inheritance, packages & exception handling

CO5: To aware about the database connectivity using JDBC

LIST OF EXPERIMENTS

The following programs on different topic are to be done in this lab.

1. **Sample Program**
   (a) Write a Java program to print "Hello Java"
2. **Operators and Expressions**
   (a) Write a java program to find the area of a rectangle.
   (b) To write a java program to find the result of the following expressions
      (i) (a<<2) +(b>>2)
      (ii) (b>0)
      (iii)(a+b*100)/10
      (iv)a & b
      Assume a=10, b=5
   (c) To write a java program to print the individual digits of a 3 digit number using Command line arguments.
3. **Decision making statements**
   (a) Write a java program to read two integers and print the larger number followed by the words "is larger". If the numbers are equal print the message "These numbers are equal"
   (b) Write a java program to read an integer and find whether the number is odd or even.
4. **Looping Statements**
   (a) Write a Java program to find the sum of digits of a given number.
   (b) Write a java program to find the first 15 terms of Fibonacci sequence.
   (c) Given a number, write a program using while loop to reverse the digits of the number.
      For example, the number
      12345
      should be written as 54321.
5. **Array & Strings**
   (a) Write a java program to find the largest and smallest number in an array.
   (b) Write a java program to multiply two matrices.

(c) Write a java program to sort the following numbers in descending order.
{55, 40, 80, 65, 71}
(d) Write a java program to arrange the following word in alphabetical order
{Madras, Delhi, Ahmadabad, Calcutta, Bombay}

6. Classes & Objects

(a) Write a java program to display total marks of 5 students using student class. Given the following attributes: Regno(int), Name(string), Marks in subjects(Integer Array), Total (int).
(b) Write a java program to find the area of a room using constructor.
(c) Write a java program to implement method overloading.

7. Inheritance

(a) Write a java program to implement single inheritance.
(b) Write a java program to implement method overriding.
(c) Write a java program to implement multiple inheritances.

8. Package & Multithreading

(a) Write a program to create your own package and use that package in another program to print " Hello package".
(b) Write a program to implement multithreading using the system function like yield(), stop(), sleep().

9. Exception Handling & File handling

(a) Write a java program to implement multiple try/catch statements.
(b) Write a program to copy the content of one file into another using character stream classes.

10. Database Connectivity

(a) Write a programme to connect java application GUI with database.(JDBC)
(b) Write a program to select all the information of a table named as "Student".

TEXT BOOK

1. Herbert Schildt , "The Complete Reference Java 2 fifth edition, McGraw Hill.

REFERENCE BOOKS

1. Balaguruswamy , E., ""Programming with Java", Tata Mcgraw Hill.
2. Horetmann Cay and Cornell Gary, "Core Java Volume – I", Pearson Education.

EC-158	Digital Electronics Lab	L T P	Cr
		0-0-2	1

LIST OF EXPERIMENTS

1. Study of TTL gates – AND; OR; NOT; NAND; NOR; EX-OR; EX-NOR.
2. Design and realize a given function using K-maps and verify its performance.
3. To verify the operation of multiplexer and Demultiplexer.
4. To verify the operation of comparator.
5. To verify the truth tables of S-R; J-K; T and D type flip flops.
6. To verify the operation of bi-directional shift register.
7. To design and verify the operation of 3-bit synchronous counter.
8. To design and verify the operation of synchronous UP/DOWN decade counter using J K flip-flops and drive a seven-segment display using the same.
9. To design and verify the operation of asynchronous UP/DOWN decade counter using J K flip-flops and drive a seven-segment display using the same.
10. To design and realize a sequence generator for a given sequence using J-K flip-flops.
11. Study of CMOS NAND and NOR gates and interfacing between TTL and CMOS gates.
12. Design a 4-bit shift-register and verify its operation. Verify the operation of a ring counter and a Johnson counter.

SYLLABUS OF SEMESTER -III

BCA-201	OPERATING SYSTEMS	L T P	Cr
		3-1-0	4

OBJECTIVE

To provide the knowledge of internals, different types and purpose of operating systems

PRE-REQUISITES

Knowledge of computer organization and architecture, programming skills

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To get familiar with the basic concepts of operating system
CO2: To know about the multiprocessing, synchronization & deadlocks
CO3: To learn the strategy to manage the memory available
CO4: To learn the concepts of files, their accession and disk scheduling
CO5: To know about the hardware devices and drivers used for them

UNIT I

PROCESS MANAGEMENT: Functionalities and Objectives of OS, historical evolution of operating systems, types of operating system, O/S service system calls, system programs, Process States, Process Control Block, Processor Scheduling, CPU scheduling, scheduling criteria, scheduling algorithms

UNIT II

PROCESS-SYNCHRONIZATION & DEADLOCKS: Critical Section; Mutual exclusion, Process cooperation,; Deadlocks: deadlock prevention; avoidance and detection; deadlock recovery;: Dining philosophers problem; semaphores.

UNIT III

MEMORY MANAGEMENT: Logical & Physical Address Space; swapping; contiguous memory allocation; non-contiguous memory allocation paging and segmentation techniques; segmentation with paging; virtual memory management - Demand Paging & Page-Replacement Algorithms;.

UNIT IV

FILE SYSTEM: Different types of files and their access methods; directory structures; various allocation methods; disk scheduling and management.

UNIT V

I/O SYSTEMS: I/O Hardware; Device Controllers; Interrupt Handlers; Device Drivers; Application I/O Interface; Kernel; Transforming I/O requests; Performance Issues.

TEXT BOOK

Silberchatz et al, ―Operating System Concepts‖, 5th edition, Addison-Wesley, 1998

REFERENCE BOOKS

1. Tanenbaum A., ―Modern Operating Systems‖, Prentice-Hall, 1992
2. Stallings William, ―Operating Systems Internals and Design P rinciples‖ , 4th edition, Prentice-Hall, 2001
3. Dhamdhere D. M., ―Operating System‖, 2nd Edition, Tata McGraw Hill, 1999
4. Kernighan Brian and Pike Rob, ―The Unix Programming Environment‖, Prentice Hall of India, 1984
5. Bach Maurich, ―Design of the Unix Operating System ‖, Prentice Hall of India, 1986
6. Muster John, ―Introduction to UNIX and LINUX‖, Tata McGraw Hill, 2003
7. Ritchie Colin, ―Operating System Incorporating Unix & Windows‖, Tata McGraw Hill, 1974
8. Madnick Stuart and Donovan John, ―Operating Systems‖, Tata McGraw Hill, 2001

BCA-203	COMPUTER ARCHITECTURE AND ORGANIZATION	L T P	Cr
		3-1-0	4

OBJECTIVE
To provide basic knowledge of internals of microprocessor, its architecture, components, terminologies, etc. at minute level and ultimately about the working of a digital computer hardware as a whole.

PRE-REQUISITES
Knowledge of data structures, microprocessors and interfacing

COURSE OUTCOMES

The students undergoing this course will be able:
CO1: To learn the basic architecture of the computer
CO2: To learn about the different addresses and instructions passed for
CO3: To know about the different types of architecture & instruction cycle
CO4: To get knowledge about the different types of memories and their hierarchies
CO5: To know about the parallel processing

UNIT I
GENERAL COMPUTER ARCHITECTURE: k-map, number system, FF, Boolean algebra, design of logic gates. Functions and block diagram of computer, store program control concept, Flynn's classification of computers (SISD, MISD, MIMD); multilevel viewpoint of a machine: digital logic, operating systems, high level language; structured I/O; performance metrics; MIPS, MFLOPS, GFLOPS and TFLOPS.

UNIT II
INSTRUCTION SET ARCHITECTURE: Instruction codes, instruction set formats (fixed, variable, hybrid); types of instructions, memory reference, register reference, I/O reference; addressing modes: register, immediate, direct, indirect, indexed; operations in the instruction set; arithmetic and logical, data transfer, control flow; types of interrupts; timing and control; instruction set based classification of processors (RISC, CISC, and their comparison).

UNIT III
BASIC NON PIPELINED CPU ARCHITECTURE: CPU Architecture types (accumulator, register, stack, memory/ register) detailed data path of a typical register based CPU, fetch-decode-execute cycle (typically 3 to 5 stage); micro-instruction formats, implementation of control unit: hardwired and micro-programmed, control memory, microinstruction sequencing.

UNIT IV
MEMORY HIERARCHY & I/O TECHNIQUES: Need for a memory hierarchy (Locality of Reference Principle, memory hierarchy in practice: cache,virtual memory, Paralleel Bus Architectures, main memory and secondary memory, memory parameters: access/ cycle time, cost per bit); main memory (semi-conductor RAM & ROM organization, memory

expansion, static & dynamic memory types); cache memory: associative &direct mapped cache organizations. .Internal memory, High speed memory.

UNIT V

ADVANCED COMPUTER ARCHITECTURE: Parallel processing architectures, Goals of parallelism (exploitation of concurrency, throughput enhancement); Amdahl's law; instruction level parallelism (pipelining, super scaling-basic features); processor level parallelism (multiprocessor systems overview), Introduction to Graphics Processing Units, Clusters and warehouse scale computers-Introduction to Multiprocessor network topologies.

TEXT BOOK

1. Carpinelli, ―Computer Organization & Architecture‖ Tata McGraw Hill, 2001
2. Mano M Morris, ―Computer System Architecture‖, 3rd Edition, Prentice Hall of India Publication, 2001 / Pearson Education Asia, 2003

REFERENCE BOOKS

1. Stallings. W, ―Computer Organization &Architecture: Designing For Performance‖, 6th Edition, Prentice Hall of India, 2002/ Pearson Education Asia, 2003
2. Rajaraman V. and Radhakrishnan T, ―Introduction to Digital Computer Design‖, 4th Edition, Prentice Hall of India 2004.
3. Stalling William, ―Computer Organization and Architecture‖, 7th Edition, Prentice Hall of India, 2005.
4. Inside the Machine: An Illustrated introduction to Microprocessor and Computer Architecture by Jon Stokes

BCA-205	MULTIMEDIA TECHNOLOGIES	L T P	Cr
		3-0-0	3

OBJECTIVE

To provide basic knowledge of image compression, audio, video, sound, virtual reality, intelligent multimedia systems etc.

PRE-REQUISITES

Knowledge of computer graphics, programming, 3D geometry

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To get familiar with different types of media
CO2: To know about the network of multimedia distribution as well as animations
CO3: To learn about different types of images, color models etc.
CO4: To learn about different signals and digital sound
CO5: To know how to add motion in pictures leads to a video

UNIT I

BASICS OF MULTIMEDIA TECHNOLOGY: Introduction and application of multimedia, framework for multimedia systems; multimedia authoring tools, concept of multimedia project, stages, interactive and non-interactive multimedia, different storage device

UNIT II

MULTIMEDIA Distribution: Internet; World Wide Web & multimedia distribution network: ATM & ADSL; multimedia servers & databases;
Animation: Introduction types of animation, morphing, color modes, importance of text, Unicode.

UNIT III

IMAGE COMPRESSION & STANDARDS: Making still images; editing and capturing images; scanning images; computer color models; color palettes; vector drawing; 3D drawing and rendering; JPEG: objectives and architecture; DCT encoding and quantization; statistical coding; predictive lossless coding; performance; overview of other image file formats as GIF; TIFF; BMP; PNG; etc.

UNIT IV

AUDIO: Digital representation of sound; time domain sampled representation; method of encoding the analog signals; sub-band coding; Fourier method; transmission of digital sound; digital audio signal processing; stereophonic and quadraphonic signal processing; editing sampled sound; MPEG Audio; audio compression and decompression; brief survey of speech recognition and generation; audio synthesis; musical instrument digital interface

UNIT V

VIDEO: digital video and image compression; MPEG motion video compression standard; DVI technology; time base media representation and delivery. Video on demand. VIRTUAL REALITY: Applications of multimedia; intelligent multimedia system; desktop virtual reality; VR operating system; virtual environment displays and orientation making; visually coupled system requirements; intelligent VR software systems.

TEXT BOOK

1. Villamil and Molina, “An Introduction to Multimedia”, MacMillan, 1997
2. Multimedia Technologies McGraw Hill Education; 1st edition (1 January 2009)
3. Multimedia Technologies: Concepts, Methodologies, Tools, and Applications
4. Information Science Reference; Three Volumes edition (30 June 2008)

REFERENCE BOOKS

1. Lozano, “Multimedia: Sound & Video”, Prentice Hall of India (Que), 1997
3. Ranjan Parekh, “Principle of Multimedia”, Tata McGraw Hill
4. Villamil and Molina, “Multimedia: Production, Planning and Delivery”, Que, 1997
5. Sinclair, “Multimedia on the PC”, BPB Publications
6. Tay Vaughan, “Multimedia: Making It Work”, Fifth edition, Tata McGraw Hill, 1994
7. James E Shuman, “Multimedia in Action”, Wadsworth Publications, 1997
8. Jeff Coate Judith, “Multimedia in Practice”, Prentice Hall of India, 1995
9. John F. Koegel, “Multimedia Systems”, Addison Wesley Ltd.

BCA-207	COMPUTER NETWORKS	L T P	Cr
		3-1-0	4

OBJECTIVE

To have a fundamental understanding of the design, performance and state of the art of wireless communication systems, Topics covered include state of the art wireless standards and research and thus changes substantially form one offering of this course to the next

PRE-REQUISITES

Knowledge of computers hardware and software

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To know different types of networks and basic architecture of network
CO2: To learn about TCP/IP and its protocol
CO3: To know deeply about the Data Link Layer
CO4: To know deeply about the Network Layer and Transport Layer
CO5: To aware about the Network security

UNIT I

OSI REFERENCE MODEL AND NETWORK ARCHITECTURE: Introduction to Computer Networks , Internet History , Uses of computer networks, Network hardware, network software ,Types of Networks, Network Topologies, ,Reference models (OSI & TCP/IP), Network standardization. The Physical Layer: Theoretical basis for data communication, Transmission media: Guided and Unguided media, Switching (circuit, packet), Multiplexing (FDM, WDM, and TDM), Overview of PSTN, ISDN, and ATM.

UNIT II

TCP/IP: Introduction; History of TCP/IP; Layers of TCP/IP; Protocols; Internet Protocol; Transmission Control Protocol; User Datagram Protocol; IP Addressing; IP address classes; Subnet Addressing; Internet Control Protocols; ARP; RARP; ICMP; Application Layer; Domain Name System; Email – SMTP; POP; IMAP; FTP; NNTP; HTTP; Overview of IP version 6.

UNIT III

DATA LINK LAYER : Design issues, Error Detection & Correction, Elementary Data Link Layer

Protocols, Sliding window protocols

Multiple Access Protocols - ALOHA, CSMA,CSMA/CD, CSMA/CA, Collision free protocols, Ethernet- Physical Layer, Ethernet Mac Sub layer, Data link layer switching: Use of bridges, learning bridges, spanning tree bridges, repeaters, hubs, bridges, switches, routers and gateways.

UNIT IV

NETWORK LAYER: Network Layer Design issues, store and forward packet switching connectionless and connection oriented networks-routing algorithms-optimality principle, shortest path,
flooding, Distance Vector Routing, Count to Infinity Problem, Link State Routing, Path Vector Routing, Hierarchical Routing; Congestion control algorithms, IP addresses, CIDR, Subnetting, SuperNetting, IPv4, Packet Fragmentation, IPv6 Protocol, Transition from IPv4 to IPv6, ARP, RARP.
TRANSPORT LAYER : Services provided to the upper layers elements of transport protocol addressing connection establishment, Connection release, Error Control & Flow Control, Crash Recovery.

UNIT V

COMPUTER NETWORK SECURITY : Introduction of Network Security,IP Security Architecture,Web Security ,Network Management Security,System Security, introduction to confidentiality : RSA,DES,digital signatures.

TEXT BOOK

1. Forouzan Behrouz A., "Data Communications and Networking", Tata McGraw Hill 2006.
2. Computer Networking : A Top-Down Approach, 7th edition, by James Kurose and Keith Ross.

REFERENCE BOOKS

1. Tanennbaum Andrew S, "Computer Networks", 4th Edition, Pearson Education/Prentice Hall of India, 2003.
2. Stallings William, "Data and Computer Communication", 5th Edition, Prentice Hall of India, 1999
3.Computer Networking :A Top-Down Approach, 7th edition, by James Kurose and Keith Ross

BCA-308	PYTHON PROGRAMMING	L-T-P	Cr
		3-0-0	3

OBJECTIVE

To build programming logic and thereby developing skills in problem solving using Python programming language; To be able to do testing and debugging of code written in Python Emphasize the concepts and constructs rather than on language features.

PRE-REQUISITES

The students are expected to have basic knowledge of programming and DBMS.

COURSE OUTCOMES

The students undergoing this course will be able to:

CO1: To learn and understand Python programming basics and paradigm.
CO2: To learn and understand python looping, control statements and string manipulations.
CO3: To learn basic concepts of list, tuple and dictionary data structures.
CO4: To learn and know the concepts of Structure and Functions.
CO5: To learn and know the concepts of file handling, exception handling.

UNIT I:

Introduction to Python: History, Features & Benefits of Python, Structure of a Python Program, Identifiers and Keywords, Concept of Variable, Memory Allocation for Variable, Data Types in Python, Conversion Functions, Operators (Arithmetic Operator, Relational, Logical or Boolean Operator, Assignment, Bitwise Operator, Membership Operator).Input and Output Function, Control Statements (Looping- while Loop, for Loop, Loop Control, Conditional Statement- if...else), Difference between break, continue and pass.

UNIT II:

Data Structures & Function: String, Lists, Tuples, Sets, Dictionary Data Structure, Built-in Library Function, Method and Operation on these Data Structure. Defining Function, Type of Function Arguments (Required Arguments, Keyword Arguments, Default Arguments, Variable-Length Arguments), Scope of a Variable, Global Vs Local Variable, Python Modules & Packages, Import Statement, dir(), globals(), locals() and reload() Functions.

UNIT III:

Python Object Oriented Programming: Introduction to Object Oriented Programming, Concept of Abstraction, Encapsulation, Class, Object and Instances. Creating Classes, _init_() Method, Creating Instance Object, Class Attributes, Access Specifiers in Python, Instance Method Vs Class Method. Inheritance & Polymorphism, Overriding and Overloading Methods.

UNIT IV:

Python File Handling, Exception Handling: Opening & Closing Files, File

Access Modes, File Object Attributes, Reading and Writing Files, Manipulating File Pointer using seek and tell. Programming using File Operations. Exception Handling in Python.

UNIT V:

Python MySQL: Mysql/Oracle Database Connection using Python. Creating Database Tables, SELECT, INSERT, UPDATE, And DELETE Operation, Performing Commit, Rollback Operation.

TEXT BOOKS

1. John V Guttag. "Introduction to Computation and Programming Using Python", Prentice Hall of India.
2. T. Budd, Exploring Python, TMH, 1st Ed, 2011

REFERENCE BOOKS

1. Python Tutorial/Documentation www.python.or 2010
2. Allen Downey, Jeffrey Elkner, Chris Meyers ,How to think like a computer scientist :Learning with Python,Freelyavailableonline.2012
3. http://docs.python.org/3/tutorial/index.html
4. http://interactivepython.org/courselib/static/pythonds

BCA-211	DATABASE MANAGEMENT SYSTEM	L-T-P	Cr
		3-1-0	4

OBJECTIVE

To provide knowledge about various organizations and management information systems, keeping in view the aspects of shareability, availability, evolvability and integrity.

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To know the basics of database & its architecture
CO2: To aware about the existing data models, entities as well as constraints
CO3: To learn about the different anomalies of the data and ways to normalize it
CO4: To know about the storage of data in the files & organization of files
CO5: To learn about the transactions and its ways done on the database

UNIT I

INTRODUCTION: Purpose of database system; characteristics of database approach; advantages of using DBMS; database concept and architecture; data abstraction, data models; instances and schema; data independence; schema architecture; database languages; database manager; database administrator; database users.

UNIT II

DATA MODELING: Introduction to Hierarchical model, Network model. Relational model, E-R Model, Entity sets attributes and keys; relationships (ER); database modelling using entity; type role and structural constraints; Concept of Keys: Primary, Secondary, Candidate, Super Key ; weak and strong entity types; entity-relationship diagram-basic concepts; Enforcing Data Integrity Constraints; Domain Relational Calculus; Codd's Rules.

UNIT III

DATABASE DESIGN AND SQL: Database design process; relational database design; relation schema; anomalies in a database; functional dependencies; 1NF, 2NF, 3NF, and BCNF. ; Decomposition of DBMS: Lossless and Lossy, Reduction of an E-R schema to Tables; Introduction to SQL; basic queries in SQL; advanced queries in SQL; functions in SQL; basic data retrieval; updates in SQLs, views in SQL. Relational Algebra: introduction, Selection and projection, set operations, renaming, Joins, Division, syntax, semantics. Operators, grouping and ungrouping, relational comparison. Calculus: Tuple relational calculus, Domain relational Calculus, calculus vs algebra, computational capabilities.

UNIT IV

FILE ORGANIZATION: indexing and hashing; overview of file organization techniques; secondary storage devices; operations in files; heap files and sorted files; ; Indexing and Hashing- Basic concepts; Static Hashing; Dynamic Hashing; ordered indices; single level ordered index; multi-level index.

UNIT V

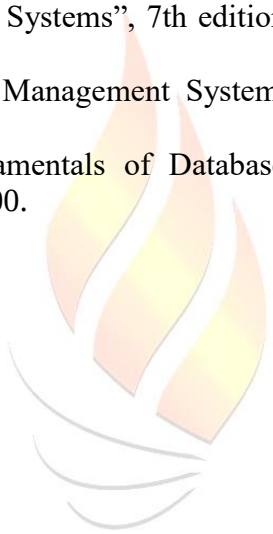
TRANSACTION PROCESSING & QUERY PROCESSING: Desirable properties of transactions; implementation of atomicity and durability; schedules and recoverability; serializability of schedules; testing for serializability, precedence graph; concurrency control. Deadlock handling - detection and resolution.

TEXT BOOK

1. Silberschatz A., Korth H. F. and Sudarshan S., "Database System Concepts", 3rd edition, McGraw-Hill, International Edition, 1997.
2. S. Chand, Rajiv Chopra, "DBMS(A practical approach)", Revised edition, Pearson.

REFERENCE BOOKS

1. Date C. J., "An Introduction to Database Systems", 7th edition, Addison- Wesley, Low Priced Edition, 2000.
2. Desai Bipin, "Introduction to Database Management System", Galgotia Publications, 1991.
3. Elmasri R. and Navathe S. B., "Fundamentals of Database Systems", 3rd edition, Addison-Wesley, Low Priced Edition, 2000.



BCA-255	MULTIMEDIA TECHNOLOGIES LAB	L T P	Cr
		0-0-2	1

OBJECTIVE

To provide practical knowledge of concepts of different medias.

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To get familiar with different types of media
CO2: To implement the motion in still images
CO3: To learn about shape tweening of objects & alphabets
CO4: To use the macromedia flash
CO5: To know how to add text in the file

List of Experiments

Easy

1. Create Motion Tweening using Macromedia Flash (Moving Ball).
2. Design a moving ball in V-shape
3. Design a moving ball in W-shape
4. Design shape tweening – Object to Object
5. Design shape tweening – Object to Alphabet

Moderate

6. Design shape tweening – Alphabet to Object
7. Create Spot Light using Macromedia Flash.
8. Implement Splitting of Ball
9. Create Animated Pool Table.
10. Create Bow & Arrow hitting a Ball.

Hard

11. Write any Text with the illusion of pen writing letters.
12. Design a scenery showing correction of Image tonality.
13. Procedure to take a photographic image. Give a title for the image. Put the border. Write your names. Write the name of institution and place.
14. Procedure to use appropriate tool(s) from the toolbox, cut the objects from 3 files (f1.jpg, f2.jpg& f3.jpg); organise them in a single file and apply feather effects.
15. Procedure to display the background given (filename: garden.jpg) through your name using mask.

BCA-261	DATABASE MANAGEMENT SYSTEM LAB	L-T-P	Cr
		0-0-2	1

OBJECTIVE

To provide knowledge about implementation of practical aspects of database i.e. creation of tables and applying queries using SQL queries

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To know the basics of structured query language

CO2: To aware about applying different queries on database structured in the form of tables

CO3: To learn about the different SQL queries performed using operators as well as constraints

CO4: To create views from created table to further organize the data

CO5: To learn about the basic operations of relational algebra

LIST OF EXPERIMENTS/EXERCISES

Basic

1. Introduction to SQL.
2. Write a query for:
   I. Creation of table.
   II. Insertion of data into table.
   III. Displaying the data of table.
   IV. Deletion of data from table.
   V. Updating the data in a table.
   VI. Modifying the structure of a table.
3. Write a query to implement: Key constraints: primary key constraints, foreign key constraints, not null constraints and unique constraints; use of check constraints.
4. Write a query to implement: Binary operations in Relational Algebra: Union, Intersection, Set Difference, Join, Cartesian product.
5. Write a query to implement: Grouping of data into tables and listing records in ascending order or descending order.
6. Write a query to implement: Creation of sequences and explain use of sequences.
7. Write a query to implement: Access permissions in SQL.

Moderate

1. Finding unique names of all salesmen, deletion of the structure of a table, use of delete command with conditions, updating records of a table with conditions, altering structure of a table and changing size of existing column in the table.
2. Write a query to implement: Arithmetic operators, logical operators and pattern matching operator.
3. Write a query to implement: Aggregate and mathematical functions: count, count(*), Avg, max, min, sum, lower, upper, power , sqrt.
4. Write a query to implement: Creating views from single and multiple tables, drop views and creating index on the table and drop them.
5. Create queries using Triggers and Procedures.

Advance

1. Consider the insurance database given below. The primary keys are made bold and the data types are specified.
   PERSON(driver_id:string , name:string , address:string)
   CAR(regno:string , model:string , year:int)
   ACCIDENT(report_number:int , accd_date:date , location:string)
   OWNS(driver_id:string , regno:string)
   PARTICIPATED(driver_id:string , regno:string , report_number:int , damage_amount:int)
   1)Create the above tables by properly specifying the primary keys and foreign keys.
   2)Enter at least five tuples for each relation.
   3)Demonstrate how you:
   a.Update the damage amount for the car with specific regno in the accident with report number 12 to 25000.
   b.Add a new accident to the database.
   4)Find the total number of people who owned cars that were involved in accidents in the year 2008.
   5)Find the number of accidents in which cars belonging to a specific model were involved.
2. Consider the following relations for an order processing database application in a company.
   CUSTOMER(custno:int , cname:string , city:string)
   ORDER(orderno:int , odate:date , custno:int , ord_amt:int)
   ORDER_ITEM(orderno:int , itemno:int , quantity:int)
   ITEM(itemno:int , unitprice:int)
   SHIPMENT(orderno:int , warehouseno:int , ship_date:date)
   WAREHOUSE(warehouseno:int , city:string)
   1)Create the above tables by properly specifying the primary keys and foreign keys.
   2)Enter at least five tuples for each relation.
   3)Produce a listing: custname , No_of_orders , Avg_order_amount , where the middle column is the total number of orders by the customer and the last column is the average order amount for that customer.
   4)List the orderno for orders that were shipped from all the warehouses that the company has in a specific city.
   5)Demonstrate the deletion of an item from the ITEM table and demonstrate a method of handling the rows in the ORDER_ITEM table that contains this particular item.
3. Consider the following database of student enrollment in courses and books adopted for that course.
   STUDENT(regno:string , name:string , major:string , bdate:date)
   COURSE(courseno:int , cname:string , dept:string)
   ENROLL(regno:string , courseno:int , sem:int , marks:int)
   BOOK_ADOPTION(courseno:int , sem:int , book_isbn:int)
   TEXT(book_isbn:int , book_title:string , publisher:string , author:string)
   1)Create the above tables by properly specifying the primary keys and foreign keys.
   2)Enter atleast five tuples for each relation.
   3)Demonstrate how you add a new text book to the database and make this book to be adopted by some department.
   4)Produce a list of text books (includes courseno , book_isbn , book_title) in the alphabetical order for courses offered by the 'CS' department that use more than two books.
   5)List any department that has all its books published by a specific publisher.

4. The following are maintained by a book dealer.
   AUTHOR(author_id:int , name:string , city:string , country:string)
   PUBLISHER(publisher_id:int , name:string , city:string , country:string)
   CATALOG(book_id:int , title:string , author_id:int , publisher_id:int , category_id:int , year:int , price:int)
   CATEGORY(category_id:int , description:string)
   ORDER_DETAILS(order_no:int , book_id:int , quantity:int)
   1)Create the above tables by properly specifying the primary keys and foreign keys.
   2)Enter at least five tuples for each relation.
   3)Give the details of the authors who have 2 or more books in the catalog and the price of the books is greater than the average price of the books in the catalog and the year of publication is after 2000.
   4)Find the author of the book that has maximum sales.
   5)Demonstrate how you increase the price of books published by a specific publisher by 10%.
5. Consider the following database for a banking enterprise.
   BRANCH(branch_name:string , branch_city:string , assets:real)
   ACCOUNT(accno:int , branch_name:string , balance:real)
   DEPOSITOR(customer_name:string , accno:int)
   CUSTOMER(customer_name:string , customer_street:string , customer_city:string)
   LOAN(loan_number:int , branch_name:string , amount:real)
   BORROWER(customer_name:string , loan_number:int)
   1)Create the above tables by properly specifying the primary keys and foreign keys.
   2)Enter at least five tuples for each relation.
   3)Find all the customers who have at least two accounts at the main branch.
   4)Find all the customers who have an account at all the branches located in a specific city.
   5)Demonstrate how you delete all account tuples at every branch located in a specific city.

Project

1. Create a Database for a college which implements all keys, views, procedures, and triggers in it.

BCA-358	PYTHON PROGRAMMING LAB	L T P	Cr
		0 0 2	1

COURSE OUTCOMES

CO1: Define basic concepts of python programming if statement, loops.
CO2: Define and demonstrate the use of built-in data structures "lists" and "dictionary".
CO3: Design and implement a program to solve a real-world problem
CO4: Design and implement GUI application and how to handle exceptions and files.

LIST OF PROGRAMS

Program 1: Programs using if else structure

a) Find the Largest Among Three Numbers
b) Python Program to Check Leap Year
c) Python Program to Take in the Marks of 5 Subjects and Display the Grade

Program 2: Programs using for and while loop

a) Python Program to check whether given number is Prime Number or not.
b) Python Program to Find the Sum of Digits in a Number.
c) Python Program to convert binary number to decimal number.

Program 3: Program using List and String data structure

a) Write Python Program to input a list of integers, (1) display the no of elements in the list (2) display minimum and maximum element in the list (3) display sum of square of all the element in the list (4) (5) add a new element at end and display the list (6) add a new element at given index and display list (7) display the occurrence of given element in the list (8) remove the given element in the list (9) add element from a new list from given list (10) sort the given list & reverse the given list (11) also perform slicing, concatenation and multiplication operation.
b) A fruit seller sells different type of fruits. Type of fruits and corresponding rates are stored in two different lists. Customer can order any type of fruit (one or more type) in any quantity. If total bill of customer is greater than 500, customer is given 10% discount. If any of the fruits required by the customer is not available in the store, then consider the bill amount to be -1. Write a Python program to calculate and display the bill amount.
c) Accept two strings 'string1' and 'string2' as input from the user. Generate a resultant string-1, such that it is a concatenated string of all upper case alphabets from both the strings in the order they appear. Generate a resultant string-2 that contain character which are in both string1 and 2. Print the actual resultant string-1 and resultant string-2.

Program 4: Programs using concept of list, tuple & dictionary

a) Write a Python program that take a string as input and store the character and occurrence of each character in a dictionary. Create two lists from dictionary first having each character in sorted order of their frequency and second having corresponding frequency.
b) A furniture seller sells different type of furniture, Type of Furniture and rates are stored in a dictionary. Customer can order any type of furniture (one or more type) in any quantity. If total bill of customer is greater than 10,000, customer is given 5% discount. 8% GST is charged on total bill. If any of the furniture required by the customer is not available in the store, then consider the bill amount to be -1. Write a Python program to calculate and display the bill amount.
c) Students name and their corresponding marks are stored in a dictionary. Write a Python program to perform following (1) Display name and marks of each student (2) Display the names of top two scorer (3) display the class average for this course (4) check if the

marks for given student is stored in dictionary or not, if not add the name and marks in the dictionary else display his/her marks (5) delete the name and marks of a given student in the dictionary (6) add name and marks from another dictionary and display combined dictionary.

Program 5: Program using Function in Python:

a) Write Python functions using the concept of Keyword & default arguments and write a program to use them.
b) Write python functions to use the concept of variable length argument & global variable.

Program 6: Program using concept of Class, object, class variable, class method:

a) Create a class Account with name, account no and balance as attribute and no_of_accounts as class variable. Account no should be generated automatically (starting from 1) using the class variable no_of_account. Add the methods for displaying the account information, depositing given amount, withdrawing given amount and initializer method to initialize the object. Create objects of Account class and call different method to test the class.
b) Create a class Employee with name , empid ,salary as attribute and no_of_ employee and annual_incr (% annual increment) as class variable. empid should be generated automatically (starting from 1) using the class variable, no_of_employee. Add the instance methods for displaying the employee information, annually increasing the salary with help of class variable annual_incr , class method to change the value of annual_incr and initializer method to initialize the object. Create objects of employee class and call different method to test the class (program using class method).

Program 7: Program using the concept of Inheritance

a) Create a class Polygon to represent a polygon having no of sides and a list having magnitude of each side as attribute. Add the inputSides() to input sides and displaySides() to display sides as methods. Derive a class Triangle from Polygon and add an additional method displayArea() to display area. Create object of Triangle and call different methods to test the class.

b) Create a class Person having name, age, as attributes, __init__() method to initialize the object and display() to display person information. Derive a class Student from Person having roll no, University name, branch as additional attributes and __init__(), display() to display student information and change_Branch() method. Create object of Student type and call different methods to test the class.
c) Write a program to show the concept of multiple inheritance in python.

Program 8: Program using the concept of Polymorphism, Operator Overloading

a) In a retail outlet there are two modes of bill Payment (1) Cash : Calculation includes VAT(10%) Total Amount = Purchase amount + VAT (2) Credit card: Calculation includes processing charge and VAT Total Amount = Purchase amount + VAT (10%) + Processing charge (2%) The act of bill payment is same but the formula used for calculation of total amount differs as per the mode of payment. Can the Payment maker simply call a method and that method dynamically selects the formula for the total amount? Demonstrate this Polymorphic behaviour with code.
b) Write a program to create a class to represent length in feet and inch. Overload the "+" operator to add the two object of length type.

Program 9: Program on file handling in Python

a) Write a python program to write few lines on a file, read it back and create a dictionary having each word in file as keys in dictionary and occurrence of these word as values and print the dictionary.

b) A file student.txt store student information. Information about each student is written on separate line in the form: roll-no student-name (student-name may consist of any number of words).Write a Python program that takes student roll no as input and print the student name. If roll no is not present in the file it display : "roll no not present in the file".

Program 10: Program on Exception handling

a) Write a function divide (arg1, arg2) to divide arg1 by arg2. Use the exception handling mechanism to handle all type of possible exceptions that may occur. Take the value of arg1 and arg2(of any type) from user as input and call the function divide to print the result of division or suitable message if any type of exception occurs(use also else and finally block).

b) Write a program to open a file in read only mode read data from file and then try to write data on file. Use the exception handling mechanism to handle all type of possible exception.

RA-101	Reasoning & Aptitude	L T P	Cr
		1 0 0	1

UNIT 1 – Logical Reasoning – Logical Deductions (Syllogism & Venn Diagrams) logical connectives
UNIT 2- Analytical Reasoning – Seating Arrangements, combinations, selections, comparisons, blood relations, directions etc

UNIT 3 – Non – Verbal Reasoning (Alpha Numeric & Visual Puzzles) – To solve problems on numbers, alphabet, symbols, visuals, problem types and series, analogies, odd man out, coding, decoding and symbols & notations.

UNIT 4 – Higher Maths – Algebra & Mensuration

UNIT 5- Business Maths – Number system, ratios & averages, time & work, time & distance, percentages, profit & loss, simple & compound interest

UNIT 6 –Date Interpretation & Sufficiency – Tables, Bar Chart, Line Graph & Pie Chart

Syllabus of Semester - IV

BCA-202	COMPUTER GRAPHICS	L T P	Cr
		3 0 0	3

OBJECTIVES

- Write programs Using C/C++/ OpenGL graphics environment.
- Use polygonal and other modelling methods to describe scenes.
- Understand and be able to apply geometric transformations.
- Create basic animations.

PRE-REQUISITES

Knowledge of computer programming

COURSE OUTCOMES

Students after undergoing this course will be able to:

CO1: Understand the basics of computer graphics, different graphics systems and applications of computer graphics.

CO2: Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis.

CO3: Use of geometric transformations on graphics objects and their application in composite form.

CO4: Extract scene with different clipping methods and its transformation to graphics display device.

CO5: Explore projections and visible surface detection techniques for display of 3D scene on 2D screen.

Unit 1

Introduction to Computer Graphics: An Introduction Graphics System: Computer Graphics and Its Types, Application of computer graphics, Graphics Systems: Video Display Devices, Raster Scan Systems, Random Scan Systems, Graphics Monitors and Work Stations, Input Devices, Hard Copy Devices, Graphics Software.

Unit 2

Algorithms: Output Primitives and Attributes of Output Primitives: Output Primitive Points and Lines, Line Drawing Algorithms, Circle Generating Algorithms, Scan-Line Polygon Fill Algorithm, Inside-Outside tests, Boundary-Fill Algorithm, Flood Fill Algorithm, Cell Array, Character Generation, Attributes of Output Primitives: Line Attributes, Color and Grayscale Levels, Area fill Attributes, Character Attributes, Bundled Attributes, Antialiasing.

Unit 3

Two and Three Dimensional Transformation:Two-dimensional Geometric Transformations: Basic Transformations, Matrix Representation and Homogeneous Coordinates, Composite Transformations, Reflection and Shearing. Two-Dimension Viewing: The viewing Pipeline, Window to view port coordinate transformation, Clipping Operations, Point Clipping, Line Clipping, Polygon Clipping, Text Clipping, Exterior Clipping Three-Dimensional Concepts:

Three-Dimensional Display Methods, 3D Transformations, Parallel Projection and Perspective Projection.

Unit 4

Multimedia in Computer Graphics: Multimedia: Introduction to Multimedia: Classification of Multimedia, Multimedia Software, Components of Multimedia – Audio : Analog to Digital conversion, sound card fundamentals, Audio play backing and recording Video, Text : Hypertext, Hyper media and Hyper Graphics, Graphics and Animation : Classification of Animation. Authoring Process and Tools.

Case Study: graphics software MatLab, Use of MatLab in graphics application, Features of MatLab, Generalize application by using MatLab.

Unit 5

Hypermedia: Multimedia authoring and user interface – Hypermedia messaging -Mobile messaging − Hypermedia message component − Creating hypermedia message − Integrated multimedia message standards − Integrated document management − Distributed multimedia systems.

CASE STUDY: BLENDER GRAPHICS Blender Fundamentals – Drawing Basic Shapes – Modelling – Shading & Textures.

Text Books:

1. Donald Hearn & M. Pauline Baker, “Computer Graphics with OpenGL”, Third Edition, 2004, Pearson Education, Inc. New Delhi.
2. Ze-NianLi and Mark S. Drew, “Fundamentals of Multimedia”, First Edition, 2004, PHI Learning Pvt. Ltd., New Delhi.

Reference Books:

1. Plastock : Theory & Problem of Computer Gaphics, Schaum Series.
2. Foley & Van Dam : Fundamentals of Interactive Computer Graphics, Addison- Wesley.
3. Newman : Principles of Interactive Computer Graphics, McGraw Hill.
4. Tosijasu, L.K. : Computer Graphics, Springer-Verleg.
5. S. Gokul : Multimedia Magic, BPB Publication.
6. Bufford : Multimedia Systems, Addison Wesley.
7. Jeffcoate : Multimedia in Practice, Prectice-Hall.
8. Any other book(s) covering the contents of the paper in more depth.

Note : Latest and additional good books may be suggested and added from time

BCA-204	DESIGN & ANALYSIS OF ALGORITHMS	L T P	Cr
		3 1 0	4

OBJECTIVE

To relay the theoretical and practical aspects of design of algorithms.

PRE-REQUISITES

Knowledge of fundamentals of basic computer programming for implementing algorithms.

COURSE OUTCOMES

CO1: Define the basic concepts of algorithms and analyze the performance of algorithms.
CO2: Discuss various algorithm design techniques for developing algorithms.
CO3: Discuss various searching, sorting and graph traversal algorithms.
CO4: Understand NP completeness and identify different NP complete problems.
CO5: Discuss various advanced topics on algorithms.

UNIT I

MATHEMATICAL PRELIMINARIES: Role of algorithm in computing; mathematical preliminaries; review of growth functions; solution of difference equations; analysis in terms of space and time complexity.

UNIT II

SORTING: Insertion sort; merge sort; heap sort; quick sort; radix sort, bucket sort, bubble sort, selection sort.

UNIT III

ADVANCED DATA STRUCTURES: Stack; queue; linked list; binary search trees; red black trees.

UNIT IV

DYNAMIC PROGRAMMING AND GREEDY ALGORITHM: Matrix multiplications; longest common subsequence, Huffman coding; task scheduling problem.

UNIT V

ELEMENTARY GRAPH ALGORITHM AND MINIMUM SPANNING TREE: Representation of graph; breadth-first search; depth first search; topological sort; strongly connected components, Growing a minimum spanning tree; Kruskal & Prims algorithms.

TEXT BOOK

Cormen Thomas H., Leiserson Charles E. and Rivest Ronald L., "Introduction to Algorithms", Tata McGraw Hill, 1990.

REFERENCE BOOKS

1. V. Aho, J. E. Hopcroft, J. D. Ullman, "The Design and Analysis of Computer Algorithms", Addition Wesley, 1998.
2. Ellis Horowitz and Sartaz Sahani, "Computer Algorithms", Galgotia Publications, 1999.
3. E. Knuth, "The Art of Computer Programming", 2nd Ed., Addison Wesley, 1998

BCA-216	Software Engineering and Testing	L T P	Cr
		3 1 0	4

OBJECTIVE

To provide basic knowledge of properties of software and its development processes, software quality, CASE tools, etc.

PRE-REQUISITE:

Knowledge of Fundamentals of Mathematics and Linear Algebra

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To learn the basic concepts of software engineering
CO2: To know about the requirements and process to engineer the software
CO3: To learn how to design a software & what are its strategies
CO4: To aware about the coding, testing & maintenance of software
CO5: To know about different metrics used for software evaluation

UNIT I

BASIC CONCEPT OF SOFTWARE ENGINEERING: Introduction to Software Engineering, Definition of Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Applications, Software Myths. Software Development Life Cycle Model: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.

UNIT II

SOFTWARE REQUIREMENT SPECIFICATIONS: Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Control Flow Model, SRS Document, IEEE Standards for SRS, Data Dictionary.

UNIT III

SOFTWARE DESIGN: Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Top-Down and Bottom-Up Design.

UNIT IV

SOFTWARE TESTING & MAINTENANCE &CODING: Top-Down and Bottom –Up programming, structured programming, Code Inspection, Compliance with Design and Coding Standards. Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Alpha and Beta Testing of Products. Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering.

UNIT V

SOFTWARE MEASUREMENT & MATRICES: Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management. , Quality Assurance, Quality Control, Software Quality Attributes, Software Quality Assurance (SQA): Verification and Validation

TEXT BOOK:

Pressman Roger S., "Software Engineering – A Practitioner's Approach", 6th Edition, McGraw Hill, 2004.

REFERENCE BOOKS

1. Aggarwal KK, Singh, Yogesh, "Software Engineering", New Age International, 2000.
2. Jalote Pankaj,"An Integrated Approach to Software Engineering", 3rd edition, Narosa, 2005.
3. Sommerville Ian, Pearson Education, "Software Engineering", 5th edition, Addison Wesley, 1999.

BCA-303	PROGRAMMING IN C#	L-T-P	Cr
		3-0-0	3

OBJECTIVE

To equip students with C# programming Concepts

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To know the basics of Dot net programming language

CO2: To aware about different programming languages via differences & comparison

CO3: To learn about the basics of C# programming

CO4: To know about the different statements and controls in C# programming

CO5: To learn about different database connectivity's like ADO etc.

UNIT I

PHILOSOPHY OF .NET AND ITS MAJOR COMPONENTS: Origin of .NET technology; .NET platform; benefits and limitations of .NET; building blocks of .NET framework; .NET programming languages; .NET types and namespaces; Understanding CLR, CTS and CLS; developing C# Applications using Visual Studio .Net

UNIT II

EVOLUTION OF C#: comparison among C++; Java and C#; benefits of C#; object-oriented programming using C#

UNIT III

C# PROGRAMMING: introduction to C#; creating a C# program; types in C#; classes; inheritance and polymorphism; methods; statements and control; arrays and strings; interfaces; abstract and base classes.

UNIT IV

STATEMENTS AND CONTROL: Properties and Indexers; delegates and their usefulness; I/O in C#; exception and error handling in C#.

UNIT V

ADO .NET AND ASP.NET: comparison of ADO and ADO. NET; introduction to data access with ADO.NET components of ADO.NET; Comparison of ASP and ASP .NET; features of ASP .NET; features provided by ASP .NET; web forms and their components.

TEXT BOOK:

Balaguruswammy, E, "Programming in C#", Tata McGraw Hill

REFERENCE BOOKS

1. Jain, V K, "The Complete Guide to C# Programming", IDG Books India.
2. Pappas & Murray, "C# Essentials", Prentice Hall of India
3. Gunnerson Eric, "A programmer's Introduction to C#", IDG Books
4. Wakefield, "C# and .NET Web Developers Guide", IDG Books India.

BCA-252	COMPUTER GRAPHICS & MATLAB LAB	L T P	Cr
		0 0 2	1

COURSE OUTCOMES

CO1: Understand the basic concepts of computer graphics.
CO2: Design scan conversion problems using C++ programming.
CO3: Apply clipping and filling techniques for modifying an object.
CO4: Understand the concepts of different type of geometric transformation of objects in 2D and 3D.
CO5: Understand the practical implementation of modelling, rendering, viewing of objects in 2D.

List of Experiments.

Basic

Program:1 Write a Program to draw basic graphics construction like line, circle, arc, ellipse and rectangle.
Program:2 Write a Program to draw animation using increasing circles filled with different colors and patterns.
Program:3 Program to draw India Gate using computer graphics in C.
Program 4:-Implement Brenham's line drawing algorithm for all types of slope.
Program 5:- Create and rotate a triangle about the origin and a fixed point.
Program 6: Draw a color cube and spin it using OpenGL transformation matrices.
Program 7: Draw a color cube and allow the user to move the camera suitably to experiment with perspective viewing.

Intermediate

Program 1:- Clip a lines using Cohen-Sutherland algorithm.
Program 2:- To draw a simple shaded scene consisting of a tea pot on a table. Define suitably the position and properties of the light source along with the properties of the surfaces of the solid object used in the scene.
Program 3:- Design, develop and implement recursively subdivide a tetrahedron to form 3D sierpinskigasket. The number of recursive steps is to be specified by the user.
Program 4:- Develop a menu driven program to animate a flag using Bezier Curve algorithm.
Program 5:- Develop a menu driven program to fill the polygon using scan line algorithm.

Advance

Program 1: Write a Program to print your name in Hindi script on console output in C.
Program 2: Write a Program control a ball using arrow keys.
Program 3: Write a Program to implement Digital Clock.
Program 4: Write a Program to implement bouncing ball using sine wave form.
Program 5: Write a Program to implement Bouncing Ball in vertical direction.
Program 6: Write a program of Translation, Rotation, and Scaling using Composite Transformation.

REFERENCE BOOKS

1. Pradeep Bhatia, "Computer Graphics", 2nd Edition, I K Publishers, 2009.

2. Computer Graphics by Donald Hearn and M. Pauline Baker, 2nd Edition, Prentice Hall of India, 1999
3. Procedural Elements for Computer Graphics, David F. Rogers, Tata McGraw Hill, Second Edition, 2001

BCA-353	PROGRAMMING IN C# LAB	L-T-P	Cr
		0-0-2	2

OBJECTIVE

To train the students with C# programming Concepts using implementation

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To know the basics of Dot net programming language
CO2: To implement operators used in C# Programming
CO3: To learn about constructors to be implemented
CO4: To know about the different functions & file operations in C# programming
CO5: To learn about different database connectivity's like ADO etc.

LIST OF EXPERIMENTS

1. Write a program in C# illustrating the use of sequence, conditional and iteration construct.
2. Write a program in C# illustrating various operators like logical, arithmetical, relational, etc.
3. Write a program in C# illustrating overloading of various operators.
4. Write a program in C# illustrating use of friend, inline and Static Member functions, default arguments.
5. Write a program in C# illustrating use of destructor and various types of constructor.
6. Write a program in C# illustrating various forms of inheritance.
7. Write a program in C# illustrating use of virtual functions, Virtual base class, delegates.
8. Write a program in C# illustrating file operations.
9. Write a program in C# illustrating simple web applications using ASP.net
10. Write a program in C# illustrating use of Active X Controls.

BCA-305	ARTIFICIAL INTELLIGENCE	L T P	Cr
		3-0-0	3

OBJECTIVE

To introduce about artificial intelligence approaches to problem solving, various issues involved and application areas

PRE-REQUISITES

Knowledge of data structures & discrete mathematics.

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To know the basics of artificial intelligence
CO2: To learn the different searching techniques of artificial intelligence
CO3: To learn about the representation of different information to produce a system
CO4: To know about different logics used
CO5: To aware about the uncertainties

UNIT I

INTRODUCTION: Definition of Artificial Intelligence (AI), Evolution of Computing History of AI, data, information and knowledge; AI problems and techniques – AI programming languages; problem space representation with examples, Applications of Artificial Intelligence.

UNIT II

SEARCH STRATEGIES GAME PLAYING: Breadth first search; Depth first search; heuristic search techniques: Hill climbing: Best first search; A* algorithm; AO* algorithm; Minimax search procedure.

UNIT III

PRODUCTION SYSTEM & KNOWLEDGE BASE REPRESENTATION: Production rules, the working memory, Recognize-act cycle, conflict resolution by Meta rules, Architecture of production system. Semantic net, Frames.

UNIT IV

PROPOSITIONAL LOGIC & PREDICATE LOGIC: Proposition, tautologies, Theorem proving, forward chaining, backward chaining, method of substitution, Alphabet of first order logic(FOL), predicate, well-formed formula, clause form, algorithm for writing sentence into clause form, Unification of predicates, unification algorithm, resolution Robinson's interface rule.

UNIT V

REASONING UNDER UNCERTAINITY: reasoning under uncertainty; non monotonic reasoning; review of probability; Baye's probabilistic interferences and Dempster Shafer theory; Heuristic methods; Fuzzy reasoning.

TEXT BOOK

Elaine Rich and Kevin Knight, "Artificial Intelligence", 3rd Edition, Tata McGraw Hill, 1991

REFERENCE BOOKS

1. Nils J Nilson, “Artificial Intelligence”, Harcourt Asia Pvt. Ltd.
2. Stuart Russell and Peter Norvig, “Artificial Intelligence: A Modern Approach”, Prentice Hall of India, 1998
3. O. W. Patterson, “Introduction to Artificial Intelligence & Expert Systems”, Prentice Hall of India
4. Patrick Henry Winston, “Artificial Intelligence”, 3rd Edition, Addition Wesley, 1992
5. Programming PROLOG, Clockson & Mellish, Narosa Publications

BCA-355	ARTIFICIAL INTELLIGENCE LAB	L T P	Cr
		0-0-2	1

OBJECTIVE

To introduce about artificial intelligence approaches to problem solving, various issues involved and application areas

PRE-REQUISITES

Knowledge of data structures

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To know the basics of python programming language
CO2: To learn the different iterative structures.
CO3: To learn about different problems and solution by python
CO4: To know about different searching methods
CO5: To aware about the natural language processing

LIST OF EXPERIMENTS

1. Study of Python programming language
2. Write programs to use iterative structures using Python (at least 3 programs)
3. Write programs to demonstrate inferencing/ deductive logic using Python (at least 3 programs)
4. Write a program to solve 8 queens problem.
5. Solve any problem using depth first search.
6. Solve any problem using best first search.
7. Solve 8-puzzle problem using best first search.
8. Solve Robot (traversal) problem using means End Analysis.
9. Solve traveling salesman problem.
10. Write program to exhibit the ability of building an Expert System.
11. Study the properties and issues of Natural Language Processing
12. Study the grammar mapping issues in language translation from English to Hindi and vice versa

REFERENCE BOOKS

1. Winston Patrick Henry, “Artificial Intelligence”, 3rd Edition, Addition Wesley, 1992

BCA-220	Elective-I A1 (PATTERN RECOGNITION)	L T P	Cr
		3 0 0	3

COURSE OUTCOMES

CO1: Explain and compare a variety of pattern classification, structural pattern recognition, and pattern classifier combination techniques.

CO2: Summarize, analyze, and relate research in the pattern recognition area verbally and in writing.

CO3: Apply performance evaluation methods for pattern recognition, and critique comparisons of techniques made in the research literature

CO4: Apply pattern recognition techniques to real-world problems such as document analysis and recognition.

CO5: Implement simple pattern classifiers, classifier combinations, and structural pattern recognizers.

UNIT I

INTRODUCTION: Basics of pattern recognition, Design principles of pattern recognition system, Learning and adaptation, Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.

UNIT II

STATISTICAL PATTEN RECOGNITION: Bayesian Decision Theory, Classifiers, Normal density and discriminant functions,

UNIT III

PARAMETER ESTIMATION METHODS: Maximum-Likelihood estimation, Bayesian Parameter estimation, Dimension reduction methods -Principal Component Analysis (PCA), Fisher Linear discriminant analysis, Expectation-maximization (EM), Hidden Markov Models (HMM), Gaussian mixture models.

UNIT IV

NONPARAMETRIC TECHNIQUES: Density Estimation, Parzen Windows, K-Nearest Neighbor Estimation, Nearest Neighbor Rule, Fuzzy classification.

UNIT V

UNSUPERVISED LEARNING & CLUSTERING: Criterion functions for clustering, Clustering Techniques:Iterative square - error partitional clustering – K means, agglomerative hierarchical clustering, Cluster validation.

REFERENCES:

1. Richard O. Duda, Peter E. Hart and David G. Stork, “Pattern Classification”, 2nd Edition, John Wiley, 2006.
2. C. M. Bishop, “Pattern Recognition and Machine Learning”, Springer, 2009.
3. S. Theodoridis and K. Koutroumbas, “Pattern Recognition”, 4th Edition, Academic Press, 2009.

BCA-222	ELECTIVE-I B1 (CYBER SECURITY)	L T P	Cr
		3 0 0	3

OBJECTIVES

To protect information and information infrastructure in cyberspace. To build capabilities to prevent and respond to cyber threats. To reduce vulnerabilities and minimize damage from cyber incidents through a combination of institutional structures, people, processes, technology and cooperation.

COURSE OUTCOMES

The students undergoing this course will be able to:
CO1: Introduce students to the fundamental concepts and principles of cybersecurity.
CO2: Provide students with an understanding of network security principles, protocols, and technologies.
CO3: Introduce students to the principles of cryptography and its application in securing information.
C04:Provide students with an understanding of the most common cybersecurity threats and methods to defend against them.
C05: Provide students with an understanding of cybersecurity governance and management principles and practices.

UNIT-I

INTRODUCTION TO CYBER SECURITY:Introduction to cybersecurity concepts, principles, and practices;Cybersecurity history, evolution, and future trends;Types of cyber threats and attacks;Risk management in cybersecurity;Cybersecurity laws, regulations, and ethics

UNIT II

NETWORK SECURITY:
Network security principles, protocols, and technologies;Wired and wireless network security;Network threats and attacks;Firewalls, intrusion detection and prevention systems;;Virtual Private Networks (VPNs) and secure remote access

UNIT III

CRYPTOGRAPHY:
Cryptography principles and concepts;Types of encryption algorithms;Symmetric and asymmetric key cryptography;Cryptographic protocols and applications;Digital signatures and certificates;

UNIT IV:

WEB AND APPLICATION SECURITY:
Web security principles and technologies;Common web vulnerabilities (e.g., XSS, CSRF, SQL injection);Secure coding practices and techniques;Application security testing and assessment;Secure software development lifecycle (SDLC);

UNIT V

INCIDENT RESPONSE AND MANAGEMENT:

Incident response planning and preparation;Incident detection, analysis, and response;Incident containment, eradication, and recovery;Cybersecurity incident management frameworks (e.g., NIST, ISO);Business continuity and disaster recovery planning;

REFERENCES

1. Cybersecurity: A Practical Guide to the Law of Cyber Risk by Edward R. McNicholas, et al.
2. Cybersecurity for Beginners: What You Must Know About Cybersecurity by Raef Meeuwisse.
3. Network Security Essentials: Applications and Standards by William Stallings.
4. Network Security: Private Communication in a Public World by Charlie Kaufman, et al.
5. Cryptography and Network Security: Principles and Practice by William Stallings.
6. Applied Cryptography: Protocols, Algorithms, and Source Code in C by Bruce Schneier.
7. Cybersecurity: Attack and Defense Strategies by Yuri Diogenes and Erdal Ozkaya.
8. Hacking Exposed 7: Network Security Secrets and Solutions by Stuart McClure, et al.
9. Cybersecurity and Cyberwar: What Everyone Needs to Know by P.W. Singer and Allan Friedman.
10. The Manager's Guide to Cybersecurity Law: Essentials for Today's Business by Tari Schreider.

BCA-224	Elective-I D1 (DATA MINING AND DATA WAREHOUSING)	L T P	Cr
		3 0 0	3

OBJECTIVE

This course introduces basic concepts, tasks, methods, and techniques in data mining. The emphasis is on various data mining problems and their solutions. Students will develop an understanding of the data mining process and issues, learn various techniques for data mining, and apply the techniques in solving data mining problems using data mining tools and systems. Students will also be exposed to a sample of data mining applications.

Pre-requisites

Introduction, Data Preprocessing- Data Integration and Transformation, Classification, Association Analysis, Cluster Analysis, Information Privacy and Data Mining, Advanced Applications, Data Warehouses, Capacity Planning

COURSE OUTCOMES

The students undergoing this course will be able to:

CO1: Understand the functionality of the various data mining and data warehousing component

CO2: Appreciate the strengths and limitations of various data mining and data warehousing models

CO3: Explain the analyzing techniques of various data

CO4: Describe different methodologies used in data mining and data ware housing.

CO5: Compare different approaches of data ware housing and data mining with various technologies.

UNIT I

DATA WAREHOUSING: Definition, usage and trends. DBMS vs data warehouse, data marts, metadata, multidimensional data mode, data cubes, schemas for multidimensional database: stars, snowflakes and fact constellations.

UNIT II

DATA WAREHOUSE ARCHITECTUREANDIMPLEMENTATION: OLTP vs. OLAP, ROLAP vs MOLAP, types of OLAP, servers, 3-Tier data warehouse architecture, distributed and virtual data warehouses, data warehouse manager, Computation of data cubes, OLAP queries manager, data warehouse back-end tools.

UNIT III

DATA MINING &ITS CURRENT TRENDS: Definition and task, KDD versus data mining, data mining techniques, Spatial databases, multimedia databases, time series and sequence data, mining text databases and mining Word Wide Web tools and applications. Strategy and business model current trends in data mining.

UNIT IV

DATA MINING QUERY LANGUAGES: Data specification, specifying knowledge, hierarchy specification, pattern presentation and visualization specification, data mining languages and standardization of data mining.

UNIT V

DATA MINING TECHNIQUES: Association rules, clustering techniques and implementation, decision tree knowledge discovery through neural networks and genetic algorithm, rough sets, support vector machines and fuzzy techniques.

TEXT BOOK

Data Mining Techbniques by ArjunPujri,PHI, Publication

REFERENCES:

1. Berson, “Data Warehousing, Data-Mining & OLAP”, TMH
2. Mallach, “Decision Support and Data Warehousing System”, TMH
3. Bhavani Thura-is-ingham, “Data-Mining Technologies, Techniques Tools & Trends”, CRC Press
4. Navathe, “Fundamental of Database System”, Pearson Education
5. Margaret H. Dunham, “Data-Mining. Introductory & Advanced Topics”, Pearson Education
6. Pieter Adriaans, Dolf Zantinge, “Data-Mining”, Pearson Education

Syllabus of Semester- V

BCA-314	Android Programming	L T P	Cr
		3 0 0	3

OBJECTIVES

- Creating robust mobile applications and learn how to integrate them with other services.
- Creating intuitive, reliable mobile apps using the android services and components.
- Create a seamless user interface that works with different mobile screens.

PRE-REQUISITES

Knowledge of Java programming language that underpins all Android development

COURSE OUTCOMES

Students after undergoing this course will be able to:

CO1: Build enterprise level mobile applications with Kotlin on Android..
CO2: Understand both the basic and advanced concepts of Kotlin..
CO3: Understand why use Kotlin over Java. Install and configure Android Studio.
CO4: Understanding the database deployment in android studio.
CO4 Deploy the application on Google Play.

.**Unit 1**

Android and its tools: Introduction to Android, open handset alliance, Android Ecosystem, Need of Android, Features of Android, Tools and software required for developing android application, android architecture. Operating systems, Java, JDK, Android SDK, Android development tools (ADT), Android virtual devices (AVDs), Emulators, Dalvik Virtual Machine, Difference between JVM and DVM, Steps to install and configure Android Studio and SDK.

Unit II

UI components and layout: Control Flow, Directory Structure Components of a screen, Fundamental UI Design Linear Layout; Absolute Layout; Frame Layout; Table Layout; Relative Layout.

Unit III

Designing user Interface with view: Text View, Edit Text; Button, Image Button; Toggle Button; Checkbox; Progress Bar, List View; Grid View; Image View; Scroll View; Custom Toast Time and Date Picker.

Unit IV

Activity and Multimedia with databases: Intent, Intent Filter, Activity Lifecycle; Broadcast Lifecycle, Content Provider; Fragments Service: Features Of service, Android platform service, Defining new service, Service Lifecycle, Permission, example of service. Android System Architecture, Multimedia framework, play audio and Video, Text to speech, Sensors, Async tasks Audio Capture, Camera Bluetooth, Animation, SQLite Database, necessity of SQLite, creation and connections of the database, extracting value from cursors, transactions.

Unit V

Security and application deployment: MS Telephony, Location Based Services: Creating the project, Getting the maps API key, Displaying the map, Displaying the zoom control, navigating to a specific location, adding markers, getting location, Geocoding and reverse Geocoding, Getting Location data, Monitoring. Android security model, declaring and using permissions, using custom permissions. Application deployment: creating small applications,

signing of applications, deploying apps on google play store, become a publisher, developer console.

Text Books :

1. Dawn Griffiths, David Griffiths “Headfirst Android Development” November 2021 O'Reilly Media, Inc.
2. Barry Burd, “Java Programming for Android Developers for Dummies.2nd edition”, Wiley.

Reference books:

mark murphy ,”The Busy Coder's Guide to Advanced Android Development” Commons Ware

John Horton “Android Programming with Kotlin for Beginners” 1st edition Packt Publishing Limited.

Michael Burton Android App Development FD 3rd edition For Dummies

BCA-315	DIGITAL MARKETING	L T P	Cr
		3 1 0	4

OBJECTIVE

The course will mainly familiarize students with its basics and fundamental components, techniques and tools. It aims to impart the learner with the key features of Digital Marketing, Video Marketing, E-mail Marketing, Content Marketing, Budgeting, and Planning.

COURSE OUTCOMES

CO1: Understand the basic concept of Digital Marketing.
CO2: Understand the techniques and tools for content Marketing and Email Marketing.
CO3: Understand the concept and techniques of social media marketing and video marketing.
CO4: Understand the techniques and tools of Google Analytics and Web Analytics and introduction to CRM platform its model and strategies.
CO5: Understand the Concept of Digital Marketing Budgeting and Planning.

UNIT I

INTRODUCTION TO DIGITAL MARKETING: Principles of Digital Marketing; Digital Marketing Channels; Tools to Create Buyer Persona; Competitor Research Tools, Website Analysis Tools, etc.

UNIT II

CONTENT MARKETING: Content Marketing Concepts & Strategies; Planning, Creating, Distributing & Promoting Content; Optimize Website UX & Landing Pages; Measure Impact; Metrics & Performance; Using Content Research for Opportunities, etc.

E-MAIL MARKETING: Effective E-mail Campaigns; E-mail Plan; E-mail Marketing Campaign Analysis; Measuring Conversions & keeping up, etc.

UNIT III

SOCIAL MEDIA MARKETING: Introduction; Major Social Media Platforms for Marketing; Developing Data-driven Audience & Campaign Insights; Social Media for Business; Creation & Optimization of Social Media Campaigns, etc.

VIDEO ADVERTISING: Basics of Video Advertising; Creating Video Campaigns; Measurement & Optimization; Creating & Managing a YouTube Channel; Targeting Video Campaigns

UNIT IV

WEB ANALYTICS & GOOGLE ANALYTICS: Google Analytics Tools; Web Analytics Tools, etc.

INTRODUCTION TO CRM: Fundamentals to CRM; CRM Platforms; CRM Models; CRM Strategy, etc.

UNIT V

DIGITAL MARKETING BUDGETING: Digital Marketing Budget & Plan; Resource Planning; Cost Estimating; Cost Budgeting; Cost Control

REFERENCE BOOKS

1. Digital Marketing for Dummies by Ryan Deiss & Russ Henneberry
2. New Rules of Marketing and PR by David Meerman Scott
3. Epic Content Marketing: How to Tell a Different Story, Break Through the Clutter, and Win More Customers by Marketing Less by Joe Pulizzi
4. Digital Marketing Strategy: An Integrated Approach to Online Marketing by Simon Kingsnorth.

BCA-317	STATISTICAL LEARNING THEORY	L T P	Cr
		3-1-0	4

COURSE OUTCOMES

CO1: To learn existing statistical algorithms of Machine Learning (ML) and Pattern Recognition (PR).

CO2: To understand the difference between Classification and Regression

CO3: To have hands-on experience in implementing various ML and PR techniques on different datasets.

CO4: To learn to compare the performance of two learning systems.

CO5: To study few optimization methods used to estimate the parameters of a model during training.

UNIT I

Probabilistic formulations of prediction problems, Plug-in estimators, empirical risk minimization linear threshold functions, perceptron algorithm

UNIT II

ERM (+Tikhonov Regularization), Iterative regularization by early stopping, SRM , Linear Models of Regression, Subset Selection methods, Shrinkage methods, Ridge regression

UNIT III

Game-theoretic formulations of prediction problems, Minimax strategies for log loss, linear loss, and quadratic loss, Universal portfolios, Online convex optimization

UNIT IV

Neural network, Stochastic gradient methods, Combinatorial dimensions and Hardness results for learning, Efficient learning algorithms

UNIT V

Kernel methods, , Mercer's theorem, Convex optimization for kernel methods, , Ensemble methods, AdaBoost, Convergence and consistency of AdaBoost

TEXTBOOKS

1. Mello, R. F., & Ponti, M. A. (2018). Machine learning: a practical approach on the statistical learning theory. Springer.
2. Hastie, T., Tibshirani, R., Friedman, J. H., & Friedman, J. H. (2009). The elements of statistical learning: data mining, inference, and prediction (Vol. 2, pp. 1-758). New York: springer.

REFERENCES

1. A Probabilistic Theory of Pattern Recognition, Devroye, Gyorfi, Lugosi, Springer
2. The Elements of Statistical Learning, Hastie, et al, Springer
3. Combinatorial methods in density estimation, Devroye and Lugosi, Springer
4. Statistical Learning Theory, Vapnik, Wiley
5. An Introduction to Computational Learning Theory, Kearns and Vazirani, MIT Press

BCA-364	Android Programming Lab	L T P	Cr
		0 0 2	1

COURSE OUTCOMES:

CO1: Understand the basic concepts of java and android programming.
CO2: Apply the concepts of android programming in with kotlin .
CO3: Apply clipping and filling techniques for modifying an object.
CO4: Understand the concepts database and deployment to IDE.
CO5: Understand the practical implementation and deploy the apps on Google play store.

Android Programming Lab Experiments

Basic

1. Develop a program to implement frame layout, table layout and relative layout.
2. Develop a program to implement Text View and Edit Text.
3. Develop a program to implement Auto Complete Text View.
4. Develop a program to implement Button, Image Button and Toggle Button.
5. Develop a program to implement login window using above controls.
6. Develop a program to implement Checkbox.
7. Develop a program to implement Radio Button and Radio Group.
8. Develop a program to implement Progress Bar.
9. Develop a program to implement List View, Grid View, Image View and Scroll View.
10. Develop a program to implement Custom Toast Alert.
11. Develop a program to implement Date and Time Picker.
12. Develop a program to create an activity.
13. Develop a program to implement new activity using explicit intent and implicit intent.

Intermediate

14. Develop a program to implement content provider.
15. Develop a program to implement broadcast receiver.
16. Develop a program to implement sensors.
17. Develop a program to build Camera.
18. Develop a program for providing Bluetooth connectivity.
19. Develop a program for animation.
20. Perform Async task using SQLite.

Advance

1. Write a Program How to Save ArrayList to SharedPreferences in Android?
2. How to Add Views Dynamically and Store Data in Arraylist in Android?
3. Write a Program to implement Volley Library in Android?
4. Write a Program JSON Parsing in Android
5. Write a Program JSON Parsing in Android using Volley Library
6. Write a Program How to Extract Data from JSON Array in Android using Volley Library?
7. Write a Program to Create sample application with login module. (Check username and password) On successful login, Change Text View "Login Successful". And on login fail, alert user using Toast "Login fail".
8. Write a Program to Create login application where you will have to validate username and password till the username and password is not validated, login button should remain disabled.

Mini Project

Program: How to Build a Grocery Android App?

Reference book:

1. Write a program GUI Design for Android Apps Authors Ryan Cohen, Tao Wang.

ELECTIVE- II
BUCKET A2

BCA-319	Elective-II (A2) (Machine Learning)	L T P 3-0-0	Cr 3

COURSE OBJECTIVE: The main objective of this course is to enabling the student with basic knowledge on the techniques to build an intellectual machine for making decisions behalf of humans. This course covers the techniques on how to make learning by a model, how it can be evaluated, what are all different algorithms to construct a learning model.

PRE-REQUISITES: Knowledge of python programming and probability and statistics.

COURSE OUTCOMES

CO1: Understand the structure, syntax, and semantics of the python language.
CO2: Appreciate the importance of visualization in the data analytics solution.
CO3: Identify various machine learning algorithms and terminologies and perform data pre-
processing using standard ML library.
CO4: Understand appropriate unsupervised learning algorithms for performing clustering
and dimensionality reduction.
CO5: Implement probabilistic graphical models for suitable applications.

UNIT I: CONCEPTS OF PYTHON PROGRAMMING:

Python data structures, Control statements, Functions, Object Oriented programming concepts using classes, objects and methods, Exception handling, Implementation of user-defined Modules and Package, File handling in python.

UNIT II: INTRODUCTION TO MACHINE LEARNING:

Machine Learning Fundamentals –Types of Machine Learning - Supervised, Unsupervised,
Reinforcement- The Machine Learning process.
Terminologies in ML- Testing ML algorithms: Overfitting, Training, Testing and Validation Sets
Confusion matrix -Accuracy metrics- ROC Curve- Basic Statistics: Averages, Variance and Covariance,
The Gaussian- The Bias-Variance trade off- Applications of Machine Learning.

UNIT III: SUPERVISED LEARNING:

Regression: Linear Regression – Multivariate Regression- Classification: Linear Discriminant Analysis,
Logistic Regression- K-Nearest Neighbor classifier.
Decision Tree based methods for classification and Regression- Ensemble methods.

UNIT IV: UNSUPERVISED LEARNING:

Clustering- K-Means clustering, Hierarchical clustering - The Curse of Dimensionality -Dimensionality
Reduction - Principal Component Analysis - Probabilistic PCA- Independent Components analysis.

UNIT V: PROBABILISTIC GRAPHICAL MODELS:
Bayesian Networks - Learning Naive Bayes classifiers-Markov Models – Hidden Markov Models.Sampling – Basic sampling methods – Monte Carlo -Reinforcement Learning.

TEXT-BOOKS

1. Machine Learning: An Algorithmic Perspective by Stephen Marsland, Chapman and Hall/CRC.
2. T. Mitchell, Machine Learning, McGraw Hill.
3. M. Gopal, Applied Machine Learning, McGraw Hill.
4. Sutton R. S. and Barto, A. G., Reinforcement Learning: An Introduction, The MIT Press (2017).

REFERENCE-BOOKS

1. Introduction to Machine Learning by Ethem Alpaydin, PHI Learning.
2. M. Evangelia, Supervised and Unsupervised Pattern Recognition, CRC Press.
3. G. James, D. Witten, T. Hastie, R. Tibshirani, Introduction to Statistical Learning, Springer.

BCA-369	Elective-II (A2) (Machine Learning Lab)	L T P 0 0 2	Cr 1

LIST OF EXPERIMENTS

1. Installation of Python / Python Libraries.
2. Data pre-processing using Python Machine Learning libraries.
3. Design a model to predict the housing price using Multivariate Linear Regression.
4. 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 data sets.
5. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions.
6. Build a classifier using Logistic Regression, k- Nearest Neighbor to classify whether the given user will purchase a product or not from a social networking dataset.
7. Segment a customer dataset based on the buying behavior of customers using K-means.
8. Implement the decision tree using publically available dataset.
9. Dimensionality reduction of any CSV/image dataset using Principal Component Analysis.
10. Build an email spam classifier using SVM.

TEXT-BOOKS

1. Machine Learning: An Algorithmic Perspective by Stephen Marsland, Chapman and Hall/CRC.
2. T. Mitchell, Machine Learning, McGraw Hill.
3. M. Gopal, Applied Machine Learning, McGraw Hill.
4. Sutton R. S. and Barto, A. G., Reinforcement Learning: An Introduction, The MIT Press (2017).

REFERENCE-BOOKS

1. Introduction to Machine Learning by Ethem Alpaydin, PHI Learning.
2. M. Evangelia, Supervised and Unsupervised Pattern Recognition, CRC Press.
3. G. James, D. Witten, T. Hastie, R. Tibshirani, Introduction to Statistical Learning, Springer.

BCA-304	Elective – II A2 (NEURAL NETWORK)	L T P	Cr
		3 0 0	3

OBJECTIVE

To study various algorithms and their implementation in real life and in different domains**.**

PRE-REQUISITES

Knowledge of Applied Mathematics and basic calculation techniques of matrices.

COURSE OUTCOMES

The students undergoing this course will be able to:

CO1: Model Neuron and Neural Network, and to analyze ANN learning, and its applications
CO2: Perform Pattern Recognition, Linear classification.
CO3: Develop different single layer/multiple layer Perception learning algorithms
CO4: Design of another class of layered networks using deep learning principles.

UNIT I

Overview of biological neurons: Structure of biological neurons relevant to ANNs.

UNIT II

Fundamental concepts of Artificial Neural Networks: Models of ANNs; Feed forward & feedback networks; learning rules; Hebbian learning rule, perception learning rule, delta learning rule, Widrow-Hoff learning rule, correction learning rule, Winner lake all learning rule, etc.

UNIT III

Single layer Perception Classifier: Classification model, Features & Decision regions; training & classification using discrete perception, algorithm, single layer continuous perception networks for linearly separable classifications.

UNIT IV

Multi-layer Feed forward Networks: linearly non-separable pattern classification, Delta learning rule for multi-perceptron layer, generalized delta learning rule, Error back propagation training, learning factors, Examples.

UNIT V

Single layer feedback Networks: Basic Concepts, Hopfield networks, Training & Examples, associative memories

TEXT BOOKS

Introduction to artificial neural systems by Jacek M. Zurada, 1994, Jaico Publ.House.

REFERENCE BOOKS

1. Neural Networks :A Comprehensive formulation , Simon Haykin, 1998, AW
2. Neural Networks , Kosko, 1992, PHI.
3. Neural Network Fundamentals N.K. Bose , P. Liang, 2002, T.M.H

BCA-354	Elective-II A2 (NEURAL NETWORK LAB)	L T P 0 0 2	Cr 1

COURSE OUTCOMES

CO1: Implement the Neuron and Neural Network, and to analyze ANN learning, and its applications

CO2: Implement and Perform Pattern Recognition, Linear classification.

CO3: Develop different single layer/multiple layer Perception learning algorithms

LIST OF EXPERIMENTS

1. Study of NN toolbox
2. Study of Python functions
3. To perform basic matrix operations.
4. To plot the following
   (a) A straight line
   (b) A sine curve.
5. To generate a few activation functions that is used in neural networks in Python.
6. To plot hard limit transfer function.
7. To generate XOR function using McCullock Pitts Neural Network in Python.
8. To generate AND-NOT function using McCullock Pitts Neural Network in Python.
9. To use Hebbian Network to classify 2-Dimentional input pattern.
10. Write a Python program for perceptron net for and function with bipolar input and targets.

REFERENCE BOOKS

Haykin Simon, ―Neural Networks: A Comprehensive Formulation‖, Addison Wesley

ELECTIVE-II
BUCKET B2

BCA-323	Elective-II B2 (Ethical Hacking)	L-T-P	Cr
		3-0-0	3

OBJECTIVES:

Ethical hacking is performed with the objective's authorization. The plan of ethical hacking is to **find vulnerabilities** from a hacker's perspective so frameworks can be better secured. It's a piece of a general data chance administration program that takes into account progressing security enhancements.

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To gain knowledge about Ethical hacking and penetration testing.

CO2 To learn about various types of attacks, attackers, security threats, and vulnerabilities in the computer system.

CO3 To examine how social engineering can be done by attackers to gain access to useful & sensitive information about confidential data.

CO4 To learn about cryptography, and the basics of web application attacks.

CO5 To gain knowledge of the tools, techniques and ethical issues likely to face the domain of ethical hacking and ethical responsibilities.

UNIT-I

Ethical Hacking: Introduction, Networking & Basics, Foot Printing, Google Hacking, Scanning, Windows Hacking, Linux Hacking, Trojans & Backdoors, Virus & Worms

UNIT-II

Proxy & Packet Filtering, Denial of Service, Sniffer, Social Engineering System and Network Vulnerability and Threats to Security, Various types of attack and the various types of attackers in the context of the vulnerabilities associated with computer and information systems and networks Physical Security, Steganography,

UNIT-III

Introduction to security attacks, services and mechanism, Classical encryption techniques - substitution ciphers and transposition ciphers, cryptanalysis, steganography, Stream and block ciphers.Modern Block Ciphers:Block ciphers principles, Shannon’s theory of confusion and diffusion, fiestal structure, Data encryption standard(DES), Strength of DES, Idea of differential cryptanalysis, blockcipher modes of operations, Triple DES

UNIT-IV

Cryptography, Wireless Hacking, Firewall & Honeypots, IDS & IPS, Vulnerability, Penetration Testing, Session Hijacking, Hacking Web Servers, SQL Injection, Cross Site Scripting, Exploit Writing, Buffer Overflow,

UNIT-V

Reverse Engineering, Email Hacking, Incident Handling & Response, Bluetooth Hacking, Mobile Phone Hacking Basic ethical hacking tools and usage of these tools in a professional environment. Legal, professional and ethical issues likely to face the domain of ethical hacking. Ethical responsibilities, professional integrity and making appropriate use of the tools and techniques associated with ethical hacking

TEXTBOOKS:

1. Engebretson, P. (2013). The basics of hacking and penetration testing: ethical hacking and penetration testing made easy. Elsevier.
2. Najera-Gutierrez, G., & Ansari, J. A. (2018). Web Penetration Testing with Kali Linux: Explore the methods and tools of ethical hacking with Kali Linux. Packt Publishing Ltd.
3. Li, L., Li, Z., Shahriar, H., Rutherfoord, R., Peltsverger, S., & Tatum, D. (2018). Ethical Hacking: Network Security and Penetration Testing.

REFERENCE BOOKS:

1. Simpson, M. T., Backman, K., & Corley, J. (2010). Hands-on ethical hacking and network defense. Cengage Learning.
2. Baloch, R. (2017). Ethical hacking and penetration testing guide. Auerbach Publications.

BCA-373	Elective-II B2 (Ethical Hacking Lab)	L-T-P	Cr
		0-0-2	1

OBJECTIVE

To provide knowledge about implementation of practical aspects of Ethical Hacking

Course Outcomes:

CO1. Gain knowledge of the use and availability of tools to support an ethical hack

CO2. Gain the knowledge of interpreting the results of a controlled attack

CO3. Plan a vulnerability assessment and penetration test for a network.

CO4. Execute a penetration test using standard hacking tools in an ethical manner.

CO5. Report on the strengths and vulnerabilities of the tested network.

LIST OF EXPERIMENT:

1. Setup a honey pot and monitor the honey pot on the network
2. Write a script or code to demonstrate SQL injection attacks
3. Create a social networking website login page using phishing techniques
4. Write a code to demonstrate DoS attacks
5. Install rootkits and study a variety of options
6. Study of Techniques uses for Web-Based Password Capturing.
7. Install the jcrypt tool (or any other equivalent) and demonstrate Asymmetric, Symmetric Crypto algorithm, Hash, and Digital/PKI signatures studied in theory Network Security and Management
8. Implement Passive scanning, active scanning, session hijacking, cookies extraction using Burp suit tool

BCA-321	Elective-II (B2) (CLOUD COMPUTING)	L T P	Cr
		3-0-0	3

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 OUTCOMES

The students undergoing this course will be able:

CO1: To learn the basic concepts of CLOUD computing.
CO2: To aware about the.Cloud Insights Architectural influences
CO3: To know about the Cloud Architecture .
CO4: To aware about Cloud Simulators
CO5: To learn about the basic of VMWare.

UNIT I

CLOUD COMPUTING OVERVIEW : Origins of Cloud computing – Cloud components - Essential characteristics – On-demand selfservice, 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 BOOK :

1. Architecting the Cloud: Design Decisions for Cloud Computing Service Models(SaaS, PaaS, and IaaS) (Wiley CIO) by Michael J. Kavis(Author)
2. Cloud Computing: SaaS, PaaS, IaaS, Virtualization, Business Models, Mobile,Security and More by Kris Jamsa(Author)

REFERENCES :

1. Cloud Computing ñ An Introduction bySubuSangameswar
2. Mastering Cloud Computing Paperback by Buyya (Author), Vecchiola (Author),Selvi (Author)
3. Cloud Computing for Complete Beginners: Building and Scaling High-PerformanceWeb Servers on the Amazon Cloud by IkramFatah

BCA-371	Elective-II (B2) Cloud Computing Lab	L T P	Cr
		0 0 2	1

List of Practicals:

1. Open Stack Installation
2. Familiarize with OpenStack dashboard
3. deploy a virtual machine instance
4. Deploy a Linux VM from an ISO Image
5. Deploy a VM from an image snapshot
6. User and Project management
7. Common Cloud Management tasks
8. Adding a new compute note
9. Overview of Nagios
10. Overview of Openstack CLI

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:

- Cloud computing 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-327	Elective-II D2 (BIG DATA ANALYSIS)	L T P	Cr
		3-0-0	3

OBJECTIVE

To give the students knowledge about Big data and uses of it in the real world.

COURSE OUTCOMES

The students undergoing this course will be able:
CO1: To learn the basic concepts of BIG DATA.
CO2: To aware about the basic concept of HADOOP.
CO3: To know about the eco system of HADOOP .
CO4: To aware about the use of No-SQL in BIG DATA.
CO5: To learn about the basic of machine learning

UNIT 1

INTRODUCTION TO BIG DATA: Types of Digital Data-Characteristics of Data – Evolution of Big Data – Definition of Big Data – Challenges with Big Data – 3Vs of Big Data – Non Definitional traits of Big Data – Business Intelligence vs. Big Data – Data warehouse and Hadoop environment – Coexistence. Big Data Analytics: Classification of analytics – Data Science – Terminologies in Big Data – CAP Theorem – BASE Concept.

UNIT 2

INTRODUCTION TO HADOOP: Features – Advantages – Versions – Overview of Hadoop Eco systems – Hadoop distributions – Hadoop vs. SQL – RDBMS vs. Hadoop – Hadoop Components – Architecture – HDFS – Map Reduce: Mapper – Reducer – Combiner – Partitioner – Searching – Sorting – Compression. Hadoop 2 (YARN): Architecture – Interacting with Hadoop Eco systems.

UNIT 3

HADOOP ECO SYSTEMS: Hive – Architecture – data type – File format – HQL – SerDe – User defined functions – Pig: Features – Anatomy – Pig on Hadoop – Pig Philosophy – Pig Latin overview – Data types – Running pig – Execution modes of Pig – HDFS commands – Relational operators – Eval Functions – Complex data type – Piggy Bank – User defined Functions – Parameter substitution – Diagnostic operator.

UNIT 4

NOSQL: Types of Databases – Advantages – NewSQL – SQL vs. NOSQL vs NewSQL. Mongo DB: Introduction – Features – Data types – Mongo DB Query language – CRUD operations – Arrays – Functions: Count – Sort – Limit – Skip – Aggregate – Map Reduce. Cursors – Indexes – Mongo Import – Mongo Export. Cassandra: Introduction – Features – Data types – CQLSH – Key spaces – CRUD operations – Collections – Counter – TTL – Alter commands – Import and Export – Querying System tables.

UNIT 5

INTRODUCTION – Connecting to Mongo DB – Connecting to Cassandra – Introduction to Machine learning: Linear Regression – Clustering – Collaborative filtering – Association rule mining – Decision tree.

TEXT BOOK :

1. Tom White " Hadoop: The Definitive Guide" Third Edit on, O'reily Media, 2012.
2. Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.

REFERENCES :

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
2. Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press (2013)
3. Tom Plunkett, Mark Hornick, "Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop", McGraw-Hill/Osborne Media (2013), Oracle press.
4. Anand Rajaraman and Jef rey David Ulman, "Mining of Massive Datasets", Cambridge University Press, 2012.

BCA-377	Elective-II D2 (BIG DATA ANALYTICS Lab)	L-T-P	Cr
		0-0-2	1

List of Experiments:

1. Implement the following Data structures in Java
    1. Linked Lists

Stacks

    1. Queues
    2. Set
    3. Map
2. Perform setting up and Installing Hadoop in its three operating modes: Standalone, Pseudo distributed, Fully distributed.
3. Implement the following file management tasks in Hadoop:
    1. Adding files and directories
    2. Retrieving files
    3. Deleting files Hint: A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities.
4. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.
5. Write a Map Reduce program that mines weather data. Weather sensors collecting data everyhour at many locations across the globe gather a large volume of log data, which is a goodcandidate for analysis with MapReduce, since it is semi structured and record-oriented.
6. Implement Matrix Multiplication with Hadoop Map Reduce
7. Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data.
8. Install and Run Hive then use Hive to create, alter, and drop databases, tables, views, functions, and indexes.
9. Solve some real life big data problems.

Syllabus of Semester- VI

BCA-302	SOFTWARE PROJECT MANAGEMENT	L T P	Cr
		3 0 0	3

OBJECTIVE

To provide the foundation required for becoming a good software project manager by means of planning, evaluation and estimation, risk management, allocation and monitoring of resources, controlling software quality PRE-REQUISITES Knowledge of software engineering and the basic principles of management

COURSE OUTCOMES

The students after undergoing this course will be able to:

CO1: Identify the different project contexts and suggest an appropriate management strategy.
CO2: Practice the role of professional ethics in successful software development.
CO3: Identify and describe the key phases of project management.
CO4: Determine an appropriate project management approach through an evaluation of the business context and scope of the project.
CO5: Methods to Maintain the Software Quality Assurance

UNIT I

INTRODUCTION: Definition of a Software Project (SP), SP vs. other types of projects activities covered by SPM; categorizing SPs; project as a system; management control, requirement specification; information and control in organization

STEPWISE PROJECT PLANNING: Introduction, selecting a project; identifying project scope and objectives; identifying project infrastructure, analyzing project characteristics; identifying project products and activities; estimate efforts each activity; identifying activity risk; allocate resources; review/ publicize plan

UNIT II

PROJECT EVALUATION AND ESTIMATION: Cost benefit analysis; cash flow forecasting; cost benefit evaluation techniques; risk evaluation; Selection of an appropriate project report; Choosing technologies, choice of process model, structured methods: rapid application development, water fall, V-process-, spiral- models; Prototyping;

ACTIVITY PLANNING : Objectives of activity planning; project schedule; projects and activities; sequencing and scheduling activities, network planning model; representation of lagged activities; adding the time dimension, backward and forward pass; identifying critical path; activity throat, shortening project; precedence networks;

UNIT III

RESOURCE ALLOCATION AND MONITORING THE CONTROL: Introduction, the nature of resources, identifying resource requirements; scheduling resources creating critical paths; counting the cost; being specific; publishing the resource schedule; cost schedules, the scheduling sequence; Monitoring the control: Introduction, creating the frame work, collecting

the data, visualizing progress, cost monitoring, earned value, prioritizing monitoring, getting the project back to target, change control

UNIT IV

MANAGING CONTRACTS AND PEOPLE:, Introduction, types of contract, stages in contract, placement, typical terms of a contract, contract management, acceptance, Managing people and organizing terms: Introduction, understanding behavior, organizational behavior: a back ground, selecting the right person for the job, instruction in the best methods, motivation, working in groups, becoming a team, decision making, leadership, organizational structures, conclusion, further exercises

UNIT V

SOFTWARE QUALITY: Introduction; the place of software quality in project planning; the importance of software quality; defining software quality, ISO 9126; Practical software quality measures; product versus process quality management; 46 external standards; techniques to help enhance software quality; Study of any software project management software: viz Project 2005 or equivalent.

TEXT BOOKS

Bob Hughes and Mike Cotterell, ―Software Project Manag em ent‖, 2nd Edition, Tata McGraw Hill, 1999

REFERENCE BOOKS

1. Futrell, ―Software Quality & Project Manag em ent‖, Pearson Education, 2002.
2. Jalote Pankaj, Software Project Management, Pearson Education, 2002.
3. Gopalaswam y Ramesh, ―Managing Global Software Projects‖, Tata McGraw Hill, 2001
4. Pressman Roger S., ―Software Engineering – A Practitioner‘s Approach‖, 5th Edition, McGraw Hill, 2001
5. Walker Royce, ―Software Project Manag em ent‖, Addison Wesley, 1998
6. Maylor, ―Project Manag em ent‖, Third Edition, 2003.

Demarco Tom, ―Controlling Software Project Management and Measurem ent‖, Prentice Hall, 1982 8. Glib Tom and Susannah Finzi, ―Principles of Software Engineering Management‖, Addison Wesley, 1998.

BCA-309	NETWORK SECURITY MANAGEMENT	L T P	Cr
		3 0 0	3

OBJECTIVE

The main objective behind this course is to learn about the various network attacks and preventing attacks. This course is designed to cover Application security, Network security, Web security etc.

PRE-REQUISITES

Knowledge of data communications and computer networks, computer programming, data structures, mathematics, telecom network. Knowledge of digital signal processing is desirable

1. **Attacks on Computers & Computer Security:** Introduction; The need of Security ; Security Approaches; Principal of Security; Types of Attacks
2. **Cryptography :** Introduction; Plain Text & Cipher Text; Substitution Techniques; Transposition Techniques; Types of Cryptography; Steganography; Symmetric Key Algorithm: Algorithm Types and Modes, DES; Asymmetric Key Algorithm: RSA, Digital Signatures
3. **Digital Certificates and Public Key Infrastructure:** Digital Certificates ; Private Key Management; The PKIX Model ; Public Key Cryptography Standards; Creating Digital certificates using Java
4. **Internet Security Protocols:** Introduction; Secure Socket Layer(SSL); Secure Electronic Transaction(SET); Electronic Money; Email security; Wireless application protocol (WAP);Security in GSM: Security in 3G
5. **User Authentication and Kerberos:** Introduction ; Authentication Basics; Passwords; Authentication Tokens; Certificate Based Authentication; Biometric Authentication; Kerberos

TEXT BOOK

1. Atuk Kahate , "Cryptography and Network Security", 3rd Edition, Tata Mcgraw Hill

REFERENCE BOOKS

1. Stallings William, "Cryptography and Network Security", 4th Edition, Prentice-Hall, Englewood Cliffs, 2006
2. Mani Subramanian, "Network Management Principles & Practices", Addison Wesley, 1999
3. Kauffman C., Perlman R. and Spenser M., "Network Security", 2nd Edition, Prentice Hall, 2002.
4. Menezes Alfred, van Oorschot Paul, and Vanstone Scott, "Handbook of Applied Cryptography", CRC Press, NY, 2004.
5. Bellovin S. and Chesvick W., "Internet Security and Firewalls", 2nd Edition, Addison Wesley, 1998.
6. Schneier Bruce, "Applied Cryptography", Wiley Student Edition, 2nd Edition

ELECTIVE-III
BUCKET A3

BCA-320	Elective-III A3 (Soft Computing)	L-T-P 3-0-0

Course Objective:
This course enables the students:
1. To know the basic functions of different AI branches.
2. To understand the functionalities of neural networks .
3. To know the application of fuzzy logic.
4. To understand the basic functionalities of optimizations through soft computing.
5. To find the basic functions of soft computing.

Course Outcomes:
After the completion of this course, students will be able to:
CO1: Solve numerical on Fuzzy sets and Fuzzy Reasoning.
CO2: Develop Fuzzy Inference System (FIS).
CO3: Solve problems on Genetic Algorithms
CO4: Explain concepts of neural networks
CO5: Develop neural networks models for various applications.

UNIT – I
Introduction to Artificial Intelligence System, Neural Network, Fuzzy Logic & Genetic Algorithm. Fuzzy Set Theory: Fuzzy Versus Crisp, Crisp Set, Fuzzy Set, Crip Relation, Fuzzy Relations.

UNIT -II
Fuzzy System: Crisp Logic, Predicate Logic, Fuzzy Logic, Fuzzy Rule Based System, Defuzzification Methods, and Applications.

UNIT – III
Genetic Algorithms, Basic Concepts, Creation Of Offspring, Working Principle, Encoding, Fitness Function, Reproduction. Genetic Modeling, Inheritance Operations, Cross Over, Inversion And Deletion, Mutation Operator, Bit Wise Operators, Generation Cycle, Convergence Of Genetic Algorithm, Application, Multi-Level Optimization, Real Life Problems, Difference And Similarities Between GA And Other Traditional Methods, Advanced In GA.

UNIT- IV
Fundamentals Of Neural Networks, Basic Concepts Of Neural Network, Human Brain, Model Of An Artificial Neuron, Neural Network Architectures, Characteristic Of Neural Networks, Learning Method, History Of Neural Network Research, Early Neural Network Architectures, MP Neurons.

UNIT – V
Back Propagation Network Architecture Of Back Propagation Network, Back Propagation Learning, Illustration, Applications, Effect Of Tuning Parameters Of The Back Propagation Neural Network, Selection Of Various Parameters In BPN, Variations Of Standard Back

Propagation Algorithm. Associative Memory And Adaptive Resonance Theory, Autocorrelations, Hetrocorrelators , Multiple Training Encoding Strategy, Exponential BAM, Associative Memory For Real Coded Pattern Pairs, Applications, Introduction To Adaptive Resonance Theory.

Text Book:

1. Rajasekharan S. &Vijayalakshmi G. A. "Neural Network Fuzzy Logic and GenticAlgorithm Synthesis and Applications", Prentice Hall of India PLT, Pai, 2004.

Reference Book:

1.Jang JyhShing R, Sun C. T., Mizutani E. "Neuro Fuzzy and Soft Computing –A Computational Approach to Learning and Machine Intelligence", Prentice Hall of India, 1997.

BCA-370	Elective-III A3 (Soft Computing Lab)	L-T-P 0-0-2

LIST OF EXPERIMENTS

1. To perform Union, Intersection and Complement operations.
2. To implement De-Morgan's Law.
3. To plot various membership functions.
4. To implement FIS Editor. Use Fuzzy toolbox to model tip value that is given after a dinner based on quality ans service.
5. To implement FIS Editor.
6. Generate ANDNOT function using McCulloch-Pitts neural net.
7. Generate XOR function using McCulloch-Pitts neural net.
8. Hebb Net to classify two dimensional input patterns in bipolar with given targets.
9. Perceptron net for an AND function with bipolar inputs and targets.
10. To calculate the weights for given patterns using heteroassociative neural net.
11. To store vector in an auto-associative net.Find weight matrix & test the net with input
12. To store the vector ,find the weight matrix with no selfconnection.Test this using a discrete Hopfield net.

BCA-318	ELECTIVE-III A3 (NATURAL LANGUAGE PROCESSING)	L T P	Cr
		3 0 0	3

COURSE OUTCOMES

CO1: Understand Natural Language Processing and Probabilistic model of defining language and techniques
CO2: Applying Hidden Markov model and Speech Recognition
CO3: Application of context free grammar and language parsing
CO4: Implement probabilistic and language parsing.
CO5: Differentiation of semantic and discourse in terms of NLP

UNIT I

INTRODUCTION TO NATURAL LANGUAGE PROCESSING: Why is NLP hard, Empirical Laws, Text Processing: Basics, Spelling Correction: Edit Distance, Weighted Edit Distance, Other Variations, Noisy Channel Model for Spelling Correction, N-Gram Language Models, Evaluation of Language Models, Basic Smoothing

UNIT II

LANGUAGE MODELING: Advanced Smoothing Models, Computational Morphology, Finite - State Methods for Morphology, Introduction to POS Tagging, Introduction to POS Tagging, Viterbi Decoding for HMM, Parameter Learning, Baum Welch Algorithm, Maximum Entropy Models – I,II, Conditional Random Fields

UNIT III

SYNTAX: Introduction, Parsing I, CKY, PCFGs- Inside-Outside Probabilities, Dependency Grammars and Parsing – Introduction, Transition Based Parsing : Formulation, Learning , MST-Based Dependency Parsing-Learning

UNIT IV

DISTRIBUTIONAL SEMANTICS: Introduction, Structured Models, Word Embeddings, Lexical Semantics – Wordnet, Word Sense Disambiguation, Novel Word Sense detection, Topic Models : Introduction, Latent Dirichlet Allocation : Formulation, Gibbs Sampling for LDA, Applications, LDA Variants and Applications , Entity Linking

UNIT V

INFORMATION EXTRACTION: Introduction, Relation Extraction, Text Summarization – LEXRANK, Optimization based Approaches for Summarization, Text Classification, Sentiment Analysis- Affective Lexicons, Learning Affective Lexicons , Aspect - Based Sentiment Analysis

TEXT BOOKS:

1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and ImedZitouni, PearsonPublication.
2. Natural Language Processing and Information Retrieval: TanvierSiddiqui, U.S. Tiwary.
3. "Natural Language Understanding" James Allen, -1995Benjamin/cummings Pub. Comp. Ltd
4. "Language as a cognitive process", Terry Winograd 1983, AW
5. "Natural Language processing in prolog", G. Gazder, 1989, Addison Wesley.
6. " Introduction of Formal Language Theory", MdljArbib&Kfaury, 1988, Springer

REFERENCES

1. Speech and Natural Language Processing - Daniel Jurafsky& James H Martin, Pearson Publications.
2. https://nptel.ac.in/course.html/Natural Language Processing

BCA-368	ELECTIVE-III A3 (Natural Language Processing Lab)	L-T-P	Cr
		0-0-2	1

List of Experiments

1. Preprocessing of text (Tokenization, Filtration, Script Validation, Stop Word Removal, Stemming).

2. Study of Morphological Analysis.

3. Study and implement N-gram model.

4. Study and implement POS tagging.

5. Study of Chunking.

6. Study and working of Named Entity Recognition.

7. Virtual Lab on Word Generator.

8. Mini Project based on NLP Application.

BCA-316	ELECTIVE-III A3 (INTERNET OF THINGS)	L-T-P	Cr
		3-0-0	3

OBJECTIVE

It enables the students to describe what IoT is and how it works today, Recognise the factors that contributed to the emergence of IoT and Design and program IoT devices.

Pre-Requisites:

Basic knowledge of passive electrical & electronics components, basic programming such as C language, accessibility to the Hardware such as Arduino UNO & Arduino IDE.

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To Use real IoT protocols for communication

CO2: To Secure the elements of an IoT device

CO3: To Design an IoT device to work with a Cloud Computing infrastructure

CO4: Transfer IoT data to the cloud and in between cloud providers

CO5: To Define the infrastructure for supporting IoT deployments

UNIT I

IOT: What is the IoT and why is it important? Elements of an IoT ecosystem, Technology drivers, Business drivers, Trends and implications, Overview of Governance, Privacy and Security Issues

UNIT II

IOT PROTOCOLS: Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFIDProtocols – Issues with IoT Standardization – Unified Data Standards – Protocols – IEEE802.15.4–BACNet Protocol– Modbus – KNX – Zigbee– Network layer – APS layer – Security

UNIT III

IOT ARCHITECTURE:

IoT Open source architecture (OIC)- OIC Architecture & Design principles- IoT Devices and deployment models- IoTivity : An Open source IoT stack - Overview- IoTivity stack architecture- Resource model and Abstraction.

UNIT IV

WEB OF THINGS:

Web of Things versus Internet of Things – Two Pillars of the Web – Architecture Standardization for WoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals and Business Intelligence.

UNIT V

IOT APPLICATIONS:

IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications. Study of existing IoT platforms /middleware, IoT- A, Hydra etc

Textbook:

1. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press, 2012.
2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", Springer, 2011.
3. David Easley and Jon Kleinberg, "Networks, Crowds, and Markets: Reasoning About a Highly Connected World", Cambridge University Press, 2010.
4. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley, 2012.

References Books:

1. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)",1st Edition, VPT, 2014
2. Francis da Costa, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013 Cuno Pfister, Getting Started with the Internet of Things, O"Reilly Media, 2011, ISBN: 978-1- 4493-9357-1

BCA-366	ELECTIVE-III A3 (IoT LAB)	L-T-P	Cr
		0-0-2	1

OBJECTIVE

To study IOT, their characteristics of components and basic awareness of Arduino/ Raspberry Pi

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To know the basics of structured query language

CO2: To aware about applying different queries on database structured in the form of tables

CO3: To learn about the different SQL queries performed using operators as well as constraints

CO4: To create views from created table to further organize the data

CO5: To learn about the basic operations of relational algebra

LIST OF EXPERIMENTS/EXERCISES

Basic

1. To write a program to sense the available networks using Arduino.
2. To write a program to measure the distance using ultrasonic sensor and make LED blink using Arduino.
3. To write a program to detects the vibration of an object with sensor using Arduino.
4. To write a program to connect with the available Wi-Fi using Arduino.
5. To write a program to sense a finger when it is placed on the board Arduino.
6. To write a program to get temperature notification using Arduino.
7. To write a program for LDR to vary the light intensity of LED using Arduino.
8. To write a program to install MySQL database in Raspberry pi.
9. To write a program to work with basic MySQL queries by fetching data from database in Raspberry pi.
10. To write a program to switch light on when the input is 1 and switch the light off when the input is 0 using Raspberry pi.

ELECTIVE-III
BUCKET B3

BCA-322	ELECTIVE-III B3 (OBJECT ORIENTED ANALYSIS AND DESIGN)	L T P	Cr
		3 0 0	3

OBJECTIVE: To understand the Object-based view of Systems; To develop robust object-based models for Systems ;To inculcate necessary skills to handle complexity in software design

PRE-REQUISITE:

Knowledge of software engineering and OOPS

COURSE OUTCOMES

CO1: Understand basics of OOAD and Unified Process, Use case Diagram
CO2: To learn about the Static UML Diagrams.
CO3: To learn about Dynamic and implementation UML Diagrams
CO4: To learn about the Design Pattern
CO5: Testing the Design and Methodologies

UNIT I UNIFIED PROCESS AND USE CASE DIAGRAMS

Introduction to OOAD with OO Basics — Unified Process — UML diagrams — Use Case – Case study — the Next Gen POS system, Inception -Use case Modelling — Relating Use cases — include, extend and generalization — When to use Use-cases

UNIT II STATIC UML DIAGRAMS

Class Diagram—- Elaboration — Domain Model — Finding conceptual classes and description classes — Associations — Attributes — Domain model refinement — Finding conceptual class Hierarchies — Aggregation and Composition — Relationship between sequence diagrams and use cases — When to use Class Diagrams

UNIT III DYNAMIC AND IMPLEMENTATION UML DIAGRAMS

Dynamic Diagrams — UML interaction diagrams — System sequence diagram — Collaboration diagram — When to use Communication Diagrams — State machine diagram and Modelling – When to use State Diagrams — Activity diagram — When to use activity diagrams Implementation Diagrams — UML package diagram — When to use package diagrams — Component and Deployment Diagrams — When to use Component and Deployment diagrams

UNIT IV DESIGN PATTERNS

GRASP: Designing objects with responsibilities — Creator — Information expert — Low Coupling — High Cohesion — Controller Design Patterns — creational — factory method —

structural — Bridge — Adapter — behavioural — Strategy — observer –Applying GoF design patterns — Mapping design to code

UNIT V TESTING

Object Oriented Methodologies — Software Quality Assurance — Impact of object orientation on Testing — Develop Test Cases and Test Plans

TEXT BOOKS:

Ali Baharmi , ”Object Oriented system Development”, McGraw-Hill international Edition 2017.

REFRENCES:

1.Scott Meyers, Effective C++: 50 Specific Ways to Improve Your Programs and Designs, Addison-Wesley.

2. Scott Meyers, More Effective C++: 35 New Ways to Improve Your Programs and Designs, Pearson Education.

3.Bjarne Stroustrup, The C++ Programming Language, Addison-Wesley.

4.Andrei Alexandrescu, Modern C++ Design, Pearson Education India.

5.Erich Gamma, Richard Helm, Ralph Johnson, and John Vlissides, Design Patterns: Elements of Reusable Object-Oriented Software, Addison Wesley.

6.Russ Miles and Kim Hamilton , Learning UML 2.0: A Pragmatic Introduction to UML, O'Reilly.

BCA-372	ELECTIVE-III B3 (OBJECT ORIENTED AND DESIGN ANALYSIS LAB)	L-T-P	Cr.
		0-0-2	1

LIST OF EXPERIMENTS

BASIC CONCEPT OF C++

1. Write a program to show the concept reference type, call by reference & return by reference in C++
2. Write a program to show the concept of default arguments in C++
3. Write a program to show the concept of inline function
4. Write a program to show the concept of dynamic memory management in C++
5. Write a program to show the concept of function overloading

CLASS & OBJECTS

6. Write a C++ program to show the concept of class & object
7. Write A C++ program showing function taking objects as a arguments and function returning objects
8. Write C++ programs to show the concept of static data member & static member function
9. Write C++ program to show the concept of friend function
10. Write C++ program to show the concept of different type of constructor
11. Write C++ program to show the concept of destructor

OPERATOR OVERLOADING

12. Write a C++ program showing overloading of unary operator using member function & friend function
13. Write a C++ program showing overloading of binary operator using member function & friend function
14. Write a C++ program showing overloading of << and >> operators

INHERITANCE

15. Write a C++ program to show the concept of multilevel inheritance
16. Write a program to show the concept of multiple inheritance
17. Write a C++ program to show the concept of hybrid inheritance
18. Write a program to show the concept of virtual base class

DYNAMIC BINDING & VIRTUAL FUNCTION

19. Write a C++ to show the concept of virtual function to implement dynamic binding
20. Write a C++ program to show the concept of pure virtual function & abstract class

FILES HANDLING

21. Write C++ programs for creating, reading& writing sequential access file
22. Write C++ programs for creating, reading & writing random access file

TEMPLATES

23. Write a C++ program to show the concept of class template

24. Write a C++ program to show the concept of function template

TEXT BOOK

1. Balagurusam y , E., ―Object Oriented Programming with C++‖, Prentice Hall of India, 2008
2. Schildt, Herbert ―C++: The Complete Reference‖, Tata McGraw Hill, 3rd Ed, 2008

REFERENCE BOOKS

1. Kamthane, ―Object Oriented Programming with ANSI and Turbo C++‖, Pearson Education
2. Lafore, Robert, ―Object Oriented Programming in Turbo C++‖, The WAITE Group Press, 1994
3. Balagurusam y , E., ―Object Oriented Programming with C++‖, Prentice Hall of India, 2008
4. Bhave, ―Object Oriented Programming with C++‖, Pearson Education.

BCA-326	Elective-III B3 Programming .NET	L-T-P	Cr
		3-0-0	3

OBJECTIVE

To equip students with C# programming Concepts

PRE-REQUISITES

Knowledge of C programming language.

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To know the basics of Dot net programming language
CO2: To learn about the basics of C# programming
CO3: To learn about objects and classes in C# programming language
CO4: To know about the exception handling and delegates in C# programming
CO5: To learn about different database connectivity like ADO etc.

UNIT I

PHILOSOPHY OF .NET AND ITS MAJOR COMPONENTS: Origin of .NET technology; .NET platform; benefits and limitations of .NET; building blocks of .NET framework; .NET programming languages; .NET types and namespaces; Understanding CLR, CTS and CLS; developing C# Applications using Visual Studio .Net

UNIT II

UNDERSTANDING C#: Data Types, Variables & Constants, Operators in C#, Arithmetic Operators, Prefix and Postfix notation, Assignment Operators, Relational Operators, Other Operators, Operators precedence, Flow Control and Conditional Statements if-else statement, switch statement, Loops in C#, for loop, do-while loop, Array in C#, foreach Loop, Comparison among C++; Java and C#; benefits of C#; object-oriented programming using C#

UNIT III

OBJECTS AND CLASSES: Concept of a class, Objects, Fields, Methods, Instantiating the class, Accessing the members of a class, Access modifiers, Properties, Static members of the class, Constructors, Desturctors, Implementing inheritance in C#, The base keyword, Protected Access Modifier, sealed keyword, Polymorphism, using the reference of the base type for referencing the objects of the child class, Overriding the methods, the new keywords, Type casting, is and as keywords.

UNIT IV

EXCEPTION HANDLING AND DELEGATES: Exceptions in C# and .Net, Handling Exceptions using the try-catch-finally blocks, Delegates Basics, Delegates in the .Net Framework, Passing delegates to methods, Multicast Delegates.

UNIT V

ADO .NET AND ASP.NET: Comparison of ADO and ADO. NET, Introduction to data access with ADO.NET, Components of ADO.NET; Comparison of ASP and ASP .NET, Features of ASP .NET, Features provided by ASP .NET; web forms and their components.

TEXT BOOKS

1. Balaguruswammy, E, "Programming in C#", Tata McGraw Hill
2. Gunnerson Eric, "A programmer's Introduction to C#", IDG Books

REFERENCE BOOKS

1. Jain, V K, "The Complete Guide to C# Programming", IDG Books India.
2. Pappas & Murray, "C# Essentials", Prentice Hall of India
3. Wakefield, "C# and .NET Web Developers Guide", IDG Books India.

BCA-376	Elective-III B3 PROGRAMMING .Net LAB	L-T-P	Cr
		0-0-2	2

OBJECTIVE
To train the students with C# programming Concepts using implementation

PRE-REQUISITES
Knowledge of C programming language.

COURSE OUTCOMES
The students undergoing this course will be able:
CO1: To know the basics of Dot net programming language
CO2: To implement operators used in C# Programming
CO3: To learn about constructors to be implemented
CO4: To know about the different functions & file operations in C# programming
CO5: To learn about different database connectivity like ADO etc.

LIST OF EXPERIMENTS

BASIC

1. Write a program in C# to calculate Hypotenuse of triangle using dynamic initialization of variables
2. Write a program in C# to get input from the user and perform calculations
3. Write a program in C# to calculate the coordinates for the quadrant using if-else
4. Write a program in C# to check whether the alphabet is a vowel or not using switch case
5. To develop a C# application to print the students list using classes and objects

INTERMEDIATE

6. Write a program in C# illustrating the use of sequence, conditional and iteration construct.
7. Write a program in C# illustrating various operators like logical, arithmetical, relational, etc.
8. Write a program in C# illustrating overloading of various operators.
9. Write a program in C# illustrating use of friend, inline and Static Member functions, default arguments.
10. Write a program in C# illustrating use of destructors and various types of constructor.
11. Write a program in C# illustrating various forms of inheritance.
12. Write a program in C# illustrating use of virtual functions, Virtual base class, delegates.
13. Write a program in C# illustrating file operations.

ADVANCED

14. Write a program in C# illustrating simple web applications using ASP.net
15. Write a program in C# illustrating use of Active X Controls.

PROJECT

Develop an e-commerce application using C# language.

TEXT BOOKS

1. Balaguruswammy, E, "Programming in C#", Tata McGraw Hill
2. Gunnerson Eric, "A programmer's Introduction to C#", IDG Books

REFERENCE BOOKS

1. Jain, V K, "The Complete Guide to C# Programming", IDG Books India.
2. Pappas & Murray, "C# Essentials", Prentice Hall of India
3. Wakefield, "C# and .NET Web Developers Guide", IDG Books India.

BCA-324	ELECTIVE-III B3 (DISTRIBUTED DATABASE MANAGEMENT SYSTEM)	L-T-P	Cr
		3-0-0	3

OBJECTIVE

To provide knowledge about various organizations and management information systems, keeping in view the aspects of shareability, availability, evolvability and integrity.

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To know the basics of database & its architecture
CO2: To aware about the existing data models, entities as well as constraints
CO3: To learn about the different anomalies of the data and ways to normalize it
CO4: To know about the storage of data in the files & organization of files
CO5: To learn about the transactions and its ways done on the database

UNIT I

INTRODUCTION: Distributed Data Processing, Distributed Database System, Promises of DDBSs, Problem areas, Architectural Models for Distributed DBMS, DDMBS Architecture, Alternative Design Strategies, Distribution Design issues, Fragmentation, Allocation.

UNIT II

QUERY PROCESSING AND DECOMPOSITION: Query processing objectives, characterization of query processors, layers of query processing, query decomposition, localization of distributed data, Query optimization, centralized query optimization, distributed query optimization algorithms.

UNIT III

DATABASE DESIGN AND SQL: Database design process; relational database design; relation schema; anomalies in a database; functional dependencies; 1NF, 2NF, 3NF, and BCNF. ; Decomposition of DBMS: Lossless and Lossy, Reduction of an E-R schema to Tables; Introduction to SQL; basic queries in SQL; advanced queries in SQL; functions in SQL; basic data retrieval; updates in SQLs, views in SQL. Relational Algebra: introduction, Selection and projection, set operations, renaming, Joins, Division, syntax, semantics. Operators, grouping and ungrouping, relational comparison. Calculus: Tuple relational calculus, Domain relational Calculus, calculus vs algebra, computational capabilities.

UNIT IV

FILE ORGANIZATION: indexing and hashing; overview of file organization techniques; secondary storage devices; operations in files; heap files and sorted files; ; Indexing and Hashing- Basic concepts; Static Hashing; Dynamic Hashing; ordered indices; single level ordered index; multi-level index.

UNIT V

TRANSACTION PROCESSING & QUERY PROCESSING: Desirable properties of transactions; implementation of atomicity and durability; schedules and recoverability;

serializability of schedules; testing for serializability, precedence graph; concurrency control. Deadlock handling - detection and resolution.

TEXT BOOK

1. Silberschatz A., Korth H. F. and Sudarshan S., "Database System Concepts", 3rd edition, McGraw-Hill, International Edition, 1997.
2. S. Chand, Rajiv Chopra, "DBMS(A practical approach)", Revised edition, Pearson.
3. M. Tomer Ozsu and P. Valduriez. Principles of Distributed Database Systems, Pearson Education.
4. S. Ceri and G. Pelagapati. Distributed Database, Principles and Systems, McGraw Hill Publication.

REFERENCE BOOKS

1. Date C. J., "An Introduction to Database Systems", 7th edition, Addison- Wesley, Low Priced Edition, 2000.
2. Desai Bipin, "Introduction to Database Management System", Galgotia Publications, 1991.
3. Elmasri R. and Navathe S. B., "Fundamentals of Database Systems", 3rd edition, Addison-Wesley, Low Priced Edition, 2000.

BCA-374	ELECTIVE-III B3 (DISTRIBUTED DATABASE MANAGEMENT SYSTEM LAB)	L-T-P	Cr
		0-0-2	1

OBJECTIVE

To provide knowledge about implementation of practical aspects of database i.e. creation of tables and applying queries using SQL queries

COURSE OUTCOMES

The students undergoing this course will be able:

CO1: To know the basics of structured query language

CO2: To aware about applying different queries on database structured in the form of tables

CO3: To learn about the different SQL queries performed using operators as well as constraints

CO4: To create views from created table to further organize the data

CO5: To learn about the basic operations of relational algebra

LIST OF EXPERIMENTS/EXERCISES

Basic

11. Implement concurrent echo client-server application
12. Implement concurrent day-time client-server application.
13. Configure following options on server socket and tests them: SO_KEEPALIVE,SO_LINGER, SO_SNDBUF, SO_RCVBUF, TCP_NODELAY ...
14. Incrementing a counter in shared memory.
15. Create CORBA based server-client application.
16. Design XML Schema and XML instance document.
17. WSDL based: Implement ArithmeticService that implements add, and subtract operations /Java based: Implement TrigonometricService that implements sin, and cos operations.
18. Configuring reliability and security options.
19. Monitor SOAP request and response packets. Analyze parts of it and compare them with the operations (java functions) headers.
20. Design and test BPEL module that composes Arithmetic Service and Trignometric Service.
21. Test open source ESB using web service.

Moderate

1. Finding unique names of all salesmen, deletion of the structure of a table, use of delete command with conditions, updating records of a table with conditions, altering structure of a table and changing size of existing column in the table.
2. Write a query to implement: Arithmetic operators, logical operators and pattern matching operator.
3. Write a query to implement: Aggregate and mathematical functions: count, count(*), Avg, max, min, sum, lower, upper, power , sqrt.
4. Write a query to implement: Creating views from single and multiple tables, drop views and creating index on the table and drop them.

5. Create queries using Triggers and Procedures.

Advance

1. Consider the insurance database given below. The primary keys are made bold and the data types are specified.
   PERSON(driver_id:string , name:string , address:string)
   CAR(regno:string , model:string , year:int)
   ACCIDENT(report_number:int , accd_date:date , location:string)
   OWNS(driver_id:string , regno:string)
   PARTICIPATED(driver_id:string , regno:string , report_number:int , damage_amount:int)
   1)Create the above tables by properly specifying the primary keys and foreign keys.
   2)Enter at least five tuples for each relation.
   3)Demonstrate how you:
   a.Update the damage amount for the car with specific regno in the accident with report number 12 to 25000.
   b.Add a new accident to the database.
   4)Find the total number of people who owned cars that were involved in accidents in the year 2008.
   5)Find the number of accidents in which cars belonging to a specific model were involved.
2. Consider the following relations for an order processing database application in a company.
   CUSTOMER(custno:int , cname:string , city:string)
   ORDER(orderno:int , odate:date , custno:int , ord_amt:int)
   ORDER_ITEM(orderno:int , itemno:int , quantity:int)
   ITEM(itemno:int , unitprice:int)
   SHIPMENT(orderno:int , warehouseno:int , ship_date:date)
   WAREHOUSE(warehouseno:int , city:string)
   1)Create the above tables by properly specifying the primary keys and foreign keys.
   2)Enter at least five tuples for each relation.
   3)Produce a listing: custname , No_of_orders , Avg_order_amount , where the middle column is the total number of orders by the customer and the last column is the average order amount for that customer.
   4)List the orderno for orders that were shipped from all the warehouses that the company has in a specific city.
   5)Demonstrate the deletion of an item from the ITEM table and demonstrate a method of handling the rows in the ORDER_ITEM table that contains this particular item.
3. Consider the following database of student enrollment in courses and books adopted for that course.
   STUDENT(regno:string , name:string , major:string , bdate:date)
   COURSE(courseno:int , cname:string , dept:string)
   ENROLL(regno:string , courseno:int , sem:int , marks:int)
   BOOK_ADOPTION(courseno:int , sem:int , book_isbn:int)
   TEXT(book_isbn:int , book_title:string , publisher:string , author:string)
   1)Create the above tables by properly specifying the primary keys and foreign keys.
   2)Enter atleast five tuples for each relation.
   3)Demonstrate how you add a new text book to the database and make this book to be

adopted by some department.
4)Produce a list of text books (includes courseno , book_isbn , book_title) in the alphabetical order for courses offered by the 'CS' department that use more than two books.
5)List any department that has all its books published by a specific publisher.

4. The following are maintained by a book dealer.
   AUTHOR(author_id:int , name:string , city:string , country:string)
   PUBLISHER(publisher_id:int , name:string , city:string , country:string)
   CATALOG(book_id:int , title:string , author_id:int , publisher_id:int , category_id:int , year:int , price:int)
   CATEGORY(category_id:int , description:string)
   ORDER_DETAILS(order_no:int , book_id:int , quantity:int)
   1)Create the above tables by properly specifying the primary keys and foreign keys.
   2)Enter at least five tuples for each relation.
   3)Give the details of the authors who have 2 or more books in the catalog and the price of the books is greater than the average price of the books in the catalog and the year of publication is after 2000.
   4)Find the author of the book that has maximum sales.
   5)Demonstrate how you increase the price of books published by a specific publisher by 10%.
5. Consider the following database for a banking enterprise.
   BRANCH(branch_name:string , branch_city:string , assets:real)
   ACCOUNT(accno:int , branch_name:string , balance:real)
   DEPOSITOR(customer_name:string , accno:int)
   CUSTOMER(customer_name:string , customer_street:string , customer_city:string)
   LOAN(loan_number:int , branch_name:string , amount:real)
   BORROWER(customer_name:string , loan_number:int)
   1)Create the above tables by properly specifying the primary keys and foreign keys.
   2)Enter at least five tuples for each relation.
   3)Find all the customers who have at least two accounts at the main branch.
   4)Find all the customers who have an account at all the branches located in a specific city.
   5)Demonstrate how you delete all account tuples at every branch located in a specific city.

Project

1. Create a Database for a college which implements all keys, views, procedures, and triggers in it.

ELECTIVE-III
BUCKET D3

BCA-328	ELECTIVE-III D3 (TIME SERIES ANALYSIS AND FORCASTING)	L T P	Cr
		3 0 0	3

OBJECTIVE:

The main objective about time series analysis and forecasting is identifying the nature of the phenomenon represented by the sequence of observations, and forecasting (predicting future values of the time series variable).

PRE-REQUISITE:

Knowledge of Statistics

COURSE OUTCOMES

CO1: Understand basics concept of Time Series Analysis and Forecasting
CO2: Identify the Exponential smoothing and ETS methods
CO3: Learn about the ARiMA
CO4: To learn and Identify the vector Autorefression
CO5: To learn about AWS Forecast

UNIT I

BASIC OF TIME SERIES ANALYSIS AND FORCASTING:Time Series Basics Section Introduction;What is a time Series;Modeling vs Predicting;Why do we care about shapes;Types of Tasks;Power ,Log,and Box-cox transformations ,Code; Forecasting Metrics;

Financial time series primer;price Simulations in code;Random walks and the Random walk Hypothesis;the naïve Forecast and the Importance of Baselines

UNIT II

EXPONENTIAL SMOOTHING AND ETS METHODS: Exponential smoothing section introduction;Exponential smoothing intuition for beginners ;SMA theory ;SMA code; EWMA theory;SES Theory,code;Holt's Linear trend Model(Theroy);Holt's Linear trend Model(Code);Walk forward Validation;Application:Sales Data,Stock Predictions;SMA Application:COVID-19 Counting ,Algorithmic trading;Exponential Smoothing Section Summary

UNIT III

ARIMA: Arima Section Introduction,Autoregressive Models-AR(p);Moving Average Models- MA(q),ARIMA ,Stationarity,ACF,PACF,Auto ARIMA and SARIMAX,Model Selection ,AIC and BIC;Auto ARIMA in Code;Auto Arima in code(stocks);ACF and PACF for stock Returns;Auto ARIMA in code(sales Data);How to Forecast with ARIMA ;Forecasting out-of-sample;ARIMA Section Summary;

UNIT IV

VECTOR AUTOREFRESSION(VAR,VMA.VARMA):

Vector Autoregression Section Introduction;Var and VARMA Theroy ;Varma code ; VARMA Econometrics Code;Granger Causality ,Granger casuality code;Converting Between Models(optional);vector Autoregression Section Summary;

UNIT V

VIP:AWS FORECAST

AWS Forecast Section Introduction;Data Model;Creating an IAM Role
Code pt 1 (Getting and Transforming the Data);Code pt 2 (Uploading the data to S3);Code pt 3 (Building your Model);Code pt 4 (Generating and Evaluating the Forecast);AWS Forecast Exercise;AWS Forecast Section Summary

TEXT BOOKS:

Shumway & Stoffer(2011) Time series analysis and its applications with examples

REFERENCES:

1. "Introductory Time Series with R (Use R!)"; Author: Paul S.P. Cowpertwait and Andrew V. Metcalfe
2. "The Analysis of Time Series: An Introduction" ;Author: Chris Chatfield
3. "Time Series Analysis";Author: James Douglas Hamilton
4. "Forecasting: Principles and Practice";Author:Rob J. Hyndman and George Athanasopoulos
5. "Introduction to Time Series Analysis and Forecasting" ;Author: Douglas C. Montgomery, Cheryl L. Jennings, and Murat Kulahci

BCA-378	ELECTIVE-III D3 (TIME SERIES AND FORECASTING LAB)	L-T-P	Cr.
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MANUAL CONTENTS:

BCA-332	ELECTIVE-III D3 (BUSINESS INTELLIGENCE)	L T P	Cr
		3-0-0	3

Prerequisites: Basic Knowledge of Statistics, Weka Tool and Excel
Objective: To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making.
Course Outcomes

CO1 Understand the essentials of BI & data analytics and the corresponding terminologies

CO2 Analyze the steps involved in the BI - Analytics process

CO3 Illustrate competently on the topic of analytics
CO4 Understand & Implement the K-Means Clustering with Iris Dataset
CO5 Demonstrate the real time scenario (Case study) by using BI & Analytics techniques
UNIT-I Introduction - History and Evolution: Effective and Timely decisions, Data Information and Knowledge, Architectural Representation, Role of mathematical Models, Real Time Business Intelligent System.
UNIT-II Data Mining - Introduction to Data Mining, Architecture of Data Mining and How Data mining works (Process), Functionalities & Classifications of Data Mining, Representation of Input Data, Analysis Methodologies.
Data Warehousing - Introduction to Data Warehousing, Data Mart, Online Analytical Processing (OLAP) – Tools, Data Modelling, Difference between OLAP and OLTP, Schema – Star and Snowflake Schemas, ETL Process – Role of ETL
UNIT-III Data Validation - Introduction to Data Validation, Data Transformation – Standardization and Feature Extraction, Data Reduction – Sampling, Selection, PCA, Data Discretization
UNIT-IV Introduction to analytics process, Types of Analytical Techniques in BI – Descriptive, Predictive, Perspective, Social Media Analytics, Behavioral, Iris Datasets
UNIT-V Business Activity Monitoring, Complex Event Processing, Business Process Management, Metadata, Root Cause Analysis.

TEXTBOOK:

Carlo-Vercellis, “Business Intelligence Data Mining and Optimization for Decision-Making”, First Edition
Link : https://bit.ly/3d6XxOr

Drew Bentely, “Business Intelligence and Analytics” ,@2017 Library Pres., ISBN: 978-1-9789-2136-8
Link : https://www.academia.edu/40285447/Business_Intelligence_and_Analytics

REFERENCE BOOK:

Cindi Howson, “Successful Business Intelligence”, Second Edition, McGraw-Hill Education, 2013

BCA-382	ELECTIVE-III D3 (Business Intelligence Lab)	L-T-P	Cr
		0-0-2	1

LIST OF EXPERIMENTS

1. Build Data Warehouse and Explore WEKA
2. Perform data preprocessing tasks and Demonstrate performing association rule mining on data sets
3. Demonstrate performing classification on data sets
4. Demonstrate performing clustering on data sets
5. Demonstrate performing Regression on data sets
6. Task 1: Credit Risk Assessment. Sample Programs using German Credit Data
7. Task 2: Sample Programs using Hospital Management System
8. Simple Project on Data Preprocessing
9. Study of Tableau.
10. Implement common visualization (bar charts, line chart etc.)

BCA-330	ELECTIVE-III D3 (DATA HANDLING AND VISUALIZATION)	L	T	P	Cr
		3	0	0	3

COURSE OUTCOMES

The students undergoing this course will be able to:

CO1: Design effective data visualizations in order to provide new insights

CO2: Find and select appropriate data that can be used in order to create visualization

CO3: Find and save data to IU-supported research storage for both short- and long-term preservation in order to comply with data management mandates

CO4: Handle data and data visualizations in a manner that demonstrates an understanding of ethical considerations surrounding data

CO5: Properly document and organize data and visualizations in order to prepare them for reuse.

UNIT I

INTRODUCTION TO VISUALIZATION: Visualizing Data-Mapping Data onto Aesthetics, Aesthetics and Types of Data, Scales Map Data Values onto Aesthetics, Coordinate Systems and Axes-Cartesian Coordinates, Nonlinear Axes, Coordinate Systems with Curved Axes, Color Scales-Color as a Tool to Distinguish, Color to Represent Data Values ,Color as a Tool to Highlight, Directory of Visualizations-Amounts, Distributions, Proportions, x–y relationships, Geospatial Data

UNIT II

VISUALIZING DISTRIBUTIONS: Visualizing Amounts-Bar Plots, Grouped and Stacked Bars, Dot Plots and Heatmaps, Visualizing Distributions: Histograms and Density Plots- Visualizing a Single Distribution, Visualizing Multiple Distributions at the Same Time, Visualizing Distributions: Empirical Cumulative Distribution Functions and Q-Q Plots-Empirical Cumulative Distribution Functions, Highly Skewed Distributions, Quantile- Quantile Plots, Visualizing Many Distributions at Once-Visualizing Distributions Along the Vertical Axis, Visualizing Distributions Along the Horizontal Axis

UNIT III

VISUALIZING ASSOCIATIONS & TIME SERIES: Visualizing Proportions-A Case for Pie Charts, A Case for Side-by-Side Bars, A Case for Stacked Bars and Stacked Densities, Visualizing Proportions Separately as Parts of the Total ,Visualizing Nested Proportions- Nested Proportions Gone Wrong, Mosaic Plots and Treemaps, Nested Pies ,Parallel Sets. Visualizing Associations Among Two or More Quantitative Variables-Scatterplots, Correlograms, Dimension Reduction, Paired Data. Visualizing Time Series and Other Functions of an Independent Variable-Individual Time Series, Multiple Time Series and Dose–Response Curves, Time Series of Twoor More Response Variables

UNIT IV

VISUALIZING UNCERTIANITY: Visualizing Trends Smoothing, Showing Trends with a Defined Functional Form, Detrending and Time-Series Decomposition, Visualizing Geospatial Data-Projections, Layers, Choropleth Mapping, Cartograms, Visualizing Uncertainty-Framing Probabilities as Frequencies, Visualizing the Uncertainty of Point Estimates, Visualizing the Uncertainty of Curve Fits, Hypothetical Outcome Plots

UNIT V

PRINCIPLE OF FIGURE DESIGN: The Principle of Proportional Ink-Visualizations Along Linear Axes, Visualizations Along Logarithmic Axes, Direct Area Visualizations, Handling Overlapping Points-Partial Transparency and Jittering, 2D Histograms, Contour Lines, Common Pitfalls of Color Use-Encoding Too Much or Irrelevant Information ,Using Nonmonotonic Color Scales to Encode Data Values, Not Designing for Color-Vision Deficiency

TEXT-BOOKS

Claus Wilke, "Fundamentals of Data Visualization: A Primer on Making Informative and Compelling Figures", 1st edition, O'Reilly Media Inc, 2019.

REFERENCE-BOOKS

1. Ossama Embarak, Data Analysis and Visualization Using Python: Analyze Data to Create Visualizations for BI Systems,Apress, 2018
2. Scott Murray, "Interactive data visualization for the web", O"Reilly Media, Inc., 2013

BCA-380	ELECTIVE-III D3 (DATA HANDLING AND VISUALIZATION LAB)	L T P	Cr
		0 0 2	1

COURSE OBJECTIVE

To up skills the knowledge about the data visualization using python.

COURSE OUTCOMES

CO1: Implement numerical and statistical analysis on various data sources.
CO2: Apply data pre-processing and dimensionality reduction methods on raw data.
CO3: Implement linear regression technique on numeric data for prediction.
CO4: Execute clustering and association rule mining algorithms on different datasets.

LIST OF EXPERIMENTS

1. Fundamentals: Introduction to Matplotlib, importing libraries in python, Basic Scatter plot, Creating Axes, Line plot
2. Customization: Title & Axis labels, Equations in text, Formatting Axis ticks, Customizing Tick Labels, Adding Legend, Annotations, Plot Styles
3. Types of Visualizations: Histograms, Bar Graphs, Box and Whisker Plots, Pit charts, 2D histograms, Images, Colour maps, 3D Line and Scatter plots, Adding animation.
4. To get the input from user and perform numerical operations (MAX, MIN, AVG, SUM, SQRT, ROUND) using Python
5. To perform data import/export (.CSV, .XLS, .TXT) operations using data frames in Python
6. To perform statistical operations (Mean, Median, Mode and Standard deviation) using Python.
7. Download the House Pricing dataset from Kaggle and map the values to Aesthetics
8. Use different Color scales on the Rainfall Prediction dataset
9. Create different Bar plots for variables in any dataset
10. Show an example of Skewed data and removal of skewedness
11. For a sales dataset do a Time Series visualization
12. Build a Scatterplot and suggest dimension reduction
13. Use Geospatial Data-Projections on datasets in http://www.gisinindia.com/directory/gis-data-for-india
14. Create the a trend line with a confidence band in any suitable dataset