

Faculty of IT & Computer Application Scheme & Syllabi

BCA

(Bachelor of Computer Applications)

Specialization in Cyber Security

(In Association with EC Council)

Academic Programme

July 2020

Total Credits for the Batch 2020-23 = 168 Credits

- 1. Minimum Credits required = 155 Credits
- 2. Total Relaxation = 13 Credits
- 3. No relaxation in Core and Foundation subjects
- 4. Theory exams duration will be of 03 hours and Practical exams will be of 02 hours.
- 5. Internal Assessment will be of 50 marks and End Term Assessment will be of 50 marks in both lab and theory courses.
- 6. The students will earn three Global Certifications of EC- Council for the specialization subjects mentioned in below scheme.

Semester wise credit							Minimum Credit for
I	II	III	IV	V	VI	Total	degree
28	28	28	28	28	28	168	155

Semester – I	
--------------	--

Course Code	Course Name	L (Hr.)	T (Hr.)	Pr (Hr.)	Credits	Туре
BCA101A	Fundamentals of Computer Systems	3	0	0	3	F
BCA102A	Programming Fundamentals using C-I	3	1	0	4	CORE
BCA103A	System Analysis and Design	3	0	0	3	CORE
BCA104A	Digital Electronics	3	0	0	3	F
BCA105B	Communication Skills	3	0	0	3	F
BCA106A	Office Automation Tools Lab	0	0	2	2	F
BCA107A	Programming Fundamentals using C-I Lab	0	0	2	2	CORE
BCA108B	Communication Skills Lab	0	0	2	2	F
BCA166A	Designing Lab(Photoshop and CorelDraw)	0	0	2	2	S
BCA110A	Digital Electronics Lab	0	0	2	2	F
BCA111A	Seminar	0	0	2	2	S
	Total	15	1	12	28	

- * F- Foundation, ID- Interdisciplinary, S- Specialization (Skill Enhance Courses)
- * L- Lecture, T- Tutorial, P- Practical

Semester – II

Course Code	Course Name	L	Т	Pr	Credits	Туре
		(Hr.)	(Hr.)	(Hr.)		
BCA112A	Environmental Studies	2	0	0	2	F
BCA113B	Operating System	3	1	0	4	CORE
BCA114B	Database Management System	3	0	0	3	CORE
BCA115B	Computer Architecture	3	1	0	4	F
BCA116A	Programming Fundamentals using C-II	3	1	0	4	CORE
BCA118B	Database Management System Lab	0	0	2	2	CORE
BCA119A	Programming Fundamentals using C-II	0	0	2	2	CORE
DEATION	Lab	0	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$			
BCA121A	UNIX and Shell Programming Lab	0	0	2	2	CORE
BCACS101						
(Cyber	EC Council Certified Security	•	0		_	COR
Security	Specialist (ECSS)	3	0	2	5	E
Specialization)						
	Total	17	3	8	28	

* F- Foundation, ID- Interdisciplinary, S- Specialization (Skill Enhance Courses)

✤ L- Lecture, T- Tutorial, P- Practical

Course Code	Course Name	L (Hr.)	T (Hr.)	Pr (Hr.)	Credits	Туре
		(111.)	(1111)	(111.)		
BCA135B	Computer Network	3	0	0	3	CORE
BCA123A	Programming in PHP	3	0	0	3	S
BCA125A	Data Structures and Algorithms using C	3	1	0	4	CORE
BCA126A	Programming Fundamentals using C++	3	1	0	4	CORE
BCA127A	Software Engineering	3	0	0	3	CORE
BCA128A	PHP Lab	0	0	2	2	S
BCA129A	Data Structure and Algorithm using C Lab	0	0	2	2	CORE
BCA130A	Programming Fundamentals using C++ Lab	0	0	2	2	CORE
BCACS102						
(Cyber Security	Certified Network Defender (CND)	3	0	2	5	CORE
Specialization)						
	Total	18	2	8	28	

Semester – III

* F- Foundation, ID- Interdisciplinary, S- Specialization (Skill Enhance Courses)

* L- Lecture, T- Tutorial, P- Practical

Semester – IV

Course Code	Course Name	L (Un)	T (Hr)	Pr (Un)	Credits	Туре
		(n r.)	(пг.)	(п г.)		
BCA171A	Soft Skills	2	0	0	2	F
BCA133A	Programming in Java	3	1	0	4	CORE
BCA134A	Programming in Python	2	1	0	3	S
	Elective – I	3	0	0	3	CORE
BCA136A	Programming in Java Lab	0	0	2	2	CORE
BCA137A	Programming in Python Lab	0	0	2	2	S
BCA139A	Project	0	0	4	4	S
BCACS103						
(Cyber	Contified Ethical Hacker (CEH)	1	0	4	Q	CODE
Security	Certined Etincal Hacker (CEH)	4	U	4	o	CORE
Specialization)						
	Total	14	2	12	28	

- * F- Foundation, ID- Interdisciplinary, S- Specialization (Skill Enhance Courses)
- ✤ L- Lecture, T- Tutorial, P- Practical

Semester –	V	
------------	---	--

Course	Course Norme	L	Т	Р	Cradita	Tune
Code	Course Mame	(Hr.)	(Hr.)	(Hr.)	Creans	туре
BCA132A	Introduction to Accounting and Economics	3	0	0	3	ID
BCA141A	Android Applications Development	3	0	0	3	S
BCA142A	Information Security and Cyber Law	3	1	0	4	CORE
BCA143A	Advance Java	3	1	0	4	CORE
	Elective – III	3	0	0	3	CORE
	Elective – IV	3	0	0	3	CORE
BCA145A	Android Applications Development Lab	0	0	2	2	S
BCA146A	Advance Java Lab	0	0	2	2	CORE
BCA138A	Introduction to PL/SQL Lab	0	0	2	2	S
BCA147A	Project	0	0	2	2	S
	Total	18	2	8	28	

* F- Foundation, ID- Interdisciplinary, S- Specialization (Skill Enhance Courses)

✤ L- Lecture, T- Tutorial, P- Practical

Semester – VI

Course Code	Course Name	Credits	Туре
BCA165A	Industrial Training/Internship/Project Presentation	28	CORE

Course Code	Course Name
BCA148A	Computer Graphics
BCA149A	Complier Design
BCA150A	MIS (Management Information System)
BCA151A	Theory of Computation
BCA152A	Web Technologies
BCA153A	Artificial Intelligence and Expert System
BCA154A	Data Mining
BCA155A	Data Warehousing
BCA156A	Mongo Database
BCA157A	Soft Computing
BCA158A	Parallel Computing
BCA159A	Mobile Computing
BCA160A	Image Processing
BCA161A	Big Data Analytics
BCA162A	Organization Behavior
BCA163A	Introduction to Cloud Computing
BCA164A	Introduction to Sales Force
BCA168A	Entrepreneurship
BCA140A	Data Analytics using R
BCA171A	Robotics Process Automation

List of courses for Electives

Note:

1. Students have to select different elective courses from the given list.

Semester I

Course Name: Fundamentals of Computer Systems

Course Code: BCA101A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
3	0	0	3

Course Objectives:

- 1. To be able to learn the major components of a computer system
- 2. To know the Student to learn different types of input and output devices, memories in computer.
- 3. To enhance the practical knowledge of the students related to Operating system, Computer Software and Boolean algebra.
- 4. To demonstrate the concept of Logic gates, Simplification of Boolean Expressions Using K-Map and Internet.
- 5. To know the Characteristics, Generations of computers, Classification of Computers and basic functionality of computers.

Syllabus

Unit I

Introduction to Computers & Number Systems: Introduction of Computers, Characteristics, Generations of computers, Classification of Computers, Basic Computer Organization, Applications of Computers, Binary Number System, Working with Binary Numbers, Octal Number System, Hexadecimal Number System, BCD Code ,Other Codes.

Unit II

Input-Output devices & Computer Memory: Input Devices, Output Devices, Soft Copy Devices, Hard Copy Devices, Memory Type: Memory Hierarchy, Processor Registers, Cache Memory, Primary Memory, Secondary Storage Devices, Magnetic Tapes, Floppy Disks, Hard Disks, Optical Drives, USB Flash Drives, Memory Cards, Mass Storage Devices

Unit III

Computer Software & Operating Systems: Computer Software: Introduction to Computer Software, Classification, System Software, Application Software, Acquiring Computer Software, Productivity Software, Graphics Software, Database management software.

Operating Systems: Basic Definitions, History, Characteristics, Properties, Classifications, Functions of OS, Popular Operating Systems, mobile operating System.

Unit IV

Boolean Algebra and Logic Gates: Boolean Algebra ,Venn Diagrams ,Truth Tables ,Basic Laws of Boolean Algebra, Representations of Boolean Functions, Logic Gates, Logic Diagrams and Boolean Expressions ,Universal Gates, Simplification of Boolean Expressions Using K-Map.

Unit V

Computer Networks and Internet: Computer Networks: Introduction to Computer Networks, Connecting Media, Network Topologies, Types of Network, Networking Devices, Wireless Networks, Data Transmission Mode, Open System Interconnection Model, TCP/IP Model, Internet, Internet Protocol Address., DNS, URL.

The Internet & Emerging Computer Technologies: History, Internet Services, Internet Glossary, Types of Internet Connections, Internet Security, Distributed Networking, Peer-to-peer Computing, Grid Computing, Cloud Computing, Utility Computing, Wireless Network, Bluetooth, Artificial Intelligence

Course Outcomes (COs):

Upon successful completion of this subject students should be able to:

CO1: Understand what is computer system and Basic information related to computer.

CO2: Understand the fundamental hardware components that make up a computer's hardware and the role of each of these components

CO3: Understand the difference between an operating system and an application program, and what each is used for in a computer

CO4: Understand the fundamentals of Logic gates and circuit design

CO5: Understand basics of World Wide Web and new Internet technologies.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course		Program Outcome										
Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				Н						Н		Н
CO2			Н			Н	М					
CO3		Н										
CO4							Н	Н				
CO5	Н				М						L	

H = Highly Related; M = Medium; L = Low

Text Books

- 1. Madan, S., "Fundamentals of Computers and Information System", Scholar Tech Press, 2012
- 2. Reema Theraja, "Fundamentals of Computers", Oxford University Press, 2014

Reference Books

- 1. Mohan, P., "Fundamentals of Computers", Himalaya publishing House, 2010
- 2. Murthy, C. S., "Fundamentals of Computers", Himalaya Publishing House, 2010
- Tiwari, H. N., & Jain, H. C., "Fundamentals of Computer and Information System", International Book House Pvt. Ltd., 2012

Course Name: Programming Fundamentals using C-I

Course Code: BCA102A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
3	1	0	4

Course Objectives:

- 1. To provide exposure to problem solving through programming.
- 2. To enhance the ability to solve the problem through various constructs of C such as decision control and looping statements.
- 3. To demonstrate the concept of Accessing Array Elements, Storing Values in Arrays and length of an Array.
- 4. To evaluate the concept of data types and variable.
- 5. To explore major concepts of computer science and the process of computer programming, including programming, procedural and data abstraction and program modularity.

Syllabus

Unit I

Introduction to Programming and C: Introduction to Computer Software, Classification of Computer Software, Programming Languages, Generation of Programming Languages

C Programming Language: Introduction, Structure of C Program, Files Used in C Program,

Unit II

Data types and Variables: Compiling and Executing C Programs, Keywords, Identifiers, Data Types, Variables, Constants, Input/output Statement in C, Operators in C, Type Conversion and Typecasting, Structure of C Program, Operators: Arithmetic operators, relational and logical operators.

Unit III

Decision Control and Looping Statements: Decision Control Statements, Conditional Branching Statements, Iterative Statements, Nested Loops, break and continue Statements, goto Statement, Building a Robust C Program, Flow Chart Designing

Unit IV

Array: Declaration of Arrays, Accessing Array Elements, Storing Values in Arrays, Length of an Array, Array Operations, Multidimensional Arrays, Two-Dimensional Arrays, and Operations on Two-dimensional Arrays.

Unit V

String: Introduction, Suppressing Input, String Operations, String and Character Functions, String Array.

Course Outcomes (COs):

Upon successful completion of this subject students should be able to:

CO1: Students will learn the concept of character set identifiers and keywords, data type, variable names, declaration statements and basic structure of C program.

CO2: Student will classify the String Operations, String and Character Functions.

CO3: Students will apply the concept of Arithmetic operators, relational and logical operators, type, conversion, Standard input and output, formatted output and input.

CO4: Students will contrast C programs based on Flow of Control and program Structures.

CO5: Students will learn the concept of Accessing Array Elements, Storing Values in Arrays, and length of an Array.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course		Program Outcome										
Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				Н						Η		Н
CO2			Н			Н	М					
CO3		Н										
CO4							Н	Н				
CO5	Н				М						L	

H = Highly Related; M = Medium; L = Low

Text Books

- 1. Reema Theraja, "Programming in C", Second Edition, Oxford University Press, 2016
- 2. Yeshwant kanetkar, Let us C, Fifteenth Edition, BPB Publication 2016.

Reference Books

- 1. Reema Thareja, "Introduction to C Programming", First Edition, Oxford University press, 2012.
- 2. Byron S Gottfriend, "Programming with C", Second Edition, Mc Graw Hill, 2007.
- 3. Herbert Schildt, Turbo C: The Complete Reference, Fourth edition, Mc Graw-Hill, 2017.

Course Name: System Analysis and Design

Course Code: BCA103A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits		
3	0	0	3		

Course Objectives:

- 1. To provide an understanding and application of system analysis and design processes centered on the systems development life cycle.
- 2. To extend the core topics include project management and cost-benefit analysis; information systems planning and project identification and selection.
- 3. To emphasizes interpersonal skill development with clients, users, team members, and others associated with development, operation, and maintenance of systems.
- 4. To learn the Information system components, Types on information systems, System development life cycles, the systems analyst.
- 5. To make a study of Systems planning, Object oriented analysis and design.

Syllabus

Unit I

System Concepts and Information Systems Environment: The System Concept: Definition, Characteristics of Systems, Elements of a System, Open and Closed System, Formal and Informal Information Systems, Computer based Information Systems, Management Information System, Decision Support System, General Business Knowledge, and Interpersonal Communicational System.

Unit II

System Development Life Cycle: Recognition of needs, Impetus for System Change, Feasibility Study, Analysis, Design, Implementation, Post implementation and Maintenance. Role of the Systems Analyst, The Analyst/User Interface, Behavioral issues.

Unit III

Systems Planning and Initial Investigation: Strategies for Determining Information Requirement, Problem Definition & Project initiation, Background Analysis, Fact Analysis, Review of Written Documents, Onsite Observations, Interviews and Questionnaires, Fact Analysis, Performance Analysis, Efficiency Analysis, Service Analysis.

Unit IV

Information Gathering: need, Information about the firms, Information gathering tools, Interviewing, Arranging the Interview, Guides to a Successful Interview, Types of Interviews and Questionnaires, The Structured and Unstructured Alternatives

Unit V

Tools of Structured Analysis: The Dataflow Diagram (DFD), Data Dictionary, Decision Trees and Structured English. Feasibility Study: System performance, Economic Feasibility, Technical Feasibility, Behavioral Feasibility, Steps in Feasibility Analysis. Input/Output and Forms Design: Input Design, CRT Screen Design, Output Design, and Requirements of form Design. H/W / S/W Selection, Make V/s Buy decision and Maintenance, Documentation: Importance, Types of documentation, Security and disaster planning and management.

Course Outcomes:

Upon successful completion of this subject students should be able to:

CO1: Students are able to describe the concept of Information System Analysis and development life cycle.

CO2: Explain the purpose of Information Requirement Analysis, Data modeling with logical entity relationship diagrams, Feasibility study and cost estimation.

CO3: Understand System Designing & Implementation of object oriented analysis and design.

CO4: Solve Managerial Issues in Software Projects using CASE tools.

CO5: Analysis and design models using object modeling techniques and object oriented database.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course	Program Outcome										
Outcome											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1		Н	М		Н						
CO2	Η					М					
CO3							М	Η			Н
CO4		Н		Н							
CO5	Μ				М				М		

H = Highly Related; M = Medium; L = Low

Text Books

- 1. Howryskiewycz, "Systems Analysis and Design", PHI Publications
- 2. Analysis and Design of Information Systems, Senn, TMH

Reference Books

- 1. System Analysis and Design Methods, Whitten, Bentley.
- 2. Shelly Cashman Series , "System Analysis & Design" , 4th Ed., Thomson Press
- 3. Analysis and Design of Information Systems, Rajaraman, PHI

Course Name: Digital Electronics Course Code: BCA104A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
3	0	0	3

Course Objective:

- **1.** To introduce the concept a comprehensive introduction to digital logic design leading to the ability to understand number system representations.
- **2.** To know binary codes, binary arithmetic and Boolean algebra, its axioms and theorems, and its relevance to digital logic design.
- 3. To know about synchronous sequential logic and Asynchronous sequential logic.
- **4.** To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.
- 5. To prepare students to perform the analysis and design of various digital electronic circuits.

Syllabus

Unit I

Binary Systems: Digital Systems, Binary Numbers, Number Base Conversions, Octal and Hexadecimal Numbers, Complements, Signed Binary Numbers, Binary Codes, Binary Storage and Registers, Binary Logic.

Unit II

Boolean Algebra and Logic Gates: Basic Definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operating, Digital Logic Operations, Digital Logic Gates, Integrated Circuits.

Unit III

Simplification of Boolean Functions: Karnaugh map and Quine-Mccluskey methods, SOP, POS simplification, NAND and NOR implementations Don't - Care Conditions, Exclusive - OR Function.

Unit IV

Combinational Logic Design: Combinational Circuits, Analysis Procedure, Design Procedure, Adder: Half adder, Full adder, Serial adder, Parallel adder & Carry look-ahead adder, Subtractors : Half subtractor & Fullsubtractor, Decoders, Encoders, Multiplexers.

Unit V

Synchronous Sequential Logic: Sequential Circuits, Latches, Flip-Flops, Analysis of Clocked Sequential Circuits, State Reduction and Assignment, Design Procedure. Registers and Circuits: Registers, Shift Registers, Ripple Counters, Synchronous Counters, Other Counters.

Course Outcomes (COs):

Upon successful completion of this subject students should be able to:

CO1: Know how digital logic design is used to represent computer systems and recall the use of digital IC's, Transistor.

CO2: Illustrate the concept of SOP, POS simplification and NAND, NOR implementations.

CO3: Know concepts of Boolean algebra, its theorems, and its relevance to digital logic design.

CO4: Demonstrate the concept of Boolean functions, multiplexer trees and de-multiplexer.

CO5: Understand the concept of sequential logic and design procedures.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Program Outcome
Outcome

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			Η				М		М			
CO2		Η						М				
CO3					Η	Μ						
CO4				Η				М				
CO5	Μ								Μ		L	

H = Highly Related; M = Medium; L = Low

Text Books

- 1. M Morris Mano, "Digital Design", 3rd Edition, 2006, PHI
- 2. Bignell& Donovan Digital Electronics, 4th Edition, 2007, Thomson Learning.

Reference Books

- 1. R. P Jain, Modern Digital Electronics, Second Edition, TMH
- 2. L K Maheswari and M M S Anand, "Laboratory Manual for Introductory Electronic Experiments", New Age, 2010.
- 3. S Poornachandra Rao and B Sasikala, "Handbook of Experiments in Electronics and Communication Engineering", Vikas publishers, 2003.

Course Name: Communication Skills

Course code: BCA105A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits

3	0	0	3

Course Objectives:

- 1. To understand the basic concepts of three major forms of communications which are vital in academic and professional settings namely professional presentations, interviews and group communications respectively.
- 2. To have a deep insight into the techniques for delivering effective presentations.
- 3. To have a deep insight for winning job interviews and actively participating in various forms of group communication.
- 4. To apply the critical and creative thinking abilities necessary for effective communication in today's business world.
- 5. To summarize the better writing skills by briefing the learners to the dynamics of effective writing.

Syllabus

Unit I

Essentials of Grammar

- 1. Parts of Speech
- 2. Articles
- 3. Question Tags
- 4. Conditional Sentences
- 5. Modal Verbs

Unit II

Applied Grammar

- 1. Tenses
- 2. Passive Voice
- 3. Indirect Speech
- 4. Relative Clauses

Unit III

Composition

Dialogue Writing Paragraph Writing Precise Writing Report, its importance and Report Writing

Unit IV

Poems

- 1. The Character of A Happy Life: Sir Henry Wotton
- 2. No Men are Foreign: James Kirkup
- 3. If : Rudyard Kipling

Unit V

Short Stories

- 1. How Much Land Does a Man Need?: Leo Tolstoy
- 2. The Last Leaf: O. Henry

Course Outcomes (COs):

Upon successful completion of this subject students should be able to:

CO1: Understand the communication processes and practices in academic and professional contexts.

CO2: Able to understand the concept and basics of communication and essentials of grammar.

CO3: Students are able to work with jumble words and grammar.

CO4: Enhance the knowledge of composition; produce written academic and professional documents.

CO5: Have the capability to apply an ability to properly carry out the purpose and significance of the channels of Communication and improve writing skills for stories and poems.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course		Program Outcome										
Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

CO1	М	Н							М	
CO2				М						Н
CO3						Η	М			
CO4							Η		М	
CO5	Н							Н		

H = Highly Related; M = Medium; L = Low

Text Books

- 1. Sanjay Kumar & Pushp Lata ,"Communication Skills ", Second Edition, Oxford University Press.
- 2. English for Engineers: Made Easy, AedaAbidi&RituChaudhary, Cengage Learning, (New Delhi)

Reference Books

- 1. A Practical Course for Developing Writing Skills in English, J.K. Gangal, PHI Learning Pvt. Ltd., New Delhi.
- Intermediate Grammar, Usage and Composition, Tickoo, A. E. Subramaniam& P. R.Subramaniam, Orient Longman (New Delhi)
- 3. The Written Word , Vandana R. Singh, Oxford University Press (New Delhi)R.T.U., Kota Scheme and

Course Name: Office Automation Tools Lab Course Code: BCA106A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
0	0	2	2

List of Sample Programs

Elaborate these topics in with the help of following tools ie. open office/MS office/Libre office

1. Introduction

- 1.1. Concept of Windows, Icon, Menu
- 1.2. Desktop
- 1.3. Creating Folders and Shortcuts
- 1.4. Finding Files & Folders
- 1.5. Creating, Copying, Moving and Deleting files
- 1.6. Windows Explorer

2. Word Processing Package

- 2.1. Typing, Editing, Proofing & reviewing
- 2.2. Formatting text & Paragraph
- 2.3. Automatics Formatting and Styles
- 2.4. Working with Tables
- 2.5. Graphics and Sound
- 2.6. Mail Merge

3. Spreadsheet package

- 3.1. Concept of worksheet
- 3.2. Working & Editing in Workbooks
- 3.3. Creating Formats & Links
- 3.4. Protecting and Hiding data
- 3.5. Built in Functions (Mathematical, Statistical, String & Date)
- 3.6. Formatting a Worksheet & Creating graphics objects
- 3.7. Creating Charts (Graphics), Formatting and analyzing data
- 3.8. Sharing & Importing Data

3.9.Printing

4. Presentation Package

- 4.1. Creating and Editing Slides
- 4.2. Creating and Editing objects in the slide
- 4.3. Animation
- 4.4. Creating and Running Slide Show
- 4.5. Templates

5. Internet

5.1. Concepts

- 5.2. Working
- 5.3. Mailing & surfing tools

Course Name: Programming Fundamentals using C-I Lab Course Code: BCA107A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits		
0	0	2	2		

List of Sample Programs

- 1. Write a program to demonstrate the use of printf Statement to print values of variables of different data types.
- 2. Write a program to calculate the area of a triangle using Hero's formula.
- 3. Write a program to calculate the distance between two points.
- 4. Write a program to perform addition, Subtraction Division, Integer Division, Multiplication and modulo Division on two Integer numbers.
- 5. Write a program to subtract two long Integers.
- 6. Write a program to illustrate the use of Unary prefix increment and decrement operators.
- 7. Write a program to find the largest of three numbers using Ternary operators.
- 8. Write a program to show use of Bitwise operators.
- 9. Write a program to demonstrate the use of Assignment Operators
- 10. Write a program to Swap 2 numbers using a temporary variable.
- 11. Write a program to Swap 2 numbers without using a temporary variable.
- 12. Write a program to convert degrees fahrenheit into Degrees Celsius.
- 13. Write a program to covert a floating point number into the corresponding integer.
- 14. Write a program to convert an Integer into the Corresponding floating point number.
- 15. Write a program to determine whether a person is eligible to vote or not.
- 16. Write a program to determine the character entered by the user.
- 17. Write a program to find whether the given number is even or odd.
- 18. Write a program to find whether the given year is a leap year or not.
- 19. Write a program to test whether a number entered is positive, negative or equal to zero.
- 20. Write a program to input three numbers and then find largest of them using && operator.
- 21. Write a program to calculate the roots of a quadratic equation.
- 22. Write a program to demonstrate the use of switch statement without a break.
- 23. Write a program that accepts a number from 1 to 10. Print whether the number is even or odd using a switch case construct.

24. Write a program to print the following pattern

- 25. Write a program to print the following pattern
 - Α

AB

ABC

ABCD

ABCDE

- 26. Write a program to print the Fibonacci series using recursion.
- 27. Write a program to read and display n numbers using an array.
- 28. Write a program to print the position of the smallest of a number using arrays.
- 29. Write a program to enter n number of digits. Form a number using these digits.
- 30. Write a program to transpose a 3X3 matrix.
- 31. Write a program to read and display a 3X3 matrix.
- 32. Write a program to print the elements of a 2D array.
- 33. Write a program to display a string using printf ().
- 34. Write a program to find the length of a string.
- 35. Write a program to convert characters of a string into lower case.

Course Name: Communication Skills Lab Course Code: BCA108A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
0	0	2	2

List of Sample Programs

Building Advanced Vocabulary

- 1. Word Formation
- 2. Affixes
- 3. Words often Mis-spelt and Mis- Pronounced
- 4. Words often Confused
- 5. Homonyms and Homophones
- 6. One Word for Many.
- 7. Synonyms and Antonyms.
- 8. Jumbled Sentences
- 9. Practice Exercise of Linking Words (Conjunctions) on software
- 10. Practice Exercise of Tenses on soft ware
- 11. Practice Exercise of passive voice on software
- 12. Dialogue conversation Practice on software

Course Name: Designing Lab (Photoshop and CorelDraw) Course Code: BCA166A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
0	0	2	2

List of Sample Programs

- This exercise can be solved using the following functions: Selection Tools, Copy, Cut, Paste, Move Tool.
- This exercise can be solved using the following functions: Lasso- and Polygonal Lasso Selection Tools, Copy, Paste Into, Move Tool, Zoom Tool, Transform.
- This exercise can be solved using the following functions: Quick Select Tool (or Magic Wand Tool), Invert Selection, Copy, Paste.
- This exercise can be solved using the following functions: Paint Bucket Tool, Color Picker, Brush Tool.
- 5. This exercise can be solved using the following functions: New Picture, Brush Tool, Layers, Eraser Tool.
- 6. Creating the master page in CorelDraw
- 7. Creating pie charts in CorelDraw
- 8. Creating flow charts in CorelDraw
- 9. Creating interactive navigational buttons in CorelDraw
- 10. Publishing your presentation as a full screen PDF in CorelDraw

Course Name: Digital Electronics Lab

Course Code: BCA110A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
0	0	2	2

List of Sample Programs

- 1. To study and verify the truth table of logic gates.
- 2. Design and implementation of Adder and Subtractor using logic gates.
- 3. Design and implementation of BCD to excess-3 code converter using logic gates.
- 4. Design and implementation of Binary to gray code converter using logic gates.
- 5. Design and implementation of 4 bit binary Adder/ subtractor using IC 7483
- 6. Design and implementation of 4 bit binary BCD adder using IC 7483
- 7. Design and implementation of 2 bit Magnitude Comparator using logic gates.
- 8. Design and implementation of 16 bit odd/even parity checker generator using IC74180.
- 9. Design and implementation of multiplexer using logic gates, IC74150 and IC74154.
- 10. Design and implementation of De-multiplexer using logic gates, IC74150 and IC74154
- 11. Design and implementation of encoder using logic gates, IC7445 and IC74147
- 12. Design and implementation of decoder using logic gates, IC7445 and IC74147
- 13. Construction and verification of 4 bit ripple counter.
- 14. Design and implementation of 3-bit synchronous up/down counter.
- 15. Implementation of SISO, SIPO, PISO and PIPO shift registers using Flip- flops

Course Name: Seminar Course Code: BCA111A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits			
0	0	2	2			

The students will present a seminar on a technical topic in front of class and faculty. The evaluation will be done on individual performance followed by submission of a written report on Seminar Topic.

SEMESTER II

Course Name: Environmental Studies

Course Code: BCA112A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits		
2	0	0	2		

- 1. To define and use correctly the common terms of environmental science.
- 2. To explain what makes up the environment, how it functions, and how humans are part of it.
- 3. To apply the concepts and principles of environmental science to propose solutions to specific environmental problems.
- 4. To analysis environmental writings and predictions and their impact on subsequent developments in human relationship with the environment.
- 5. To evaluate the adequacy of conclusions about environmental phenomena.

Syllabus

Unit I

Introduction and Natural Resources: Multidisciplinary nature and public awareness, Renewable and nonrenewal resources and associated problems, Forest resources, Water resources, Mineral resources, Food resources, Energy resources, Land resources, Conservation of natural resources and human role.

Unit II

Ecosystems: Concept, Structure and function, Producers composers and decomposers, Energy flow, Ecological succession, Food chains webs and ecological pyramids, Characteristics structures and functions of ecosystems such as Forest, Grassland, Desert, Aquatic ecosystems.

Unit III

Biodiversity and Conservation: Definition, Genetic, Species, and Ecosystem diversity, Biogeographical classification of India, Value of biodiversity at global, national, local levels, India as a mega diversity nation, Hot sports of biodiversity, Threats to biodiversity, Endangered and endemic species of India, In-situ and ex-situ conservation of biodiversity.

Unit IV

Environmental Pollution: Definition, Causes, effects and control of air pollution, water pollution, soil pollution, marine pollution, noise pollution, thermal pollution, nuclear hazards, human role in prevention

of pollution, Solid waste management, Disaster management, floods, earthquake, cyclone and landslides.

Unit V

Social issues and Environment: Unsustainable to sustainable development, Urban problems related to energy, Water conservation and watershed management, Resettlement and re-habitation, Ethics, Climate change, Global warming, Acid rain, Ozone layer depletion, Nuclear accidents, holocaust, Waste land reclamation, Consumerism and waste products, Environment protection act, Wildlife protection act, Forest conservation act, Environmental issues in legislation, population explosion and family welfare program, Environment and human health, HIV, Women and child welfare, Role of information technology in environment and human health.

Course Outcomes:

Upon successful completion of this subject students should be able to:

CO1: Understand fundamental physical and biological principles that govern natural processes.

CO2: Understand fundamental concepts from the social sciences and the humanities underlying environmental thought and governance.

CO3: Integrate and apply perspectives from across the natural sciences, social sciences, and the humanities in the context of complex environmental problems.

CO4: Apply the concepts and principles of environmental science to propose solutions to specific environmental problems.

CO5: Able to understand social and environmental issues.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course	Program Outcome											
Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				Н						Н		Η
CO2			Н			Н	М					

CO3		Н							
CO4					Н	Н			
CO5	Н			М				L	

H = Highly Related; M = Medium; L = Low

Text Books

- 1. Rajgopalan, "Environmental Studies From Crisis to Cure", (3e), Oxford University Press.
- 2. Agarwal, K.C., Environmental Biology, Nidi Publication Ltd., Bikaner, 2001.

Reference Books

- 1. BharuchaErach, Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmadabad, 2002.
- 2. Clark, R.S., Marine Pollution, Clanderson Press, Oxford, 2002.
- 3. Cunningham, W.P., et al., Environmental Encyclopedia, Jaico Publishing House, Mumbai, 2003.

Course Name: Operating System

Course Code: BCA113B

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
3	1	0	4

- 1. To understand the OS role in the overall computer system
- 2. To study the operations performed by OS as a resource manager and the scheduling policies of OS
- 3. To understand the different memory management techniques

- 4. To understand process concurrency and synchronization
- 5. To understand the concepts of input/output, storage and file management and to study different OS and compare their features.

Syllabus

Unit – I

Introduction - Operating system objectives, User view, System view, Operating system definition ,Types, Functions, Computer System Organization, Computer System Architecture, OS Structure, Operating System services, User and OS Interface, System Programs, Operating System Design and Implementation, OS Structure.

Unit – II

Process and CPU Scheduling – Process concepts, The Process, Process State, Process Control Block, Threads, Process Scheduling, Scheduling Criteria, Scheduling algorithms Scheduling Queues, Schedulers, Context Switch, Operations on Processes, System calls, Process Synchronization, The Critical Section Problem, Peterson's solution, Synchronization Hardware, Semaphores.

Unit – III

Deadlocks- Deadlock characterization, Methods of handling deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

Unit - IV

Memory Management – Memory Management Strategies- Overlays and Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of Page Table, Virtual Memory Management-Segmentation, Paging, Demand Paging, Page Replacement, Page Replacement Algorithms, Allocation of Frames, Thrashing.

Unit - V

File System and Security - File-System Structure, File-System Implementation , Directory Implementation, Allocation Methods, Free-Space Management, Efficiency and Performance, Recovery, NFS, Organization of I/O Function, I/O Buffering, Disk Organization, Disk Scheduling, RAID, Operating Systems view of file system, Disk space management. System Security- The Security Problem, Program Threats, Policies, System and Network Threats, User Authentication, Security Models

Course Outcomes (COs):

Upon successful completion of this subject students should be able to:

CO1: Apply optimization techniques for the improvement of system performance.

CO2: Ability to design and solve synchronization problems.

CO3 Learn about minimization of turnaround time, waiting time and response time and also maximization of throughput by keeping CPU as busy as possible.

CO4: Ability to change access controls to protect files.

CO5: Ability to compare the different operating systems.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course		Program Outcome										
Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		Н							М			
CO2				Н								
CO3			Н				М				М	
CO4			М									Н
CO5		М			Н					Н		

H = Highly Related; M = Medium; L = Low
Text Books

- 1. A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, 8th edition, John Wiley Publications ,2008.
- 2. A.S. Tanenbaum, Modern Operating Systems, 3rd edition, Pearson Education ,2007.

Reference Books

- 1. G. Nutt, Operating Systems: A Modern Perspective, 2nd edition Pearson Education ,1997.
- W. Stallings, Operating Systems, Internals & Design Principles, 5th edition, Prentice Hall of India, 2008.
- 3. "Operating Systems: Internals and Design Principles" by William Stallings

Course Name: Database Management System

Course Code: BCA114B

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
3	1	0	4

Course Objectives:

- 1. To enhance the fundamentals knowledge of data models and to conceptualize and depict a database system using ER diagram.
- 2. To develop programs and queries based on SQL and relational database, and do fundamental Operations of Relational Algebra & their Implementation.
- 3. To be able to know the fundamental concepts of transaction processing management.

- 4. To justify the concept of concurrency control techniques and recovery procedure.
- 5. To have an introductory knowledge about the Storage and Query processing Techniques.

Syllabus

Unit I

Basic Concepts: Purpose of database systems-Components of DBMS – DBMS Architecture and Data Independence- Data modeling, Entity Relationship Model, Relational, Network, Hierarchical and object oriented models, Data Modeling using the Entity Relationship Model.

Unit II

Structure of relational databases: Relational Constraints, Domain Constraints, Key Constraints Referential Integrity Constraints, Relational Algebra, Fundamental Operations of Relational Algebra & their Implementation, Data definition with SQL, insert, delete and update statements in SQL – views – data manipulation with SQL.

Unit III

Query Processing: Methods for Joining Tables –Nested Loop Join Merge Join, Hybrid Join, Multiple table Join, Transforming Nested Queries to Joins, Object Relational SQL, Procedural SQL, Introduction to Embedded SQL.

Unit IV

Database Design: Integrity Constraints – Domain Constraints- Referential integrity – Functional Dependency- Normalization using Functional Dependencies, Normal forms based on primary keys-general definitions of Second and Third Normal Forms. Boyce Codd Normal Form– Multivalued Dependencies and Forth Normal Form – Join Dependencies and Fifth Normal Form.

Unit V

Transaction Management: Transaction Concept, ACID Properties, Transaction State, Implementation of ACID properties, Schedules. Concurrency Control: Need of concurrency control, Concurrency control techniques, Lock based protocols, binary lock, share and exclusive lock, two phase locking protocol. Introduction to recovery.

Course Outcomes:

Upon successful completion of this subject students should be able to:

CO1: Recall the basic concept of DBMS and models of DBMS.

CO2: To know the fundamental concepts of transaction processing management.

CO3: To develop programs and queries based on SQL and relational database, and do fundamental Operations of Relational Algebra & their Implementation.

CO4: Contrast the concept of functional dependency, Norm forms, constraints and integrity

CO5: Able to understand the concept of concurrency control techniques and recovery.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course		Program Outcome										
Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Η		М						М			М
CO2		Н			Н							
CO3			М	Н				М				
CO4						М					М	Н
CO5	M						Н					

H = Highly Related; M = Medium; L = Low

Text Books

- Fundamentals of Database System Elmasri and Navathe (4rd Edition), Pearson Education Asia (2008)
- 2. An Introduction to Database Systems C.J.Date (7th Edition) Pearson Education Asia (2006)

Reference Books

- 1. A.Silberschatz, H. Korth and S. Sudarshan, *Database System Concepts*, 5th Edition, McGraw Hill, 2010.
- 2. R. Ramakrishnan, J. Gehrke, *Database Management Systems*, 3rd edition, McGraw Hill International Edition, 2007.
- Database System Concepts Henry F Korth, Abraham Silbershatz, McGraw Hill 2nd edition. (2005)

Course Name: Computer Architecture Course Code: BCA115B

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
3	1	0	4

Course Objectives:-

- 1. To provide information about digital computer technology and how data is represented in computer system.
- To discuss in detail the operation of the arithmetic Unit including the algorithms & implementation of fixed-point and floating-point addition, subtraction, multiplication & division.
- 3. To have a systematic understanding of the basic structure and operation of a digital computer.
- 4. To clear concepts of central processing unit and describes the structure of arithmetic/logic units.
- 5. To understand the pipelining and vector processing concepts.

Syllabus

Unit I

Digital logic circuits, Digital component and Data Representation: Digital computers, Logic gates Boolean algebra, Complement of a function, combinational circuits, Half adder, Full Adder, Flip flop: SR flip flop, D Flip flop, JK Flip Flop, T flip flop, integrated circuits, Decoder, Multiplexer, Registers Shift register Binary Counter Memory Unit.

Data Representation: Data Types, Number Systems, Octal and Hexadecimal Numbers, Decimal Representation, Alphanumeric Representation, Complements, (r-l)'s Complement, (r's) Complement, Subtraction of Unsigned Numbers, Fixed-Point Representation, Integer Representation, Arithmetic Addition, Arithmetic Subtraction.

Unit II

Register Transfer and Micro operation, Basic Computer Organization and Design:

Register Transfer, Bus and Memory Transfer, Arithmetic, Logic and shift Micro operations, Instruction Codes, Stored Program Organization, Indirect Address, Computer Registers, Common Bus System, Computer Instructions, Instruction Set Completeness, Timing and Control, Instruction Cycle, Fetch and Decode, Determine the Type of Instruction, Register-Reference Instructions, Memory-Reference Instructions.

Unit III

Central Processing Unit: General Register Organization, Control Word, Examples of Micro operations, Stack Organization, Register Stack, Memory Stack, Reverse Polish Notation, Evaluation of Arithmetic Expressions, Instruction Formats, Three-Address Instructions, Two-Address Instructions, One-Address Instructions, Zero-Address Instructions, RISC, CISC.

Unit IV

Pipeline and Vector Processing, Computer Arithmetic: Parallel Processing, Pipelining, General Considerations, Arithmetic Pipeline, Instruction Pipeline, Four-Segment Instruction Pipeline, Data

Dependency, Handling of Branch Instructions, RISC Pipeline, Three-Segment Instruction Pipeline, Delayed Load, Delayed Branch, Vector Processing.

Addition and Subtraction, Addition and Subtraction with Signed-Magnitude Data, Hardware Implementation, Addition and Subtraction with Signed- 2' s Complement Data, Multiplication Algorithms Hardware Implementation for Signed-Magnitude Data, Booth Multiplication Algorithm, Array Multiplier, Division Algorithms, Floating-Point Arithmetic Operations, Basic Considerations, Register Configuration, Addition and Subtraction, Multiplication, Division, Decimal Arithmetic Unit.

Unit V

DMA and Memory organization

Direct Memory access, DMA controller, DMA Transfer, Memory Hierarchy, Main Memory, Cache Memory: Associative mapping, Direct mapping, set associative mapping, writing into Cache, Cache initialization, Virtual Memory: Address space and memory space, address mapping using pages, associative memory page table, Page replacement algorithms.

Course Outcomes (COs):-

On successful completion of this course, the learner will be able to:

CO1: Understand the concept of digital logic circuit and digital component.

CO2: Understand the concept of register transfer and micro operations.

CO3: Develop an understanding of concepts of central processing unit and describes the structure of arithmetic/logic units.

CO4: Examine the pipelining and vector processing concepts and implement computer arithmetic.

CO5: Understand the concept of DMA and Memory organization

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course		Program Outcome										
Outcome												
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO1	PO1	PO1
	1	2	3	4	5	6	7	8	9	0	1	2
CO1				Η					М			

CO2		Μ		Μ					М	
CO3	М				Μ	L				М
CO4			L				М			
CO5	Н				L			М		

H = Highly Related; M = Medium; L = Low

Text Books:

1. Morris Mano, "Computer system architecture", 5th edition, Pearson Education.

2. Carl Hamacher, ZvonkoVranesic and SafwatZaky, Naraig Manjikian, "Computer Organization and Embedded Systems",(6e),McGraw Hill Publication, 2012

Reference Books :

- 1. D. A. Patterson and J. L. Hennessy, "Computer Organization and Design The Hardware/Software Interface",(5e),Morgan Kaufmann, 2011
- 2. Mohammed Rafiquzzaman and Rajan Chandra, "Modern Computer Architecture", Galgotia Publications Pvt. Ltd. 2008.
- 3. William Stallings, "Computer Organization and Architecture Designing for Performance", (8e), PHI, 2009.

Course Name: Programming Fundamentals using C-II Course Code: BCA116A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
3	1	0	4

Course Objectives:

- 1. To provide exposure to problem solving through programming.
- 2. To enhance the ability to solve the problem through various constructs of C such as decision control and looping statements.
- 3. To demonstrate the concept of functions, arrays, strings, pointers, structure and union.
- 4. To evaluate the concept of file management and pre-processor directives.
- 5. To explore major concepts of computer science and the process of computer programming, including programming, procedural and data abstraction and program modularity.

Syllabus

Unit I

Introduction to C: Data types, variables, Decision Control Statements, Conditional Branching Statements, Iterative Statements, Nested Loops, break and continue Statements, Array, and String.

Unit II

Functions: Function Declaration/Function Prototype, Definitions, Function call, Return Statement, Parameter passing, Scope of Variables, Storage classes, Recursive functions

Unit III

Pointers: Computer's Memory, Introduction to Pointers, Declaring Pointer Variables, Pointer Expressions and Pointer Arithmetic, Null Pointers, Generic Pointers, Passing Arguments, Pointers and Arrays, Pointers and Strings, Array of Pointers, Function Pointers, Array of Function Pointers, Pointers to Pointers

Unit IV

Structure & Union: Structure Declarations, Typedef keyword, initialization, Accessing members, nested structure, Array of Structure, Structure with functions, Self-referential Structures, Union, Structure vs Union

Unit V

Files and Preprocessor Directives: Files: Introduction to Files, Using Files in C, Writing to files, Read data, EOF, Error handling, Command line Arguments, Functions for Selecting a Record Randomly, Renaming the File, Temporary File.

Preprocessor Directives: Introduction, Types, #define, #include, #undef, #line, Pragma Directives, Conditional Directives, The Defined Operator, #error Directive, Predefined Macro Names.

Course Outcomes (COs):

Upon successful completion of this subject students should be able to:

CO1: Students will learn the concept of character set identifiers and keywords, data type, variable names, declaration statements and basic structure of C program and Flow of Control and program Structures.

CO2: Student will classify the File handling, preprocessor directives and predefined macro names.

CO3: Students will apply the concept of Arithmetic operators, relational and logical operators, type, conversion, Standard input and output, formatted output and input.

CO4: Students will contrast C programs based on Structures Union and Files.

CO5: Students will learn the concept of Arrays, Pointers, Null Pointers, and Generic Pointers

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course		Program Outcome										
Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				Н						Н		Н
CO2			Н			Н	М					
CO3		Н										
CO4							Н	Н				
CO5	Н				М						L	

H = Highly Related; M = Medium; L = Low

Text Books

- 1. Reema Theraja, "Programming in C", Second Edition, Oxford University Press, 2016
- 2. Reema Thareja, "Introduction to C Programming", First Edition, Oxford University press, 2012.

Reference Books

- 1. Yeshwant kanetkar, Let us C, Fifteenth Edition, BPB Publication 2016.
- 2. Byron S Gottfriend, "Programming with C", Second Edition, Mc Graw Hill, 2007.
- 3. Herbert Schildt, Turbo C: The Complete Reference, Fourth edition, Mc Graw-Hill, 2017.

Course Name: HTML Programming Course Code: BCA117B

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
2	0	0	2

Course Objectives

- 1. To summarize the structure of HTML, XHTML and tags.
- To demonstrate core HTML attributes id, class, style, title, core language, core events, Headings, Paragraphs and Breaks etc.
- 3. To visualize the basic concept of Images Preliminaries, Tables and layout of tables.
- 4. To recognize the elements of HTML, frameset, multimedia and video.
- 5. To introduce basics concept of CSS, Adding Style to a document, CSS and HTML Elements

Syllabus

Unit I

Introduction to HTML and XHTML- HTML Structure, Document types, Tag- HTML, Head, Title, Body, Elements and Characters, The Rules of HTML, XHTML: The rules enforced. Web Development Overview: Need for Careful Web Development, Clients-Servers and Communication, Internet-Basic ,Internet Protocols(HTTP,FTP,IP), World Wide Web(WWW)

Unit II

Core Elements: Document Structure Redux, Core HTML Attributes- id, class, style, title, core language, core events, Headings, Paragraphs and Breaks, Division and Centering, Quotations, Preformatted Text. Creating Lists in HTML- Ordered lists, Unordered List, definite List. Horizontal Rules, Other block

Level Elements- Address, Text Level Elements, Inserting and Deleted Text, Character Entities. Comments, Linking and Addressing- Linking Basics, UML, Linking in HTML, Anchor Attributes, Images and Anchors.

Unit III

Images- Images Preliminaries, HTML Images Basics, Images as Buttons, Text, Color and Backgrounds-HTML Approach to Visual Design, Fonts, Colors in HTML, Color Attributes for Body, Background Images, Tables and Layout- Introduction to tables : the rowspan and colspan attributes, Table for Layout: cellpadding and cellspacing, cell alignment, colored tables and cells, background images in tables Frames: Overview of Frames, Simple Frame Example, The use of <noframes> Frame Targeting, Frame Layouts, Floating Frames. Multmedia: Audio- Digital Sound Basics, Audio file formats and compression, Downloading and playing audio, MP3, Audio Inclusion Basics. Video: Video Inclusion Basics, QuickTime, Streaming Video Choices.

Unit IV

CSS1: Style Sheet Basics, Adding Style to a document, CSS and HTML Elements, Selectors, CSS1 Properties: Font, Text, List, Color and Background, box, Display. CSS2: CSS2 Selectors, CSS Properties- Positioning and Sizing of Regions, z-index, Content Overflow Properties, Max and Min Height and Width, Clipping Regions, CSS2 Text and font Improvements, CSS2 Text and Font Improvements, CSS2 List Changes, Display Properties Changes.

Unit V

Introduction to Java Script, Identifier & operator, control structure, functions, Document object model (DOM), DOM Objects(window, navigator, history, location) ,Predefined functions, math & string functions ,Array in Java scripts , Event handling in Java script

Course Outcomes (Cos):

Upon successful completion of this subject students should be able to:

CO1: Apply a structured approach to identifying needs, interests, and functionality of a website.

CO2: Demonstrate core HTML attributes id, class, style, title, core language, core events, Headings, Paragraphs and Breaks etc.

CO3: Visualize the basic concept of Images Preliminaries, Tables and layout of tables, accessible HTML code.

CO4: Write well-structured, easily maintained, standards-compliant CSS code to present HTML pages.

CO5: Recognize the elements of HTML, frameset, multimedia and video.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course		Program Outcome										
Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Н		М								М	
CO2				Н								
CO3						М				М		
CO4		Η					M					Η
CO5	М				L				М			

H = Highly Related; M = Medium; L = Low

Text Books:

- 1. The Complete Reference HTML and XHTML by Thomas A. Powell, McGraw Hill, Forth Edition, 2007
- 2. "HTML5: Designing Rich Internet Applications" by Matthew David

Reference Books:

- Beginning HTML, XHTML, CSS, and JavaScript, John Duckett, Wiley India, Forth Edition, 2008
- 2. HTML, XHTML, and CSS Bible, Steven M. Schafer, Wiley India, Fifth Edition, 2012
- 3. "HTML and CSS: Design and Build Websites" by Jon Duckett

Course Name: Database Management System Lab Course Code: BCA118B

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
0	0	2	2

Course Objectives:

The purpose of this course is to enhance the practical knowledge based on prescribed theory course. The students will be able to enhance their analyzing and problem solving skills after implementation of all the given experiments.

List of Sample Programs

- 1. Data Definition Language (DDL) commands in DBMS
- 2. Data Manipulation Language (DML) and Data
- 3. Control Language (DCL)
- 4. Join Inner Join and Outer Join
- 5. High level language extensions with cursors
- 6. High level language extension with Triggers
- 7. Procedures and Functions
- 8. Embedded SQL
- 9. Database design using E-R model and Normalization
- 10. Design and implementation of payroll processing system
- 11. Design and implementation of banking system

Course Name: Programming Fundamentals using C-II Lab Course Code: BCA119A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
0	0	2	2

Course Objectives:

The purpose of this course is to enhance the practical knowledge based on prescribed theory course. The students will be able to enhance their analyzing and problem solving skills after implementation of all the given experiments.

List of Sample Programs

- 1. Write a program to demonstrate the use of printf Statement to print values of variables of different data types.
- 2. Write a program to calculate the area of a triangle using Hero's formula.
- 3. Write a program to calculate the distance between two points.
- 4. Write a program to perform addition, Subtraction Division, Integer Division, Multiplication and modulo Division on two Integer numbers.
- 5. Write a program to subtract two long Integers.
- 6. Write a program to illustrate the use of Unary prefix increment and decrement operators.
- 7. Write a program to find the largest of three numbers using Ternary operators.
- 8. Write a program to show use of Bitwise operators.
- 9. Write a program to demonstrate the use of Assignment Operators
- 10. Write a program to Swap 2 numbers using a temporary variable.
- 11. Write a program to Swap 2 numbers without using a temporary variable.
- 12. Write a program to convert degrees fahrenheit into Degrees Celsius.

- 13. Write a program to covert a floating point number into the corresponding integer.
- 14. Write a program to convert an Integer into the Corresponding floating point number.
- 15. Write a program to determine whether a person is eligible to vote or not.
- 16. Write a program to determine the character entered by the user.
- 17. Write a program to find whether the given number is even or odd.
- 18. Write a program to find whether the given year is a leap year or not.
- 19. Write a program to test whether a number entered is positive, negative or equal to zero.
- 20. Write a program to input three numbers and then find largest of them using && operator.
- 21. Write a program to calculate the roots of a quadratic equation.
- 22. Write a program to demonstrate the use of switch statement without a break.
- 23. Write a program to determine whether an entered character is a vowel or not.
- 24. Write a program to enter a number from 1 to 7 and display the corresponding day of the week using switch case statement.
- 25. Write a program that accepts a number from 1 to 10. Print whether the number is even or odd using a switch case construct.
- 26. Write a program to print the following pattern

27. Write a program to print the following pattern

A AB ABC

ABCD

ABCDE

- 28. Write a function to swap the value of two variables.
- 29. Write a program to calculate area of a circle using function.
- 30. Write a program to print the Fibonacci series using recursion.
- 31. Write a program to read and display n numbers using an array.
- 32. Write a program to print the position of the smallest of a number using arrays.

- 33. Write a program to enter n number of digits. Form a number using these digits.
- 34. Write a program to transpose a 3X3 matrix.
- 35. Write a program to read and display a 3X3 matrix.
- 36. Write a program to enter n number of digits. Form a number using these digits.
- 37. Write a program to implement linear search.
- 38. Write a program to implement Binary search.
- 39. Write a program to print the elements of a 2D array.
- 40. Write a program to display a string using printf ().
- 41. Write a program to find the length of a string.
- 42. Write a program to convert characters of a string into lower case.
- 43. Write a program to print Hello worlds using pointers.
- 44. Write a program to calculate area of circle.
- 45. Write a program to display the sum and average of numbers from m to n.
- 46. Write a program to calculate area of a Triangle.
- 47. Write a program using structures to find the largest of three numbers.
- 48. Write a program to read a file character by character, and display it simultaneously on the screen.
- 49. Write a program to count the number of characters and number of lines in a file.
- 50. Write a program to copy one file into another .copy one character at a time.

Course Name: HTML Lab Course Code: BCA120B

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
0	0	2	2

Course Objectives:

The purpose of this course is to enhance the practical knowledge based on prescribed theory course. The students will be able to enhance their analyzing and problem solving skills after implementation of all the given experiments.

List of Sample Programs

- Create a Web Page using HTML To Display "Welcome to the World of HTML" using basic HTML tags.
- 2. Create a Web Page using HTML using Headings, Paragraphs and Breaks HTML Tags.
- 3. Write a program to design a Bio-Data.
- 4. Write a program in html to create a webpage with four frames (Picture, table, list, and hyperlink)
- 5. Write a program to create a Ordered List in HTML
- 6. Write a program to create a Unordered List in HTML
- 7. Write a program to create a Defined List in HTML
- 8. Write a program in html to create a webpage to show different hobbies.
- 9. Write a program in html to Implementation Of Table Tag
- 10. Write a program in html to create a webpage with four frames (Picture, table, list, and hyperlink).
- 11. Write a program in html to create a webpage to show the block level elements and text level elements.
- 12. Write a program in html to create a webpage to show various confectionary items using ordered list and unordered list.

- 13. Write a program in html to create a webpage to show different hobbies.
- 14. Write a program in html to show India map.
- 15. Write a program in html to create a web page using style sheet.
- 16. Write a program in html to create a web page to show registration naukri.com.
- 17. Write a program in html to show books in inventory in different tables by using rowspan and colspan.
- 18. Create a Web Page in HTML to show Admission form in some university.
- 19. A Web Page in HTML to show all the Text, Color, Background and Font Elements.
- 20. Write a Program to Create a Nested List.
- 21. Write a program to create menu using HTML and CSS
- 22. Design of the cart page and the registration page required for online book store.
- 23. Create a static webpage using table tags of HTML
- 24. Create a static web page which defines all text formatting tags of HTML in tabular format.
- 25. Create webpage using list tags of HTML
- 26. Create employee registration webpage using HTML form objects
- 27. Apply style sheet in Web page. [inline, embedded and linked]
- 28. Create a simple xml file and also create dynamic web page in which XML tags used.

Course Name: UNIX and Shell Programming Lab

Course Code: BCA121A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
0	0	2	2

Course Objectives:

The purpose of this course is to enhance the practical knowledge based on prescribed theory course. The students will be able to enhance their analyzing and problem solving skills after implementation of all the given experiments.

List of Sample Programs

- 1. Demonstrate how to use the following Bourne Shell commands: cat, grep, ls, more, ps, chmod, finger, ftp, etc.
- 2. Use the following Bourne Shell constructs: test, if then, if then else, if thenelif, for, while, until, and case.
- 3. Copy, move, and delete files and directories.
- 4. Write moderately complex Shell scripts.
- 5. Make a Shell script executable.
- 6. Create a ".profile" script to customize the user environment.
- 7. Execute programs written in C under UNIX environment
- 8. Learn tracing mechanisms (for debugging), user variables, Bourne Shell variables, read-only variables, positional parameters, reading input to a Bourne Shell script, command substitution, comments, and exporting variables. In addition, test on numeric values, test on file type, and test on character strings are covered.
- 9. Use advanced features of File Transfer Protocol (FTP)
- 10. Compile source code into object and executable modules.

Semester III

Course Name: Principles and Practices of Management

Course Code: BCA122A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
3	0	0	3

Course Objectives:

- 1. To discuss, understand, and present management principles, processes and procedures in consideration of their effort on individual actions.
- 2. To participate, summarize and lead class discussions case problems
- 3. To be able to understand the concept of environment and environment relationship.
- 4. To knowledge and understanding of the Principles of Management
- 5. To enable the students to manage valuable insight into the workings of business and other organizations.

Syllabus

Unit I

Introduction: Concepts of management, The management process and function, Types and roles of managers, Managerial levels and skills, Emerging challenges for management.

Management Theories: Scientific management school, Administrative management, Behavioral School, Management science school, Systems approach, Contingency approach.

Unit II

Environmental Context: Concept of environment, External environment and internal environment, Organization- environment relationships, Managerial ethics, Social responsibility, Planning and Decision Making: Planning an overview, Importance of planning, Purpose and functions of organizational goals, Types of planning, Concept of strategic planning, Situational analysis, Managerial decision making: nature of decision making, styles and conditions of decision making, group decision making, tools for planning and decision making

Unit III

Organizational Design and Structure: Meaning, Principles and approaches to organizing, job design, Departmentation, Nature and types of organization design, Situational influence on organizational design, informal organization, Authority, power and responsibility, Delegation and decentralization of authority, Emerging concepts in organizing

Unit IV

Motivation: the motivational process, the need-hierarchy and motivation-hygiene theories, Motivation through employee participation

Communication and Team Work: Concept, nature, and forms of organizational communication, Informal communication, Interpersonal communication, barriers to communication, Groups and teams: concept and characteristics, Interpersonal and inter-group conflicts, Managing conflicts

Unit V

Control and Quality Management: Elements of control, Nature and types of control, Managing control in organization, Information for effective control, MIS and DSS, TQM, Factors effecting quality. Deming management

International Management: Globalization – concept, nature and forms. Methods of globalization, changing international management scenario. Multinational companies – meaning and types, effects and benefits

Course Outcomes (COs):

Upon successful completion of this subject students should be able to:

CO1: Introduction to relation between management and behavior.

CO2: Define management, quality management, and project management in respect of planning & Decision making.

CO3: Identify relevant issues in human resource management with leadership qualities.

CO4: Understands the theories and practices of Communication and team work in management.

CO5: Describe International Management with Quality control concepts.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course	Prog	ram O	utcom	e								
Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Η							L				Η
CO2		М				Н	М					
CO3				Η						Н		
CO4							Н					
CO5	Η				Μ						L	

H = Highly Related; M = Medium; L = Low

Text Books

- 1. Stoner J.A. and Freeman R.E, "Management", VI Edition, Prentice hall India
- 2. Parkinson C.N., Rustomji M.K. and Sapre S.A, "Great Ideas in Management".

Reference Books

- 1. S.K. Mandal, "Management: Principles and Practice"
- 2. Lallan Prasad, S S Gulshan, "Management Principles and Practices".
- 3. "Great Ideas in Management" by Parkinson C N and Rustomji M K and Sapre S A

Course Name: Programming in PHP

Course Code: BCA123A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
3	0	0	3

Course Objectives:

- 1. To demonstrate the basics of the PHP and MYSQL, PHP configuration in IIS & Apache Web Server and features of PHP.
- 2. To understand how PHP, HTML and MYSQL work together to produce dynamic pages.
- 3. To apply specific PHP variables, data types, syntax and conditional statements.
- 4. To be able to apply control statements and database connectivity.
- 5. To make use of string functions and array functions.

Syllabus

Unit I

Introduction to PHP, Installation of PHP and MySQL, PHP configuration in IIS & Apache Web Server and features of PHP, Writing PHP, How PHP code is parsed, Embedding PHP and HTML Executing PHP and viewing in Browser.

Unit II

Data types, Operators, PHP variables: static and global variables, Comments in PHP, Control Structures, Condition statements, If...Else, Switch, ? operator, Loops, While, Break Statement Continue. Do...While, For, For each, Exit, Die, Return

Unit III

Arrays in PHP, Working With Data, FORM element, INPUT elements, Validating the user input, Passing variables between pages, Passing variables through GET, Passing variables through POST, Passing variables through REQUEST, Working With Data, Built-in functions.

Unit IV

String.Functions: chr, ord, strtolower, strtoupper, strlen, ltrim, rtrim, substr, strcmp, strcasecmp, strpos, strrpos, strstr, stristr, str_replace, strrev, echo, print, Math Functions: abs, ceil, floor, round, fmod, min, max, pow, sqrt, rand.

Unit V

Array Functions: count, list, in_array, current, next, previous, end, each, sort, rsort,assort, array_merge, array_reverse User Defined Functions. Sessions and cookies, Concept of Session Starting session, Modifying session variables, registering and deleting session variable Concept of Cookies.

Course Outcomes:

Upon successful completion of this subject students should be able to:

CO1: Demonstrate the basics of the PHP and MYSQL, PHP configuration in IIS & Apache Web Server and features of PHP.

CO2: Examine how web pages are developed using PHP array, form and input elements.

CO3: Apply specific PHP variables, data types, syntax and conditional statements.

CO4: Understand the basics of array functions and user defined functions.

CO5: Understand the basics of string functions like chr, ord, strtolower, strtoupper, strlen.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course	Prog	ram O	utcom	e								
Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Н							L				Н
CO2		М				Н	М					
CO3				Н						Η		
CO4							Н					
CO5	Н				М						L	

H = Highly Related; M = Medium; L = Low

Text Books

- PHP Cookbook by David Sklar and Adam Trachtenberg, O'Reilly Media, Inc., ISBN: 978-1-449-36375-8.
- Core PHP Programming, Leon Atkinson Pearson publishers, 2nd Edition, ISBN-13: 978-0130893987.

Reference Books

- 1. The Complete Reference PHP, SteverHolzner McGraw Hill, Edition: 1 ISBN: 9780070223622.
- Web Technologies: HTML, JAVASCRIPT, PHP, JAVA, JSP, ASP.NET, XML and Ajax, Black Book: HTML, Javascript, PHP, Java, Jsp, XML and Ajax, Black Book" by Kogent Learning Solutions Inc.
- "Web Enabled Commercial Application Development Using HTML, JavaScript, DHTML and PHP (4th Revised Edition) CD-ROM Included" by Ivan Batross

Course Name: Basic Mathematics Course Code: BCA124A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
3	0	0	3

Course Objectives:

- 1. To be able to learn the concept of basic mathematics terms for competition exams.
- 2. To learn the basic operations like addition, subtraction, multiplication and division.
- 3. To demonstrate the concept of number system and binary numbers.
- To be able to work with Time and Work, solve problem Based on Ages, Profit and Loss, Simple Interest, Compound Interest.
- 5. To be able to classify the basic reasoning concepts.

Syllabus

Unit I

Basic Operations: Addition, Addition and subtraction in a single row, Multiplication, multiply by different numbers, Divisibility, Divisibility by different number, Squaring, Cube, HCF & LCM, HCF and LCM of decimal numbers and fractions, Fractions, Decimal Fractions,

Unit II

Elementary Algebra, Surds, Number System, Binary System, Permutation & Combination, Probability, Ratio and Proportion, Partnership, Percentage, Calculation oriented basic Percentage Problems, Average, and Problem Based on Ages, Profit and Loss, Simple Interest, Compound Interest, Allegation

Unit III

Time and Work, Work and Wages, Pipes and Cisterns, Time and Distance, Problems on Average/Relative speeds, Boats, Trains, Trains, Streams, Series, Data Sufficiency, Data Analysis, Problems on Bar/Line Graphs, Pie Charts, Tables.

Unit IV

Reasoning Classification: Number, Letter, GK and Meaningful Words, Analogy, Coding Decoding: Coding by Analogy, Coding and decoding by letter shifting & Coding Letters of a Word, Puzzle: Number based puzzles; Puzzle Quant based questions like on age, speed and distance or Seating arrangement questions.

Unit V

Blood Relations: Family Tree or General Blood Relation Problems, Missing Number: missing number from the given matrix or diagram, Series: Number & Alphabet series, Non Verbal Reasoning: Complete the pattern, Assemble Image, Mirror Image, Hidden Image, Counting Figures.

Course Outcomes (COs):

Upon successful completion of this subject students should be able to

CO1: Learn the basic operations like addition, subtraction, multiplication and division.

CO2: Able to work with Time and Work, solve problem Based on Ages, Profit and Loss, Simple Interest, Compound Interest.

CO3: Demonstrate the concept of number system and binary numbers.

CO4: Able to classify the basic reasoning concepts.

CO5: Determine the concept of blood relations, number series, Non Verbal Reasoning.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course	Prog	Program Outcome										
Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		Н							М			
CO2						М				Н		
CO3				Н				М				
CO4						М					Н	
CO5	Η				М							L

H = Highly Related; M = Medium; L = Low

Text Books

1. Magical Book on Quicker Maths by M. Tyra.

2. Verbal Reasoning and non verbal by M. Tyra

Reference Books

- 1. Quantitative Aptitude by R.S. Agarwal.
- 2. A Modern Approach to Verbal & Non Verbal Reasoning by R.S. Agarwal.
- 3. Fast track objective arithmetic by Rajesh Verma.

Course Name: Data Structures and Algorithms using C

Course Code: BCA125A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits

3	1	0	4

Course Objectives:

- 1. To impart the basic concepts of data structures and algorithms.
- 2. To understand concepts about searching and sorting techniques.
- 3. To understand basic concepts about stacks, queues, lists, trees and graphs.
- 4. To understanding about writing algorithms and step by step approach in solving problems with the help of fundamental data structures.
- 5. To impart the basic concepts of algorithms implementation in optimized time .

Syllabus

Unit I

Introduction to Data Structures and Algorithms: Elementary Data Structure Organization, Classification of Data Structures, Operation of Data Structures, Operations on Data Structures, Abstract Data Type ,Algorithms, Different Approaches to, Designing an Algorithm, Control Structures Used in Algorithms, Time and Space Complexity, Omega Notation (Ω), Theta Notation (Q) ,Other Useful Notations.

UNIT II

Array and Linked List: Declaration of Arrays, Accessing the Elements of an Array, Storing Values in Array, operations, Passing Array to functions, Pointers and Arrays, Arrays of Pointers, Two-dimensional Arrays, Operations on , Passing Two-dimensional Arrays to Functions, Pointers and Two-dimensional Arrays, Sparse Matrices .

Linked list Basic Terminologies, Memory Allocation and De-allocation for a Linked List, Singly Linked Lists, Circular Linked Lists, Doubly Linked Lists, Circular Doubly Linked Lists, Header Linked Lists, Multi-linked Lists, Applications of Linked Lists.

UNIT III

Stack: Array Representation of Stack, Operations on Stack, inked Representation of Stacks, Operations on a Linked Stack, Multiple Stacks, Applications of Stack,

Queues: Introduction to Queues, Array Representation of Queues, Linked Representation of Queues, Types of Queues, Applications of Queues

UNIT IV

Trees and BST Trees: Types of trees, Creating a Binary Tree from a General Tree, Traversing a Binary Tree, Huffman's Tree

Binary Search Trees: BST Operations, Threaded Binary Trees, AVL Trees, Red-Black Trees, Splay Trees

UNIT V

Graph, Searching & Sorting: Basic Terminologies, Directed Graphs, Representations of Graphs, Graph Traversals Algorithms, Topological Sorting, Shortest-Path Algorithms.

Searching & Sorting: Introduction to searching, Linear and Binary Search, Interpolation Search, jump search, Sorting Types, Bubble, Insertion, Selection, Merge Sort, Radix Sort Shell Sort, Quick Sort, Heap Sort.

Course Outcomes (COs):

Upon successful completion of this subject students will able

CO1: Ability to analyse algorithms and a algorithm correctness.

CO2: Ability to implement various techniques of link list.

CO3: Ability to describe stack, queue with linked list operation.

CO4: Ability to have knowledge of tree and graphs concepts.

CO5: Ability to summarize searching and sorting techniques

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course	Prog	Program Outcome										
Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

CO1		Н					М			
CO2					М			Н		
CO3			Η			М				
CO4					М				Η	
CO5	Н			М						L

H = Highly Related; M = Medium; L = Low

Text Books

- 1. R. G. Dromey, "How to Solve it by Computer", Second Edition, Prentice-Hall of India, 2002.
- 2. Reema Thereja,, "Data Structure using C", Second Edition, Oxford University Press, 2014

Reference Books

- 1. M. A. Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education Asia, 2002.
- 2. ISRD Group, "Data Structures using C", Fifth Edition Tata McGraw Hill, 2007
- Richard F. Gilberg, Behrouz A. Forouzan, "Data Structures A Pseudocode" Third Edition Prentice-Hall of India, 2004.

Course Name: Programming Fundamentals using C++ Course Code: BCA126A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
3	1	0	4

Course Objectives:

- 1. To explain the difference between object oriented programming and procedural programming and features of object oriented programming.
- 2. To be able to create programs using more advanced C++ features such as composition of objects, operator overloads, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling, etc.
- 3. To be able to build C++ classes using appropriate encapsulation, objects and functions.
- 4. To be able to apply operator overloading in different form.
- 5. To be able to understand the working of files.

Syllabus

Unit I

Introduction to Object Oriented Programming: Generation of Programming, Programming Paradigms, Features of Object Oriented Programming, Introduction to C++, History of C++, Structure, First Program, Compiling and Executing C++, Using Comments, Tokens, Character Set, Keywords, Identifiers, Data Types, Variables, Constants, Input and Output Statements, Operators in C++, Operator Precedence and Associability, Decision Control and Looping, Statements, Functions, Arrays, Strings, Pointers, Structure, Union, and Enumerated Data Types

Unit II

Classes and Objects: Introduction, Class, Creating Objects, Accessing Object Members, Nested Member Functions, Making a Member Function Inline, Memory Allocation for Class and Objects, Array of Objects, DMA, Objects as Function Arguments, Returning Objects, this pointer, Constant Parameters and Members, Pointers Within a Class, Empty Classes, Friend Classes, Constructor, Types of Constructors, Constructor with Arguments, Constructor Overloading, Destructors

Unit III

Operator Overloading and Type Conversions: Scope of Operator Overloading, Syntax, Not Overloading Operators, Implementing Operator, Overloading Unary Operators, Overloading Binary Operators, Overloading Special Operators, Type Conversions

Unit IV

Inheritance: Defining Derived Classes, Access Specifies, Inheritance, Types of Inheritance, Single Inheritance, Constructors and Destructors in Derived Class, Constructor in Multi-Level, Multi-Level Inheritance, Constructor in Multi-Level Inheritance, Multiple Inheritance, Hierarchical Inheritance, Multi-path Inheritance.

Unit V

File Handling: Streams in C++, Classes for File Stream, Opening and Closing of Files, Detecting the End-of-File, Files Modes, File pointer.

Course Outcomes:

Upon successful completion of this subject students should be able to:

CO1: Understand the features of C++ supporting object oriented programming

CO2: Be able to program using more advanced C++ features such as composition of objects, operator overloads, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling, etc. CO3: Be able to apply operator overloading in different form.

COS. Be able to appry operator overloading in different form.

CO4: Understand how to apply the major object-oriented concepts to implement object oriented programs in C++, encapsulation, inheritance and polymorphism

CO5: Able to understand the working with files like opening and closing of files.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course	Program Outcome											
Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		L	Н				М		М			
CO2		Н			L			М				L
CO3	Н				Н	М			L			
CO4			Н	Н			L	М				
CO5		L							Н		М	

H = Highly Related; M = Medium; L = Low

Text Books

- 1. Reema Thereja, "Object Oriented Programming with C++", First Edition, Oxford University Press ,2015
- 2. Let Us C: Bala Guruswamy, TATA McGraw Hill.

Reference Books

- **1.** Object Oriented Programming with C++, Sourav sahay, Oxford University, Sept 2012.
- Richard F. Gilberg, Behrouz A. Forouzan, "Data structures, A Pseudocode Approach with C", (2e), Cengage Learning India Pvt.Ltd, India, 2009.
- 3. Robert Kruc & Bruce Lening, "Data structures & Program Design in C", (2e), Pearson, 2007.

Course Name: Software Engineering

Course Code: BCA127A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
3	0	0	3

Course Objectives

- 1. To provide a comprehensive overview of Software Engineering
- 2. To understand the full software development life cycle, including a thorough coverage of methods, tools, principles, and guidelines.

- To understand software metrics, real-time software design, quality assurance, reliability, risk management, cost and schedule estimation, sizing, planning, test and integration process, technical management and human
- 4. To be able to work with software metrics (attributes) to measure properties of the software product as a means to evaluate and control the development process.
- 5. To understand the concept of planning and managing the software development.

Syllabus

Unit I

Software Engineering Introduction: Motivation, Definition of Software Engineering, Characteristics of Software, Problems Confronted by Software Engineering, The Software Engineering Response, Challenges with the Response, Grand Challenge.

Evolution of Software Engineering: Motivation, History, Evolutionary Trends, Programming to Software Engineering.

Unit II

Planning and Managing Software Development: Software Development Methodologies: A Method to the Madness, Software Development Life Cycle Algorithm, Process, and Methodology, Different Development Philosophies, People and Processes Software Estimation: Science and Art of Software Estimation, Importance of Estimation in Software Development, Estimating Size, Estimating Effort, Estimating Time, Estimation and Experience, COCOMO

Metrics in Software Development: Need for Measurement, Metrics Go beyond Mere Measuring, Metrics, Management, and Beyond, Brief Review of Software Metrics, Function point, LOC.

Unit III

Software Making: Software Architecture: Architectural Views of Software, Views and Definitions of Software Architecture, Need for Architecture in Large-Scale Software Systems, How Architecture Differs from Design, Architectural Patterns, Future of Software Architecture,

Unit IV
Languages of Software Development: Incremental Approach to Learn Languages, Programming Languages, Modeling Languages, Specification Languages

Software Development across Workflows and Phases: Dimensionality of Software Development Phases and Workflows in Perspective, Model for Software Development

Unit V

Testing, Maintaining: Software Testing, Reliability, and Quality: Some Testing Terms, Some Testing Tenets, Testing Philosophies, Different Types of Testing, Inspections, Walkthroughs, and Reviews, Case Study

Course Outcomes (COs):

Upon successful completion of this subject students should be able to:

CO1: Understanding of Basics of Software Engineering & Development.

CO2: Understanding of Different-2 models, Software Matrices and Estimation.

CO3: Understanding of Software Development across Workflows and Phases, languages & Architecture.

CO4: Understanding of different -3 testing strategies and tools.

CO5: Be exposed to World Wide Web and Enterprise Software Development.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcomes	Prog	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	
CO1	Н			М				М					
CO2		М				М					М		

CO3	Η			М			
							_
CO4		Н			Μ		L
CO5	М						

H = Highly Related; M = Medium; L = Low

Text Books

- 1. Software Engineering Fundamentals, Oxford, Ali Behforooz and Frederick Hudson, October 2012.
- 2. Pressman, R.S., "Software engineering" A Practitioner's Approach", Third Edition

Reference Books

- 1. Jalote P., "An Integrated approach to Software Engineering", Narosa, 1991.
- 2. Ghezzi Carlo and Others "Fundamentals of Software Engineering" PHI
- 3. Fairley R., "Software Engineering Concepts", Tata McGraw Hill, 1997.

Course Name: PHP Lab

Course Code: BCA128A

L (Hr.)	T/P (Hr.)	Pr (Hr.)	Credits
0	0	2	2

Course Objectives

The purpose of this course is to enhance the practical knowledge based on prescribed theory course. The students will be able to enhance their analyzing and problem solving skills after implementation of all the given experiments.

List of Sample Programs

1. WAP to reverse the string without using any predefined function

2. WAP to check the season of the year according to given month using control statement (Switch statement)

- a. spring month 3,4,5
- b. summer month 6,7,8
- c. autumn month 9,10,11
- d. winter month 12,1,2

3. WAP to create an array for employee names and associate another array of employee's salary and print these values using for each loop.

4. WAP that will accept an array of integers as input and output an array where for each item in the source array, the new array will perform the following operations:-

a. for even numbers divide by 2

b. for odd number multiply by 3

5. WAP to make sure a value has been supplied for a form element. For example, you want to make sure a text box hasn't been left blank.

6. WAP to know whether an email address a user has provided is valid.

7. WAP in php to show the values in the input fields after the user hits the submit button

8. WAP create a form with one text field and submit button to find string in lower case, uppercase, sub string, position of a string and trimmed string

9. WAP to find whether a given string is subset of another given string or not

10. WAP to find square and square root of a randomly generated number

11. WAP to merge 2 associative array sort that array in :-

- a. ascending order
- b. descending order
- c. in key sorted form

12. WAP to generate captcha code

13. WAP to create session, provide it name and id and display their values and finally delete the session.

14. WAP to in which you want to set a cookie so that your website can recognize subsequent requests from the same web browser.

15. WAP to in which you want to read the value of a cookie that you've previously set.

16. WAP in which You want direct access to the body of a request, not just the parsed data that PHP puts in *§*_POST for you. For example, you want to handle an XML document that's been posted as part of a web services request.

17. WAP to shows how to use validate().

18. WAP to Call ob_start() at the top of your page and ob_end_flush() at the bottom. You can then intermix commands that generate output and commands that send headers.

19. WAP to send compressed content to browsers that support automatic decompression.

20. WAP to use the same HTML page to emit a form and then process the data entered into it. In other words, you're trying to avoid a proliferation of pages that each handle different steps in a transaction.

21. WAP in which you have data that can be easily represented as key/value pairs, want to store it safely, and have very fast lookups based on those keys.

22. WAP in which you want access to a SQL database to store or retrieve information. Without a database, dynamic websites aren't very dynamic.

23. WAP in which you want to retrieve some data from your database.

24. WAP in which you want a concise way to execute a query and retrieve the data it returns.

25. WAP in which you want to know how many rows a SELECT query returned, or you want to know how many rows an INSERT, UPDATE, or DELETE query changed.

26. WAP in which you need to make text or binary data safe for queries

Course Name: Data Structure and Algorithm using C Lab

Course Code: BCA129A

L (Hr.)	T/P (Hr.)	Pr (Hr.)	Credits
0	0	2	2

Course Objectives

The purpose of this course is to enhance the practical knowledge based on prescribed theory course. The students will be able to enhance their analyzing and problem solving skills after implementation of all the given experiments.

List of Sample Programs

- 1. Write a menu driven program to implement the following sparse matrices using one-dimensional array:
 - i) Diagonal Matrix
 - ii) Lower Triangular Matrix
 - iii) Upper Triangular Matrix
 - iv) Symmetric Matrix
- 2. Write a program to compute b^r using recursion where b represent base and r represents power.
- 3. Write a program to reverse a user entered string using recursion.
- 4. Write a program to perform the following Queue operations using Circular Array implementation (Use Templates):
 - i) Enqueue
 - ii) Dequeue
- 5. Write a program to add two large integers using stack.
- 6. Write a program to evaluate postfix expression using stack.
- Write a program to implement Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list and concatenate two linked lists (include a function and also overload operator +).
- 8. Write a program to perform the following Stack operations using linked list.
 - i) Push
 - ii) Pop
 - iii) Clear
- 9. Write a program to create and perform the following operations on Queues using linked list:
 - i) Enqueue
 - ii) Dequeue
- 10. Write a program to implement Doubly Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list.
- 11. Write a program to implement Circular Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list.
- 12. Write a program to add two polynomials using linked list representation.
- 13. Write a menu driven program to implement the insertion operations in an ordered linked list.
- 14. Write a menu driven program to implement the deletion operations in an ordered linked list.

- 15. Write a menu driven program to implement the merging operations in an ordered linked list.
- 16. Write a Program to reverse elements of a Stack using an additional Stack.
- 17. Write a Program to reverse elements of a Stack using an additional Queue.
- 18. Write a Program to implement the insertion operation in a Binary Search Tree.
- Write a Program to implement the deletion by coping or by merging operation in a Binary Search Tree.
- 20. Write a Program to implement the Search a number in BST operation in a Binary Search Tree.
- 21. Write a Program to implement the count leaf nodes of the tree operation in a Binary Search Tree.
- 22. Write a menu driven program to implement the Selection sorting algorithms.
- 23. Write a menu driven program to implement the Insertion sorting algorithms.
- 24. Write a menu driven program to implement the Binary Search algorithms.
- 25. Write a menu driven program to implement the Bubble sorting algorithms.

Course Name: Programming Fundamentals using C++ Lab Course Code: BCA130A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
0	0	2	2

Course Objectives:

The purpose of this course is to enhance the practical knowledge based on prescribed theory course. The students will be able to enhance their analyzing and problem solving skills after implementation of all the given experiments.

List of Sample Programs

- 1. Write a program to read and print values of variables of different data types.
- 2. Write a program to calculate the distance between two points.

- 3. Write a program to perform addition, subtraction, multiplication and division on 2 integer numbers.
- 4. Write a program to find largest of two numbers using ternary operator.
- 5. Write a program to print the ASCII value of a corrector.
- 6. Write a program to swap 2 numbers using a temporary variable.
- 7. Write a program that displays the size of every data type.
- 8. Write a program to convert an integer into the corresponding floating point number.
- 9. Write a program to enter any character. If the entered character is in lower case, convert it into upper case. If it is a lower case character, then convert it into upper case.
- 10. Write a program to find whether a given year is leap year or not.
- 11. Write a program to print 20 horizontal asterisks (*)
- 12. Write a program to display the largest of 10 numbers using ternary operator.
- 13. Write a program to print the following pattern:
 - A
 - AB
 - ABC
 - ABCD

ABCDE

- 14. Write a program to print the following pattern:
 - 1 121 12321 1234321
- 15. Write a program to classify a given number as prime or composite.
- 16. Write a program using for loop to calculate the average of first n natural numbers.
- 17. Write a program to enter a decimal number. Calculate and display the binary equivalent of this number.
- 18. Write a program to sum the series: $1/1+2^2/2+3^3/3+...$
- 19. Write a program to generate calendar of a month given the start day and the number of days in that month.
- 20. Write a program to calculate the area of a circle using functions.

- 21. Write a program to calculate the volume of a cuboid using default arguments.
- 22. Write a program to add two values of different data types using static polymorphism.
- 23. Write a program to calculate GCD using recursive function.
- 24. Write a program to calculate exp(x,y) using recursive functions.
- 25. Write a program to read and display n random numbers using an array.
- 26. Write a program to interchange the largest and the smallest number in the array.
- 27. Write a program to find the second largest number using an array of n numbers.
- 28. Write a program to merge 2 unsorted arrays.
- 29. Write a program to implement linear search in any given array.
- 30. Write a program to transpose a 3*3 matrix.
- 31. Write a program to read and display a 2*2*2 array.
- 32. Write a program to concatenate 2 strings.
- 33. Write a program to compare 2 strings.
- 34. Write a program to insert a string in the main text.
- 35. Write a program to sort names of students.
- 36. Write a program to enter a text that contains multiple lines. Display the n lines of text starting from mth line.
- 37. Write a program to add 2 integers using pointer.
- 38. Write a program to add 2 vectors (Arrays).
- 39. Write a program to copy a given string into a new string. Memory for the new string must be allocated dynamically.
- 40. Write a program to read, display, add and subtract 2 complex numbers.
- 41. Write a program to read and display information of a student using structure within a structure.
- 42. Write a program to read and display information of all the students in the class.
- 43. Write a program using pointer to structure to initialize the members in the structure.
- 44. Write a program to illustrate the use of arrays within structure.
- 45. Write a program to display the name of the colors using enumerated types.
- 46. Write a program to enter a rational number, simplify and display it.
- 47. Write a program to demonstrate the concept function overloading in the member functions of a class.

- 48. Write a program that adds 2 complex numbers. The object must be passed through preference and the result must be passed by value.
- 49. Write a program to display the list of students according to their marks.
- 50. Write a program to find mean of 2 numbers belonging to two different classes using friend function.

Course Name: Multimedia Lab (Audio/Video editing tools, Flash, Dreamweaver) Course Code: BCA167A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
0	0	2	2

Course Objectives:

The purpose of this course is to enhance the practical knowledge based on prescribed theory course. The students will be able to enhance their analyzing and problem solving skills after implementation of all the given experiments.

List of Experiment

1. Video Production/Editing

Macs - iMovie (Apple iLife Suite)

Windows - Corel VideoStudio Ultimate

2. Sound Production/Editing

Macs - GarageBand (Apple iLife Suite)

All – Audacity + LAME encoder

3. Scanning

All – Epson Scan

Macs – Apple Scan

Windows – Windows Fax & Scan

4. Photo (bitmap) Editing

All – Affinity Photo

All - Gimp

5. Drawing (vector) Production/Editing

All- Affinity Designer

All – Inskscape

6. Productivity/Office

All – LibreOffice

All-GoogleApps

7. PDF Production/Editing

All – LibreOffice

- 8. Web Site/Page Production
 - All GoogleSites

All- WordPress

Semester IV

Course Name: Programming in Java

Course Code: BCA133A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
3	1	0	4

Course Objectives:

- 1. To be able to understanding the concept of programming paradigms, basic concept of object oriented programming and features of java.
- 2. To demonstrate the concept of data types, literals and basic structure of java programming.
- 3. To enhance the practical knowledge of decision making statements and control statements.
- 4. To be able to use variety technologies of Java and work with different platforms.
- 5. To examine the life cycle of applets and packages.

Syllabus

Unit I

Introduction to OOPS: Paradigms of Programming Languages – Basic concepts of Object Oriented Programming – Differences between Procedure, Oriented Programming and Object Oriented , History of Java features – Java Environment, JDK ,API.

Introduction to Java: Types of java program, Creating and Executing a Java program, Java Tokens: Keywords, Character set, Identifiers, Literals, Separator, Java Virtual Machine (JVM) – Command Line Arguments, Comments in Java program.

Unit II

Control Structures, Arrays, and Vectors: Elements, Constants, Variables, Data types, Scope of variables, Type casting – Operators: Special operators, Expressions, Evaluation of Expressions. Decision making and Branching: Simple if statement, if – else statement, nesting if – else, else if Ladder – switch statement – Decision making and looping: While loop, do - While loop for loop, break, loop continue Statement.

Unit III

Array, Strings: Arrays: One Dimensional Array – Creating an array, Array processing, Multidimensional Array, Vectors ArrayList, Advantages of Array List over Array Wrapper classes. Strings: String Array, String Methods, String Buffer Class.

Unit IV

Classes and Inheritance: Class and objects: Defining a class, Methods, Creating objects, Accessing class members, Constructors, Method overloading, Static members, Nesting of Methods, this keyword – Command line input.

Inheritance: introduction and its definition, Final variables and methods, Final classes, Final methods, Abstract methods and classes.

Unit V

Packages, Applets and Awt Controls: Packages: Java API Packages System Packages, Naming Conventions, Creating & Accessing a Package, Adding Class to a Package Hiding.

Classes Applets: Introduction, Applet Life Cycle, Creating & Executing an Applet, Applet tags in HTML, Parameter tag aligning the display, Graphics Class: Drawing and filling lines, Rectangles, Polygon, Circles, Arcs, Line Graphs, Drawing Bar charts.

Course Outcomes (COs):

Upon successful completion of this subject students should be able to:

CO1: Understanding the concept of programming paradigms, basic concept of object oriented programming and features of java.

CO2: Enhance the practical knowledge of decision making statements and control statements.

CO3: Examine the life cycle of applets and packages and use the exception handling mechanism for handle the errors.

CO4: Illustrate the concept of Inheritance, Constructor, operator overloading and graphics in java.

CO5: Evaluate the concept of array, string, function, class and object.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course	Progr	am Ou	itcome									
Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Н		М			L				М		
CO2		Н										М
CO3			Н								М	
CO4					М			Н				
CO5	Н			М					Μ			

H = Highly Related; M = Medium; L = Low

Text Books

- 1. Programming in Java, Sachin Malhotra, Oxford University, November 2013
- 2. Java One step ahead, Seth and Juneja, Oxford University, May 2017.

Reference Books

- 1. Programming with Java A Primer, E. Balaguruswamy Tata McGraw Hill Companies
- R. Nageswara Rao, "Core Java: An Integrated Approach", First Edition, DT Editorial Services, 2016.
- 3. Herbert Schildt, "The Complete Reference", Ninth Edition, McGraw Hill, 2014.
- 4. Cay S. Horstmann," Core Java", Ninth Edition, Prentice Hall,2012.

Course Name: Programming in Python

Course Code: BCA134A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
3	0	0	3

Course Objectives:

- 1. To lineup the basics of python programming, Features, history, data types and variables.
- 2. To be able to solve real-world problems through python programming.
- 3. To be able to understand problem solving approaches, programming languages, object oriented programming.
- 4. To construct of Python language such as control statements, functions, strings, files, data structures.
- 5. To apply the concept of Classes and objects, functions and array in python.

Syllabus

Unit I

Basics Of Python Programming: Features of Python ,History of Python ,The Future of Python ,Writing and Executing First Python Program, Literal Constants , Numbers , Strings, Variables and Identifiers , Data Types , Input Operation, Comments , Reserved Words , Indentation.

Unit II

Operators and Expressions, Expressions in Python, Operations on Strings, Concatenation, Multiplication (or String Repetition), Other Data Types, Tuples, Lists, Dictionary, Type Conversion

Unit III

Decision Control, Function and Modules: Introduction to Decision Control Statements, Selection/Conditional Branching Statements, Basic Loop Structures/ Iterative Statements, while loop, Nested Loops, The break Statement, The continue Statement, The pass Statement, The else Statement used with Loops.

Unit IV

Function: Function Definition, Function Call, Variable Scope and Lifetime, return statement, Lambda Functions or Anonymous Functions, Documentation Strings, Recursive Functions.

UNIT V

File Handling File : File Path, Types of Files, Opening and Closing Files, Reading and Writing Files, File Positions Renaming and Deleting Files, Directory Methods

Course Outcomes (COs):

Upon successful completion of this subject students should be able to:

CO1: Outline the basics of python programming, Features, history, data types and variables.

CO2: Understanding of Python especially Decision control, function and modules.

CO3: Understanding of the file handling and Data Structure.

CO4: Be exposed to object oriented concepts in Python programming, decision controls and function.

CO5: Understand the concept of file, opening, closing, reading and writing files.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course	Prog	ram Oı	ıtcome									
Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Н								М			
CO2	Н		Μ									М
CO3				Μ						М		
CO4							Н					
CO5		Μ			М			Н				

H = Highly Related; M = Medium; L = Low

Text Books

- 1. Python Programming, Oxford, ReemaThareja, June 2017
- 2. "Programming Python" by Mark Lutz and O'Reilly Media

Reference Books

- 1. "Python Testing Cookbook" by Greg L Turnquist
- 2. "Head First Programming" by Paul Barry and David Griffiths
- 3. "Python Crash Course: A Hands-On, Project-Based Introduction to Programming" by Eric Matthes.

Course Name: Computer Network

Course Code: BCA135A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
3	0	0	3

Course Objectives:

- 1. Explain the importance of data communications and the Internet in supporting business communications and daily activities.
- 2. Explain various switching techniques and functions of physical layer.
- 3. Recognize the working of different internetworking devices and their functions.
- 4. Explain the role of protocols in networking and analyze the services and features of the network layer of data networks.
- 5. Analyze the working of transport layer protocols and compare TCP and UDP.

Syllabus

Unit I

Introduction: Network definition, Network topologies, Network classifications, Layered network architecture, Overview of ISO-OSI reference model, Overview of TCP/IP protocol suite. Multiplexing techniques, Transmission media.

Unit II

Networks Switching Techniques and Access mechanisms: Circuit switching; Packet switching-Connectionless datagram switching, Connection-oriented virtual circuit switching. Data Link Layer Functions and Protocol: Error detection and error correction techniques, Data-link control- framing and flow control, Error recovery protocols- Stop and wait ARQ, Go-back-n ARQ.

Unit III

Multiple Access Protocol and Networks: LANS, Ethernet, Token Ring, WAN, WAN Architecture, ALOHA,CSMA/CD protocols, Repeaters, Hubs, Switches, Bridges, Router and Gateways.

Unit IV

Networks Layer Functions and Protocols: Routing, Routing algorithms, Network layer protocol of Internet- TCP/IP protocol, IP Addressing, IP Datagram Packet. Internet control protocols – ICMP, ARP, RARP.

Unit V

Transport Layer Functions and Protocols: Transport services, Transport layer protocol of Internet- UDP and TCP. Relationship between TCP and IP, TCP Connections, TCP Packet format.

Course Outcomes (Cos):

Upon successful completion of this subject students will able

CO1: Independently understand basic computer network and models.

- CO2: Understand and explain Data Communications System, switching, error correction and detection.
- CO 3: Identify the different types of network devices and protocols.
- CO 4: Enumerate the network layer functions and protocols.
- CO 5: Understand transport layer functions and protocols.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course					P	rogran	1 Outco	ome				
Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				Н					М			
CO2		М		М						М		
CO3	М				М		L					М
CO4			L					М				
CO5	Н				L				М			

H = Highly Related; M = Medium; L = Low

Text Books

- 1. A.S Godbole, Data Communications and Networks", 2nd Edition, Tata Mc Graw Hill,2014
- 2. B. A. Forouzan: Data Communications and Networking, 4th edition, Tata McGraw Hill Education Private Ltd., 2007.

Reference Books

- 1. A. S. Tanenbaum: Computer Networks, 4th edition, PEARSON, 2003.
- 2. D. E. Comer, M.S.Narayanan, Computer Networks and Internets with applications, Fourth Edition, PEARSON ,2008.

Course Name: Data Science & Analytics

Course Code: BCA169A

L (Hr.)	T/P (Hr.)	Pr (Hr.)	Credits
2	1	0	3

Course Objectives

- 1. Able to explain Statistical Analysis, Python Environment Setup and working of Numpy.
- 2. Able to design Data Visualization in Python using matplotlib.
- 3. Able to perform linear and multiple linear regression analyses.
- 4. Ability to select and implement machine learning techniques in real life applications.
- 5. Learn about computing environment that is suitable for the applications under consideration.

6.

Syllabus

Unit - I

Data Science Overview, Data Analytics Overview, Statistical Analysis and Business Applications, Python Environment Setup and Essentials, Mathematical Computing with Python – NumPy: -Introduction to Numpy, Creating and Printing an ndarray, Class and Attributes of ndarray, Basic Operations, Slicing, Mathematical Functions of Numpy.

Unit- II

Data Manipulation with Pandas: - Introduction to Pandas, Understanding DataFrame, View and Select Data, Missing Values, Data Operations, File Read and Write Support, Pandas Sql Operation, Analyse different Dataset using Pandas.

Unit- III

Data Visualization in Python using matplotlib: - Introduction to Data Visualization, Line Properties, Plot and Subplots, Types of Plots, Draw a pair plot using seaborn library.

Unit- IV

Scientific computing with Python (Scipy):- Introduction to SciPy, SciPy Sub Package - Integration and Optimization, SciPy sub package - Statistics, Weave and IO, Solving Linear Algebra problem using SciPy.

Unit- V

Machine Learning with Scikit–Learn: Machine Learning Approach, Supervised Learning Model Considerations, Supervised Learning Models - Linear Regression, Logistic Regression, K Nearest Neighbours, Decision Tree: Regression and Classification Trees, Support Vector Machines, Unsupervised Learning Models.

Course Outcomes (Cos):

CO1: Students will able to explain Statistical Analysis, Python Environment Setup and working of Numpy.

CO2: Students will able to Manipulate and analysis data with Pandas

CO3: Students will able to design Data Visualization in Python using matplotlib.

CO4: Students will be able to learn about scientific computing with Python

CO5: Students will be able to learn Machine Learning Approaches using Scikit Learn.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course		Program Outcome										
Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

CO1				Н				Μ		
CO2		М		М					М	
CO3	М				М	L				М
CO4			L				М			
CO5	Н				L			М		

H = Highly Related; M = Medium; L = Low

Text Books

- 1. Hastie, Trevor, et al., The elements of statistical learning. Vol. 2. No. 1. New York: springer, 2009.
- 2. Montgomery, Douglas C., and George C. Runger., Applied statistics and probability for engineers. John Wiley & Sons, 2010

Course Name: Programming in Java Lab Course Code: BCA136A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits		
0	0	2	2		

Course Objectives:

The purpose of this course is to enhance the practical knowledge based on prescribed theory course. The students will be able to enhance their analyzing and problem solving skills after implementation of all the given experiments.

List of Sample Programs

- 1. To write a java program to find the area of rectangle
- 2. To write a java program to print the individual digits of a 3 digit number.
- 3. 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".
- 4. To write a java program to read an integer and find whether the number is odd or even
- 5. To write a java program find the biggest of three integers.
- 6. Write a program to display a simple message.
- 7. Write a program to add two numbers.
- 8. Write a program to arithmetic operations.
- 9. Write a program to area of the circle.
- 10. Write a program to check odd or even.
- 11. Write a program to find Greatest among three numbers.

- 12. Write a program to find greatest number using nested if.
- 13. Write a program to sum and average of five marks.
- 14. Write a program to describe functionality of Arithmetic operations using switch.
- 15. Write a program to write names of 10 natural numbers.
- 16. Write a program to sum of 'n' natural numbers.
- 17. Write a program to find Factorial of a number.
- 18. Write a program to sum of 'n' numbers.
- 19. Write a program to sum of two numbers using class and object.
- 20. Write a program to prepare mark sheet of a student.
- 21. Write a program to find area of rectangle using constructor.
- 22. Write a program to find area of room.
- 23. To write a java program to find the sum of digits of a given number
- 24. To write a java program to find the first 15 terms of Fibonacci sequence.
- 25. To write a java program to print the Armstrong numbers.
- 26. To write a java program to find the largest and smallest number in an array.
- 27. Write a program to arithmetic operations using static members.
- 28. Write a program to print greatest value using nesting of methods.
- 29. To write a java program that creates a string object and initializes it with your name and performs the following operations
- 30. To find the length of the string object using appropriate String method.
- 31. To find whether the character 'a' is present in the string. If yes find the number of times 'a' appear in the name and the location where it appears
- 32. To write a java program to create a StringBuffer object and illustrate how to append characters and to display the capacity and length of the string buffer
- 33. To write a java program to create a StringBuffer object and illustrate how to insert characters at the beginning
- 34. To write a java program to Create a StringBuffer object and illustrate the operations of the append () and reverse () methods.
- 35. To 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).

- 36. To write a program in java with a class Rectangle with the data fields width, length, area and colour. The length, width and area are of double type and colour is of string type. The methods are get_length(), get_width(), get_colour() and find_area().
- 37. Create two objects of Rectangle and compare their area and colour. If the area and colour both are the same for the objects then display "Matching Rectangles", otherwise display "Non-matching Rectangle".
- 38. Write a java program to create a Player class and inherit three classes Cricket_Player, Football_Palyer and Hockey_Player.
- 39. Write a program to find area and volume of a room using inheritance.
- 40. Write a program to describe Method overriding
- 41. To write a java program to show how a class implements two interfaces.
- 42. To write a java program to show that the variables in an interface are implicitly static and final and methods are automatically public
- 43. To write a java program to create a package for Book details giving Book name, Author name, price and year of publishing.
- 44. To write a java applet program to change the color of a rectangle using scroll bars to change the value of red, green and blue
- 45. To write an applet program for creating a simple calculator to perform Addition, subtraction, Multiplication and Division using Button, Label and TextField component.
- 46. To write a java program to catch more than two exception
- 47. To write a java program to create our exception subclass that throws exception if the sum of two integers is greater than 99.
- 48. To write a java program for generating two threads, one for generating even number and one for generating odd number.

Course Name: Programming in Python Lab Course Code: BCA137A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits		
0	0	2	2		

Course Objectives:

The purpose of this course is to enhance the practical knowledge based on prescribed theory course. The students will be able to enhance their analyzing and problem solving skills after implementation of all the given experiments.

List of Experiment

- 1. Write a program to display data of different types using variables and literals constants.
- 2. Write a program to reassign values to a variable.
- 3. Write a program to read variables from the user.
- 4. Write a program to exhibit indentation errors.
- 5. Write a program to enter a number and display its hex and octal equivalent and its square root.
- 6. Write a program to read and print values of variables of different data types.
- 7. Write a program to calculate area of triangle using Heron's formula.
- 8. Write a program to calculate the distance between two points.
- 9. Write a program to perform addition, subtraction, division and multiplication on two floating point numbers.
- 10. Write a program to perform addition, subtraction, division and multiplication on two integer point numbers.
- 11. Write a program to calculate average of two numbers. Print their deviation.

- 12. Write a program to calculate the total amount of money in the piggy bank given the coins of Rs 10, 5, 2, 1.
- 13. Write a program to convert degrees Fahrenheit into degrees Celsius.
- 14. Write a program to count all the prime and composite numbers entered by the user.
- 15. Write a program to find the greatest number from 3 numbers.
- 16. Write a program to take input from the user and then check whether it is a number or a character.
- 17. Write a program to separate two values printed on the same line using a tab.
- 18. Write a program to calculate the sum and average of first 10 numbers.
- 19. Write a program to find whether the given number is an Amstrong number or not.
- 20. Write a program to enter a number and then calculate the sum of its digits.
- 21. Write a program to enter a binary number and convert it into decimal number.
- 22. Write a program to calculate GCD of 2 numbers.
- 23. Write a program to print the reverse of a number.
- 24. Write a program to print the multiplication table of n, where n is entered by the user.
- 25. Write a program using for loop to calculate the average of first n natural numbers.
- 26. Write a program using for loop to calculate factorial of a number.
- 27. Write a program to classified a given number as prime or composite.
- 28. Write a program to sum the series--- $1+1/2+\ldots+1/n$.
- 29. Write a program using while loop to read the numbers until -1 is encountered. Also count the numbers of prime numbers and composite numbers entered by the user.
- 30. Write a program to demonstrate the continue statement.
- 31. Write a program to write a function that displays a string repeatedly.
- 32. Write a program to demonstrate the mismatch between function parameters and arguments.
- 33. Write a program to demonstrate the use global statement.
- 34. Write a program to demonstrate name clash of local and global variable.
- 35. Write a program to demonstrate access of variables in inner and outer functions.
- 36. Write a program to demonstrate flow of control after the return statement.
- 37. Write a program to write another function which returns an integer to the caller.
- 38. Write a program that adds two numbers using the syntax of lambda functions.
- 39. Write a program to use a lambda function with an ordinary function.
- 40. Write a program to add two numbers using lambda function.

Course Name: Minor Project Course Code: BCA139A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits		
0	0	4	4		

Course Objectives:

The purpose of minor project is to enhance the practical knowledge based on prescribed languages which are introduced in this program. The students will be able to enhance their analyzing and problem solving skills after implementation of all the given experiments.

Semester V

Course Name: Introduction to Accounting and Economics

Course Code: BCA132A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
3	0	0	3

Course Objectives:

- 1. To be acquainted with about the important concepts and characteristics of accounting.
- 2. To study the application of accounting in the general business environment.
- 3. To prepare the estimate for various business activities such as purchase, sale, production and cash budgets.
- 4. To provide a comprehensive treatment of accounting principles, technique and practices.
- 5. To get the students acquainted with fundamental concepts and processes of accounting so that they are able to appreciate the nature of item presented in the annual accounts of an organization.

Syllabus

Unit I

Accounting Concept: Basic of Accounting, Meaning and nature of accounting, Scope of financial accounting, Interrelationship of Accounting with other disciplines, Branches of Accounting, Accounting concepts and convention, Indian Accounting Standards

Unit II

Journal, Ledger and Trial Balance: Journal: Meaning of Journal, Advantages, and Subdivision. Ledger: Meaning, subdivision, Mechanics of Posting, balancing of Ledger accounts. Trial Balance: Objectives, Defects of trial balance, Errors disclosed by trial balance, preparation and locating errors.

Unit III

Cash Book and Subsidiary books of Accounting: Kinds of cashbook, Purchase daybook, Sales daybook, Bills receivable book, Bills payable book.

Unit IV

Depreciation: Causes of Depreciation, Meaning of Depreciation Accounting, Method of Recording depreciation, Methods of Providing Depreciation.

Unit V

The Scope and Method of Economics, the Economic Problem: Scarcity & Choice, The Price Mechanism, And Demand & Supply Equilibrium: The Concept of Elasticity and its Applications. The Production Process: Output decisions – Revenues Costs and Profit Maximization. Laws of returns & Returns to Scale: Economics and Diseconomies of scale.

Course Outcomes (COs):

Upon successful completion of this subject students should be able to:

CO1: Get the Knowledge about the important concepts and characteristics of accounting.

CO2: Able to understand the budget preparation and control of a company.

CO3: Be prepared of fiscal policies of the organization.

CO4: Learn about Inventory Systems, Methods of Valuation of Inventories.

CO5: Learn about Cash Journal, Petty Cash Book, Purchase Journal, Purchase Return, Sales Journal and Sales Return Journal.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course	Prog	ram O	utcom	e								
Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		Н										
CO2			Н						М			
CO3					Н							М
CO4	М						Н					
CO5		Н			Μ					L		

H = Highly Related; M = Medium; L = Low

Text Books

1. Maheshwari, S.N. and Maheshwari, S. K., (2009) An Introduction to Accountancy, Eighth Edition, Vikas Publishing House.

Reference Books

- 1. Ahuja H.L., "Business Economics", S.Chand & Co., New Delhi, 20012.
- 2. Financial Accounting: A Managerial Perspective" by Narayanaswamy
- 3. Tulsian, P.C., (2009) Financial Accountancy, 2nd edition, Pearson Education.
- 4. Ferfuson P.R., Rothchild, R and Fergusen G.J."Business Economics" Mac-millan, Hampshire, 1993.

Course Name: Android Application Development Course Code: BCA141A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits		
3	0	0	3		

Course Objectives:

- 1. To understand the Android application architecture, including the roles of the task stack, activities, and services.
- 2. To be able to build user interfaces with fragments, views, form widgets, text input, lists, tables, and more.
- 3. To be able to use advanced UI widgets for scrolling, tabbing, and layout control.
- 4. To be able to store application data on the mobile device, in internal or external storage locations.
- 5. To be able to support user-specific preferences using the Android Preferences API.

Unit I

Introduction to Android: Android Versions, Features of Android, Architecture of Android Obtaining the Required Tools: Android Studio, Android SDK, Creating Android Virtual Devices (AVDs), Launching Your First Android Application.

Unit II

Exploring the IDE, Using Code Completion, Debugging Your Application:- Setting Breakpoints, Navigating Paused Code, Publishing Your Application:- Generating a Signed APK

Unit III

Android User Interface:- Understanding the Components of a Screen: Views and ViewGroups, LinearLayout (Horizontal) and LinearLayout (Vertical), RelativeLayout, ScrollView, Using Basic Views: TextView, Button, ImageButton, EditText, CheckBox, ToggleButton, RadioButton, and RadioGroup Views, Using List Views to Display Long Lists: ListView, Using the Spinner View.

Unit IV

Activities, Fragments, and Intents:- Understanding Activities: Applying Styles and Themes to an Activity, Hiding the Activity Title, Displaying a Dialog Window, Displaying a Progress Dialog, Linking Activities Using Intents: Open an Activity, Returning Results from an Intent, Fragments: Life Cycle of a Fragment, Adding Fragments Dynamically, Interactions Between Fragments, Understanding the Intent Object

Unit V

Saving and Loading User Preferences: Accessing Preferences Using an Activity, Modifying, Programmatically Retrieving and Modifying the Preferences Values, Creating and Using Databases: Creating the DB Adapter Helper Class, Using the Database Programmatically

Course Outcomes (COs):

Upon successful completion of this subject students should be able to:

CO1: Student can setup Android Environment, Well understanding of Android Architecture.

CO2: Capable to customize IDE, can insert breakpoint and debugging, learn application deployment.

CO3: Learn to create different views of activity and manage layout for different activity.

CO4: Knowledge of Activity life cycle, and fragment. How intent will work for communication.

CO5: Can store Activity data on local device with database helper class.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course		Program Outcome										
Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		L	Н				М		М			
CO2		Н			L			М				L
CO3	Н				Н	М			L			
CO4			Н	Η			L	М				
CO5		L							Η		М	

H = Highly Related; M = Medium; L = Low

Text Books

- 1. Building Android application with HTML, CSS, and JavaScript 2nd Edition O'Relly's Publication
- 2. Beginning Android Programming with Android Studio

Reference Books

- 1. Android Application Development Cookbook.
- 2. Android 4.2 App Development Essentials
- 3. Android Application Development for Dummies

Course Code: BCA142A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
3	1	0	4

Course Objectives:

- 1. To learn today's increasing network security threats and explain the need to implement a comprehensive security policy to mitigate the threats.
- 2. To provide extended security using authentication, Substitution Techniques, Transposition Techniques, Encryption and Decryption
- 3. To introduce security services for email and email protocols, Digital Certificates, Private Key Management, E-mail Security and Wireless Application Protocol (WAP) Security
- To be able to understand awareness of Prohibited actions on Cyber, Cyber Squatting Banking/Credit card related crime E-commerce.
- 5. To gain the knowledge about Cyber Crime and Prohibited actions on Cyber.

Syllabus

Unit I

Introduction to the Concepts of Security: The need for security, Security Approaches, Principles of Security, Types of Attacks. Cryptographic Techniques: Plain Text and Cipher Text, Substitution Techniques, Transposition Techniques, Encryption and Decryption, Symmetric and Asymmetric Key Cryptography, Key Range and Key Size, Possible Types of Attacks.

Unit II

Computer-based Symmetric Key Cryptographic Algorithms: Algorithm Types and Modes, An overview of Symmetric Key Cryptography, DES, International Data Encryption, Algorithm (IDEA), RC5, Blowfish, AES, Differential and Linear Cryptanalysis.

Unit III

Computer-based Asymmetric Key Cryptography: Brief History of Asymmetric Key Cryptography, An overview of Asymmetric Key Cryptography, The RSA Algorithm, Symmetric and Asymmetric Key Cryptography Together, Digital Signatures, Knapsack Algorithm, Some other Algorithms.

Unit IV

Public Key Infrastructure: Digital Certificates, Private Key Management, The PKIX Model, Public Key Cryptography Standards, XML, PKI and Security. Internet Security Protocols: Basic Concepts, Secure Socket Layer, SHTTP, Time Stamping Protocol E-mail Security, Wireless Application Protocol (WAP) Security.

Unit V

Prohibited Actions on Cyber: Pornography, IPR violations: software piracy, copyright infringement, trademarks violations, theft of computer source code, patent violations, Cyber Squatting Banking/Credit card Related crime E-commerce/ Investment Frauds.

Course Outcomes (Cos):

Upon successful completion of this subject students should be able to:

CO1: Demonstrate the threats in networks and security concepts, Plain Text and Cipher Text, Substitution Techniques, Transposition Techniques, Encryption and Decryption.

CO2: Apply authentication applications in different networks.

CO3: Understand security services for email, the RSA Algorithm, Symmetric and Asymmetric Key Cryptography Together and Digital Signatures.

CO4: Know of Digital Certificates, Private Key Management, E-mail Security and Wireless Application Protocol (WAP) Security

CO5: Awareness of Prohibited actions on Cyber, Cyber Squatting Banking/Credit card related crime Ecommerce.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:
Course		Program Outcome										
Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				Н						М		
CO2		Н										
CO3							Μ					М
CO4	М				Н						М	
CO5		Н						М		L		

H = Highly Related; M = Medium; L = Low

Text Books

- 1. William Stallings, —Cryptography and Network Security, Prentice Hall, New Delhi, 2006.
- 2. Chalie Kaufman, Radia Perlman, Mike Speciner, —Network Security: Private Communication in a Public Network, Pearson Education, New Delhi, 2004.

Reference Books

- 1. Neal Krawetz, —Introduction to Network Security, Thomson Learning, Boston, 2007.
- 2. Bruce Schneier, —Applied Cryptographyl, John Wiley & Sons, New York, 2004.
- 3. Frontiers of of Electronic Commerce Kalakota and Whinstn Addition Wesley

Course Name: Advance Java Course Code: BCA143A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
3	0	0	3

Course Objectives:

- 1. To be able to exhaustive coverage of advanced topics on Java from tools to enterprise Java
- 2. To provide ample application-based examples, with step-by-step explanations
- 3. To provide thorough understanding of each topic through extensive examples along with the program codes and screenshots
- 4. To provide relevant software installation and configuration information wherever necessary
- 5. To be able to work with comprises keywords, objective-type questions (with answers) and subjective-type questions for students at the end of all the chapters

Syllabus

Unit I

Core Java Recap: Introduction, Java Evolution and history, Classes and Objects, Functions & Interfaces, Inheritance, keywords: Static, Final, Super, Packages, Applets

Unit II

Exception Handling, Multi-threading & Garbage Collection: Limitations of Error handling – Advantages of Exception Handling Types of Errors – Basics of Exception Handling – try blocks – throwing an exception – catching an exception – finally statement, tracing stack, custom exception classes.

Multi-threading : Introduction, Main Thread, Creating Thread, Interrupting Thread, Suspending and Resuming, Thread Priority, Synchronization & Deadlock, Inter-thread Communication Garbage Collection: Introduction, Size, Accessing GC from Java Program

Unit III

AWT: AWT Class Hierarchy, Creating Container, Adding Components, Layout, AWT components, Event Handling, Dialog Boxes, Scrollbar, Menu.

Unit IV

Swings & Input/Output: Swing Containment Hierarchy, Swing Components, Methods of Important Event Listener Interfaces Streams, Formatting, Data Streams, Object Stream, Reading/writing Arrays via Streams, Pipes, File I/O, Path, File

Unit V

JDBC: JDBC Drivers, JDBC Architecture, JDBC Classes and Interfaces, Loading a Driver, Making a Connection, Execute SQL Statement, SQL Statements, Retrieving Result, Getting Database Information, Metadata

Course Outcomes (Cos):

Upon successful completion of this subject students should be able to:

CO1: Revise object oriented features of java language and develop java applet programming using various techniques.

CO2: Handling exceptions and develop multi- threaded applications.

CO3: Develop applications using collection framework and concepts of generic programming.

CO4: Develop applications using Abstract Window Toolkit

CO5: Demonstrate the connectivity with SQL through JDBC and describe the JDBC architecture.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course	Progr	am Ou	tcome									
Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		Η	Н						М			

CO2			М			L		М	
CO3				Н					М
CO4	L						Н		
CO5		М			Η			L	

H = Highly Related; M = Medium; L = Low

Text Books

- 1. Sachin Malhotra, Saurabh Chaudhary, "Programming in Java", Second Edition, Oxford University Press, 2014.
- 2. Advance java programming, Oxford, Uttam Kumar Roy, April 2015.

Reference Books

- 1. Programming with Java A Primer, E.Balaguruswamy Tata McGraw Hill Companies
- 2. Java Programming Language Ken Arnold Pearson
- 3. The complete reference JAVA2, Herbert schildt. TMH

Course Name: Android Application Development Lab Course Code: BCA145A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
0	0	2	2

Course Objectives:

The purpose of this course is to enhance the practical knowledge based on prescribed theory course. The students will be able to enhance their analyzing and problem solving skills after implementation of all the given experiments.

List of Experiment

Following are the list of sample programs. Students have to perform accordingly.

- 1. Develop an application that uses GUI components, Font and Colors.
- 2. Develop an application that uses Layout Managers and event listeners.
- 3. Develop a native calculator application.
- 4. Write an application that draws basic graphical primitives on the screen.
- 5. Develop an application that makes use of database.
- 6. Develop an application that makes use of RSS Feed.
- 7. Implement an application that implements Multi threading.
- 8. Develop a native application that uses GPS location information.
- 9. Implement an application that writes data to the SD card.
- 10. Implement an application that creates an alert upon receiving a message.
- 11. Write a mobile application that creates alarm clock.

Course Name: Advance Java Lab

Course Code: BCA146A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
0	0	2	2

Course Objectives:

The purpose of this course is to enhance the practical knowledge based on prescribed theory course. The students will be able to enhance their analyzing and problem solving skills after implementation of all the given experiments.

List of Experiment

- 1. Write a program to sum and average of five marks.
- 2. Write a program to describe functionality of Arithmetic operations using switch.
- 3. Write a program to write names of 10 natural numbers.
- 4. Write a program to sum of 'n' natural numbers.
- 5. Write a program to find Factorial of a number.
- 6. Write a program to sum of 'n' numbers.
- 7. Write a program to sum of two numbers using class and object.
- 8. Write a program to prepare mark sheet of a student.
- 9. Write a program to find area of rectangle using constructor.
- 10. Write a program to find area of room.
- 11. To write a java program to find the sum of digits of a given number
- 12. To write a java program to find the first 15 terms of Fibonacci sequence.
- 13. To write a java program to print the Armstrong numbers.
- 14. Write a Java program that prints all real solutions to the quadratic equation $ax^2+bx+c = 0$. Read in a, b, c and use the quadratic formula. If the discriminate b2-4ac is negative, display a message stating that there are no real solutions?
- 15. The Fibonacci sequence is defined by the following rule. The first 2 values in the sequence are 1,1. Every subsequent value is the sum of the 2 values preceding it. Write a Java program that uses both recursive and non-recursive functions to print the nth value of the Fibonacci sequence?
- 16. Write a Java program that prompts the user for an integer and then prints out all the prime numbers up to that Integer?
- 17. Write a Java program that checks whether a given string is a palindrome or not. Ex: MADAM is a palindrome?
- 18. Write a Java program that reads a line of integers and then displays each integer and the sum of all integers.
- 19. To write a java program to show how a class implements two interfaces.
- 20. To write a java program to show that the variables in an interface are implicitly static and final and methods are automatically public.
- 21. Write a program to implement multilevel inheritance and method overriding.

- 22. Write a program to illustrate class member access for packages and also implement interfaces.
- 23. To write a java applet program to change the color of a rectangle using scroll bars to change the value of red, green and blue
- 24. To write an applet program for creating a simple calculator to perform Addition, subtraction, Multiplication and Division using Button, Label and TextField component.
- 25. Write a program in Java to describe concepts of handling exceptions.
- 26. Write a program in Java to describe Exception Handling with all keywords
- 27. Write a program to describe the concept of Collection framework an ArrayList.
- 28. Write a program to describe Java Generics using Map.
- 29. Write a program in Java in AWT to design login form.
- 30. Write a Java program to draw a rectangle using swing.
- 31. Write a Java swing program to print a wave form with output.
- 32. Write a Enable and Disable button in Java swing.
- 33. Write a java program that connects to a database using JDBC and does add, deletes, modify and retrieve operations.
- 34. Write a program to update student information using jdbc connection.
- 35. Write a program to create an applet of a moving banner.
- 36. Develop static pages (using only HTML) of an online Book store.

Course Name: Introduction to PL/SQL Lab

Course Code: BCA138A

L (Hr.)	T/P (Hr.)	Pr (Hr.)	Credits
0	0	2	2

Course Objectives

The purpose of this course is to enhance the practical knowledge based on prescribed theory course. The students will be able to enhance their analyzing and problem solving skills after implementation of all the given experiments.

List of Sample Programs

- Create a relational database that contains the following tables and insert 10 records into these tables. Solved the Following SQL Queries:
 student (<u>sid</u>, sname, sex, age, year, gpa)
 dept (<u>dname</u>, numphds)
 prof (<u>pname</u>, dname)
 course (<u>dname, cno</u>, cname)
 major (<u>dname, sid</u>)
 section (<u>dname, cno, sectno</u>, pname)
 enroll (sid, dname, cno, sectno, grade)
 - i. Print the names of professors who work in departments that have fewer than 50 PhD students.
 - ii. Print the names of the students with the lowest GPA.
 - iii. For each Computer Sciences class, print the class number, section number, and the average gpa of the students enrolled in the class.
 - iv. Print the names and section numbers of all classes with more than six students enrolled in them.
 - v. Print the name(s) and sid(s) of the student(s) enrolled in the most classes.
 - vi. Print the names of departments that have one or more majors who are under 18 years old.
 - vii. Print the names and majors of students who are taking one of the College Geometry courses.
 - viii. For those departments that have no major taking a College Geometry course print the department name and the number of PhD students in the department.
 - Print the names of students who are taking both a Computer Sciences course and a Mathematics course.
 - x. Print the age difference between the oldest and the youngest Computer sciences major.

- xi. For each department that has one or more majors with a GPA under 1.0, print the name of the department and the average GPA of its majors.
- xii. Print the ids, names and GPAs of the students who are currently taking **all** the Civil Engineering courses.
- 2. Create the 3 structured record data type named as address_type(street, city, state, pin_code), person_type(firstname, lastname, DOB) and business_type(title, company). Create 2 tables based on person_type and business_type. Create one more table which is referred by first two tables. (Reference type)
- 3. Write a program to enter a number and find the factorial of the number.
- 4. Write a code to create a type with an array of number 10.
- 5. Write a PL/SQL code to take the input from the user for 3 subjects and calculate total marks and percentage.
- 6. Write a program to create a function for add two numbers and call it by passing the values as an argument.
- 7. Write a program to enter two number and find greater number using function
- 8. Write a program to create a PL/SQL function for count the number of records in any existing table.
- 9. Write a PL/SQL code to create a table using the already created array type and insert 5 records.
- 10. Write a PL/SQL code to enter two numbers and perform the arithmetic operations. (Addition, Subtraction, Multiplication, Division).

Course Name: Minor Project

Course Code: BCA147A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
0	0	2	2

Course Objectives:

The purpose of minor project is to enhance the practical knowledge based on prescribed languages which are introduced in this program. The students will be able to enhance their analyzing and problem solving skills after implementation of all the given experiments.

List of Courses for Electives

Course Name: Data Analytics using R

Course Code: BCA140A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
3	0	0	3

Course Objectives:

- 1. To explain the key differences between the tasks of classification, clustering, regression, and dimensionality reduction
- 2. To identify the key differences between supervised and unsupervised learning paradigms
- 3. To explain how noisy observations affect the result of data mining methods.
- 4. To deal with missing data and Manipulate strings in R
- 5. To understand basic regular expressions in R and base R graphics

Syllabus

Unit I

Introduction to R: Basics of R, R-Environment Setup, Installation of R, Rstudio, Installing and Configuring, RStudio in Windows, Installing and Configuring, RStudio in Linux, Programming with R, Basic Data Types, Vectors, Matrices, Arrays.

Factors and data Frames: Factor Levels, Data Frame, Creating a Data Frame, Sub setting of Data Frames, Extending Data Frames, Sorting Data Frames

Unit II

List: Creating a List, Creating a Named List, Lists Operations, Conditionals and Control Flow, Relational Operators, Relational Operators and Vectors, Logical Operators, AND Operator, OR Operator, NOT Operator, Logical Operators and Vectors, Conditional Statements

Unit III

Iterative Programming: While Loop, For Loop, Looping Over List, Loops for Vectors, Loops for Matrices, Loops for Data Frames, Loops for Lists, Functions in R.

Unit IV

Function in R: Writing a Function in R, Nested Functions, Function Scoping, Function Environment, Function Scope, Default Values for Arguments, Returning Complex, Recursion, Loading an R Package, Methods of Loading, Mathematical Functions in R, Cumulative Sums and Products, Calculus in R, Input and Output Operations

Unit V

Apply Family in R , Charts & Graphs: Apply Family : Using apply in R, Using lapply in R, Using sapply in R, Using mapply in R.

Charts & Graphs: Pie Chart, Bar Chart, Box Plot, Histogram, Line Graph, Scatter

Course Outcomes (Cos):

Upon successful completion of this subject students should be able to:

CO1: Students will able to explain Basics of R programming.

CO2: Students will able to estimate the effects data interfaces.

CO3: Able to design data mining experiments using R and existing data mining tools.

CO4: Students will be able to programming with the help of functions.

CO5: Able explain the working of lists in R and will be able working with bar and charts.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course		Program Outcome										
Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				Н					М			
CO2		М		М						М		
CO3	М				М		L					М
CO4			L					М				
CO5	Н				L				М			

H = Highly Related; M = Medium; L = Low

Text Books

- 1. Statistical Programming in R (Oxford) Srinivasa, Siddesh, Shetty and Sowmya, June 2017.
- 2. VikramDayal. An Introduction to R for Quantitative Economics: Graphing, Simulating and Computing. Springer, 2015

Reference Books

1. Lawrence Leemis. Learning Base R. Lightning Source, 2016

- 2. Matthias Kohl. Introduction to statistical data analysis with R. bookboon.com, London, 2015.
- 3. Matthias Kohl. Introduction to statistical data analysis with R. bookboon.com, London, 2015.

Course Name: Computer Graphics

Course Code: BCA148A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
3	0	0	3

Course Objectives:

1. To provide comprehensive introduction about computer graphics system, design algorithms and two dimensional transformations.

- 2. To make the students familiar with techniques of clipping, three dimensional graphics and three dimensional transformations.
- 3. To be enable for prepare students for activities involving in design, development and testing of modeling.
- 4. To make the students familiar with techniques of rendering, shading and animation.
- 5. To know about Modeling Transformations.

Syllabus

Unit I

Computer Graphics Basics and Object Representation: Historical Development of the Field, Major Issues and Concerns in Computer Graphics, Preliminaries: Basics of Graphics System, CRT Displays, Graphics Pipeline: Stages of Rendering Process, Role of Graphics Libraries.

Unit II

Modeling Transformations, Illumination, Lighting Models, and Intensity Representation: Basic Transformations, Matrix Representation and Homogeneous Coordinate System, Composition of Transformations, Transformations in 3D ,Simple Lighting Model, Shading Models, Handling the Shadow Effect Intensity Representation.

Unit III

Color Models, Texture Synthesis, 3D Viewing and Clipping: Physiology of Vision, Color Models, Texture Synthesis, 3D Viewing Transformation, Projection, Window-to-viewport Transformation, Clipping in 2D, 3D clipping.

Unit IV

Hidden Surface Removal and Rendring: Types of Methods, Application of Coherence, Back Face Elimination, Depth (Z) Buffer Algorithm, A-Buffer Algorithm, Depth Sorting (Painter's) Algorithm, Warnock's Algorithm, Octree Methods, Scan Conversion of a Line Segment, DDA Algorithm,

Bresenham's Algorithm. Circle Scan Conversion, Midpoint Algorithm, Fill Area Scan Conversion, Seed Fill Algorithm, Flood Fill Algorithm, Scan Line Polygon Fill Algorithm.

Unit V

Computer Animation , Multimedia and Hypermedia: Generic Architecture, Input and Output of Graphics System, GPU and Shader Programming, Graphics Software and OpenGL, Traditional Animation Tech, Keyframing, Motion Capture, Physically based Methods and Procedural Techniques. Hypermedia, Multimedia Authoring, Components of Multimedia, Data Compression Standards

Course Outcomes (COs):

On successful completion of this course students will be able to:

CO1: Students will get the concepts of Graphics display devices, different types of graphics drawing algorithms.

CO2: Students will get the concepts of 2D and 3D Geometrical Transformations

CO3: Students will get the concepts of Color models and clipping.

CO4: Students will get the concepts of Hidden Line/surface elimination techniques

CO5: Student will get the concepts of creating animations and multimedia.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course	Prog	ram Ou	itcome									
Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		М				М				М		
CO2				М				М				
CO3					М						М	
CO4							Н					
CO5	Н	М				М			Μ			

H = Highly Related; M = Medium; L = Low

Text Books

- 1. Computer Graphics, Oxford University, Bhattacharya, December 2015.
- 2. "Mathematical Elements of Computer Graphics" by Kogin Adams

Reference Books

- 1. "Computer Graphics" by John F Hughes
- 2. "Computer Graphics" by Desai and Apurva A
- 3. "Computer Graphics: A Programming Approach" by Steven Harrington

Course Name: Compiler Design

Course Code: BCA149A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
3	0	0	3

Course Objectives:

- 1. To understand, design and implement a lexical analyzer.
- 2. To understand, design and implement a parser.
- 3. To understand, design code generation schemes.
- 4. To understand optimization of codes and run time environment.

5. To understand various compiler writing tools.

Syllabus

Unit I

Introduction to Compiler: Theory of Computer Languages, Design of a Language, Evolution of Compilers, Stages of Compilation: Lexical Analysis, Syntactic Analysis, Semantic Analysis, Intermediate Code Generation, Code Optimization, Code Generation, Symbol Table Management.

Unit II

Lexical Analysis and Syntax Analysis: Lexical Analysis: Alphabets and Tokens in Computer Languages, Representation of Tokens and Regular Expression, Token Recognition and Finite State Automata, Implementation, Error Recovery.

Unit III

Syntax Analysis: Context-free Grammar and Structure of Language, Parser and its Types, Top down Parser, Bottom-up Parser, Parser Generator Tool (Yacc).

Unit IV

Code Optimization: Need for Optimization, Objectives, Performance factors, Writing Optimized Code at User Level, Construction of Basic Blocks and Processing, Data-flow Analysis Using Flow Graph, Principal Sources of Optimization and Transformations, Alias, Procedural Optimization, Loops in Flow Graphs, Loop Optimization.

Unit V

Code Generations and Compiler Writing Tools: Issues in Code Generation, Target Machine Architecture, Subsequent Use Information, Register Allocation, Directed Acyclic Graph Representation of Basic Blocks, Code Generation From Intermediate Code, Peephole Optimization, Code Scheduling, Lexical Tools.

Course Outcomes (COs):

On successful completion of this course, the learner will be able to

CO1: Learn the design and develop a comprehensive Compiler for a given language or an Introduction.

- CO2: Analyze and able to design a compiler development with lexical and syntax analysis.
- CO3: Describe all aspects of Run time storage with intermediate Code generation.
- CO4: Implement various code optimization techniques.
- CO5: Implement various optimization and code generation algorithms for the design of a compiler.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course					Pr	ogram	Outcom	ie				
Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				Н						М		
CO2		Н			L			М				
CO3			Н								М	
CO4							Н					
CO5	Н			L					М			

H = Highly Related; M = Medium; L = Low

Text Books

- 1. Compiler Design, Oxford University, Muneeswaran, November 2012.
- 2. "Engineering a Compiler" by Keith D Cooper and Linda Torczon

Reference Books

- 1. "Compilers: Principles, Techniques and Tools" by Alfred V Aho and Ravi Sethi
- 2. "Compiler Design in C" by Allen I Holob
- 3. "Elements of Compiler Design" by Meduna

Course Name: Management Information System Course Code: BCA150A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
3	0	0	3

Course Objectives:

- 1. To get the knowledge about the important management concepts & their application, to have an insight of various functional departments in an organization.
- 2. To discuss the importance of security, privacy, and ethical issues as they relate to information systems.
- 3. To identify some of the strategies employed to lower costs and improve service.
- 4. To know about the designing and development of MIS
- 5. To know about Role of Decision Support System in MIS, Decision Support Models,

Syllabus

Unit I

Introduction to Information System: Information system, Classification of Information, Key aspects of Management, Definitions, roles and features of MIS, Structure of Management Information System, Benefits of Management Information System, Limitations of Management Information System.

Unit II

MIS Development: Overview of design of an information system, The role and tasks of systems analysts, Tools used by system analyst in designing Information system, MIS Requirement Analysis, MIS Requirement Specification, Feasibility Analysis & Report, MIS Development Models, MIS Design & Development Phase

Unit III

Decision Support System in MIS: Managerial Decision Making, Types of Decisions, Definition and characteristics of DSS, Types of Decision Support Systems, Components of DSS, Role of Decision Support System in MIS, Decision Support Models, Risks of DSS in MIS,

Unit IV

Applications of Management Information Systems to E-Business: Applications in Manufacturing Sector, Applications in Service Sector. Decision Support System and Knowledge Management, Enterprise Management Systems

Unit V

E-Business Enterprise: A Digital Firm, Strategic Management of Business Performance, Information Security Challenges in E-Enterprises, Information Technology: Impact on Society.

Infotech Infrastructure: Technology of Information Systems Unified Communication and Networks, Database and Client Server Architecture. Data Warehouse: Architecture to Implementation E-Business Technology

Course Outcomes (Cos):

Upon successful completion of this subject students should be able to:

CO1: Understand the basic concept of Management support system.

CO2: Know about the designing and development of MIS

CO3: To identify MIS Security Risks, Threats & Vulnerability and Assessing Risks.

CO4: To identify Database and Client Server Architecture. Data Warehouse: Architecture to implementation.

CO5: Know about Role of Decision Support System in MIS, Decision Support Models,

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course	Prog	ram O	utcom	e								
Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				Η						М		
CO2		Н										
CO3							М					М
CO4	М				Н						М	
CO5		Н						М		L		

H = Highly Related; M = Medium; L = Low

Text Books

- 1. Management Information Systems: Waman S Jawadekar, Tata McGraw-Hill
- 2. Management Information Systems S. Sadagopan, PHI learning PVT Ltd.

Reference Books

- 1. Management Information Systems, Davis, Tata McGraw-Hill
- 2. Decision Support and Expert Systems: Management Support Systems, Efraim Turban, Prentice Hall
- 3. Dr. C.B Gupta "Management concepts & practices" S.Chand& Sons, 2009.

Course Name: Theory of Computation

Course Code: BCA151A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
3	0	0	3

Course Objectives:

- 1. To introduce students to the mathematical foundations of computation including automata theory.
- 2. To be able to understand the concept of theory of formal languages and grammars and the notions of algorithm, decidability, complexity, and computability.
- 3. To enhance/develop students' ability to understand and conduct mathematical proofs for computation and algorithms.
- 4. To enhance the ability to understand the concept of Regular Expression Formalism.
- 5. To be able to describe formation of Turing machine by Grammars.

Syllabus

Unit I

Introduction: Basic Concepts, Sets, Relations, Graphs, Languages, Mathematical Induction, Finite State Machines FSM: Concept of Basic Machine, Finite State Machine, Finite Automata, Deterministic Finite Automata, Non-deterministic Finite Automata, Equivalence of NFA and DFA, NFA with ε -Transitions, Equivalence of NFA and NFA with ε -Transitions, Equivalence of DFA and NFA with ε -Transitions, DFA Minimization

Unit II

Regular Expression: Formalism, Examples of Regular Expressions, Equivalence of Regular Expressions and Finite Automata, DFA to Regular Expression Conversion, Regular Sets and their Closure Properties, Pumping Lemma for Regular Languages, Decision Algorithms for Regular Sets, Applications of Regular Expressions and Finite Automata.

Unit III

Turing Machine: Elements of a Turing Machine, Turing Machine Formalism, Instantaneous Description, Transition Graph for Turing Machine, Complexity of a Turing Machine, Composite and Iterative Turing Machines, Universal Turing Machine, Multi-tape Turing Machine, Multi-stack Turing Machine, Multi-track Turing Machine.

Unit IV

Grammar: Constituents of Grammar, Formal Definition of Grammar, Grammar Notations, Derivation Process, Derivation Tree, Context-free Languages, Ambiguous Context-free Grammar, Simplification of Context-free Grammar, Normal Forms, Chomsky Hierarchy, Equivalence of Right-linear and Left-linear Grammars ,Equivalence of Regular Grammars and Finite Automata Pumping Lemma for Context-free Languages.

Unit V

Automata: Elements of a PDM, Pushdown Automata, Finite Automata vs PDAPDA Accepting CFLs, DPDA vs NPDA, Equivalence of CFG and PDA, Closure Properties of CFLs, Additional PDA Examples. Parsing, Bottom-up Parsing, Working of a Bottom-up Parser, Automatic Construction of Bottom-up Parser.

Course Outcomes (COs):

On successful completion of this course, the learner will be able to

CO1: Students are able to understand basic terms TOC and FSM.

CO2: Students are able to understand Regular Expression and its fundamentals.

CO3: Students will be able to describe formation of Turing machine by Grammars.

CO4: Students will be able to understand the different-2 types of grammars

CO5: Students will be able to describe the PDA.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course					Р	rogran	n Outco	ome				
Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Н		Н					Н	М			
CO2				Н		Η				L		
CO3												М
CO4				М				Н				
CO5		Н					М		Н		М	

H = Highly Related; M = Medium; L = Low

Text Books:

- 1. Vivek Kulkarni "Theory of Computation", Oxford University Press. 2013
- 2. Peter Linz, "An Introduction to Formal Languages and Automata", (5e), Jones & Bartlett Learning, 2011

Reference Books:

- 1. John C Martin, "Introduction to Languages and the Theory of Computation", (3e), McGraw Hill, 2007.
- 2. J E Hopcroft, Rajeev Motwani & Jeffrey D Ullman, "Introduction to Automata Theory, Languages and Computation", (3e), Pearson Education, 2006.
- 3. K. L. P. Mishra, N. Chandrashekharan, "Theory of Computer Science", (3e),PHI publications, 2007.

Course Name: Web Technologies

Course Code: BCA152A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
3	0	0	3

Course Objectives:

- 1. To be able to develop a dynamic webpage by the use of java script and DHTML.
- 2. To be able to write a well formed / valid XML document.
- 3. To be able to connect a java program to a DBMS and perform insert, update and delete operations on DBMS table.
- 4. To be able to write a server side java application called Servlet to catch form data sent from client, process it and store it on database.
- 5. To be able to write a server side java application called JSP to catch form data sent from client and store it on database.

Syllabus

Unit I

Introduction to the Web and HTTP: History of the Web, Protocols Governing the Web, Creating Websites for Individuals and Web Applications, Writing Web Projects, Identification of Objects, Web Team, Planning and Process Development, TCP/IP Protocol Suite, IP Addresses.

Unit II

Hypertext Markup Language (HTML): History of HTML and W3C, HTML and its Flavors, HTML Basics, Elements, Attributes, and Tags, HTML Elements, HTML Tags, Basic Tags, Headings, Advanced tags, Frames, Images, Meta Tag, Planning of Web Page, Model and Structure for a Website, Designing Web Pages.

Unit III

Cascading Style Sheet (CCS) & XML: Introduction, Advantages, Adding CSS, External Style Sheets, Embedded Style Sheets, Imported Style Sheets, Inline Style Sheets, Cascading Rule, Browser Compatibility, CSS and Page Layout, Anatomy of a Style Rule, Selectors, Grouping, Type Selectors ,Universal Selectors, Descendant Selectors ,Child Selectors, Attribute Selectors, class Selectors, ID selectors ,XML: Common Use , Role of XML, Basic Structure, Body, Elements, Attributes, Validation, Displaying XML, Namespace

Unit IV

Java Script: Introduction, Variables, Literals, Operators, Control Structure, Conditional Statement, Arrays, Functions, Predefined Objects, The Location Object, History, Object Hierarchy, Accessing Objects, Event Handling, DOM, JavaScript and XML

Unit V

Servlet and JSP: Introduction, Definitions, Server-side Java, Advantage over Applet, Servlet Architecture, Servlet Life Cycle, GenericServlet, HttpServlet, First Servlet, Passing. JSP: JSP and HTTP, JSP Engines, JSP and Servlet, JSP Syntax, JSP Components

Course Outcomes (COs):

Upon successful completion of this subject students should be able to:

CO1: Students are able to understand basic terms and protocols related to WWW.

CO2: Students are able to develop a dynamic webpage by the use of HTML/DHTML

CO3: Students will be able to write a well formed / valid XML document.

CO4: Students will be able to use java script for event handling etc.

CO5: Students will be able to write a server side java application called Servlet to catch form data sent from client, process it and store it on database.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course	Prog	ram O	utcom	e								
Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		L	Н				М		Μ			
CO2		Η			L			М				L
CO3	Н				Н	М			L			
CO4			Н	Н			L	Μ				
CO5		L							Н		М	

H = Highly Related; M = Medium; L = Low

Text Books

- 1. Web Technologies, Oxford University, Uttam Kumar Roy, November 2010
- 2. "Semantic Web Technologies: Trends and Research in Ontology-based Systems" by John Davies and Rudi Studer

Reference Books

- 1. "Semantic Web Technologies and Legal Scholarly Publishing (Law, Governance and Technology Series)" by Silvio Peroni
- 2. "Foundations of Semantic Web Technologies" by Pascal Hitzler and Markus Krotzsch
- "Semantic Web Technologies for Intelligent Engineering Applications" by Stefan Biffl and Marta Sabou

Course Name: Artificial Intelligence and Expert System Course Code: BCA153A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
3	0	0	3

Course Objectives:

- 1. To understand AI methodology and fundamentals; intelligent agents.
- 2. To understand search algorithms; game playing; supervised and unsupervised learning; decision tree learning.
- 3. To learn neural networks, nearest neighbor methods, dimensional reduction, clustering.
- 4. To understand kernel machines, support vector machines; uncertainty and probability theory.
- 5. To understand probabilistic reasoning in AI.

Syllabus

Unit I

History: Artificial Intelligence: History and Applications, Intelligence, Communication, Learning, Artificial Intelligence, Progress of Artificial Intelligence, Modeling, Simulation, and AI, Intelligent Systems, Comparison of Various Intelligent Systems

Unit II

Knowledge Representation: Reasoning, Issues, and Acquisition, Propositional Calculus, Predicate Calculus, Rule-based Knowledge Representation, Symbolic Reasoning Under Uncertainty, Basic Knowledge Representation Issues, Knowledge Acquisition

Unit III

Artificial Intelligence Problem-solving Languages: PROLOG, Control Structures used in Rule-Based Systems, Search, Search Strategies Using Search Techniques, Implementation of Search, Construction and Debugging Methods for a Program, LISP, Problem-solving by LISP, Implementation of LISP, Comparison of LISP and PROLOG

Unit IV

Fuzzy Systems: Foundation of Fuzzy Systems, Fuzzy Relations ,Arithmetic Operations of Fuzzy Numbers, Linguistic Descriptions and their Analytical Forms , De- fuzzification Methods, Fuzzy Logic in Control and Decision-making Applications,

Unit V

Expert Systems: Features ,Characteristics, Architecture, Goals, Basic Activities, Advantages, Stages in the Development of an Expert System, Probability-based Expert Systems, Expert System Tools, Applications

Course Outcomes:

On successful completion of this course students will be able to:

CO1: Knowledge of what constitutes "Artificial" Intelligence and History of Artificial Intelligence.

CO2: Explain Implementations Applications related to Artificial Intelligence.

CO3: Implement Expert system technologies and Fuzzy logic theory.

CO4: Ability to apply Artificial Intelligence with neural network and genetic algorithm.

CO5: Explain the Swarm Artificial Intelligence techniques.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course		Program Outcome										
Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		М				М				М		
CO2				М				М				
CO3					М						М	
CO4							Н					
CO5	Н	М				Μ			М			

H = Highly Related; M = Medium; L = Low

Text Books

- N. P. Padhy, "Artificial Intelligence and Intelligent Systems", 1 edition, Oxford University Press, 2005.
- 2. Don W. Patterson, "Introduction to Artificial Intelligence and Expert Systems", PHI Publication, 2006.

Reference Books

- 1. Stuart Russell and Peter Norvig, "Artificial Intelligence A Modern Approach", 3'rd Edition, Pearson Education, 2010.
- 3. 2. Elaine Rich, Kevin Knight, Shivashankar B. Nair, "Artificial Intelligence", 3'rd Edition, Tata McGraw Hill Edition, 2008.
- 4. Saroj Kaushik, "Artificial Intelligence", (1e), Cengage Learning Publications, 2011.

Course Name: Data Mining Course Code: BCA154A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
3	0	0	3

Course Objectives:

- 1. To know about data mining techniques like KDD and DM.
- 2. To understand the basic concept of clustering, hierarchical and non-hierarchical techniques
- 3. To understand the use of K-MEDOID Algorithm, Partitioning Decision Tree.
- 4. To know the basic concept of data mining.
- 5. To provide the fundamental concepts of data warehousing technology.

Unit I

Introduction to Data mining: Introduction, Architecture of a Data Mining System, The Knowledge Discovery Process, Integrating Data Mining with Data Warehouse, Related Areas of Data Mining, Data Mining Techniques

Unit II Data Mining: KDD vs. DM, DBMS vs. DM, DM Techniques, Issues and Challenges in DM, DM Applications. Association Rules: A Prior Algorithm, Generalized association rule.

Unit III Data Warehousing: Introduction, Definition, Multidimensional data transformation, OLAP operations, Warehouse schema.

Unit IV Clustering: Hierarchical and non-hierarchical techniques, K-MEDOID Algorithm, Partitioning Decision Trees: Decision tree induction, Tree pruning, and Extracting classification rules from decision trees.

Unit V Introduction to Techniques for Data mining: Neural Networks, Data mining using neural networks, Genetic algorithms, Web Mining.

Course Outcomes

CO1: Students are able to understand the concepts of data mining and different techniques of data mining.

CO2: Understanding of various techniques to mine the data with the application area.

CO3: Able to utilize data warehouses and OLAP for data mining and knowledge discovery activities.

CO4: Able to determine an appropriate mining strategy and obtain knowledge of current data mining applications.

CO5: Able to know about data warehousing schema.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course		Program Outcome										
Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Н					М						
CO2			М							М		
CO3											Н	М
CO4					М			Н				
CO5	Н		М						L			

H = Highly Related; M = Medium; L = Low

Text Books

- 1. Vikram Pudi, "Data Mining", Third Edition, Oxford university Press
- 2. Jiawei Han and Micheline Kamber, "Data Mining- Concepts and Techniques", (3e), Morgan Kaufmann Publishers, 2011

Reference Books

- 1. Paulraj Ponniah, "Data Warehousing", (2e), Wiley India Pvt. Ltd., 2010
- 2. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Introduction to Data Mining. Pearson (2005), India.
- Jiawei Han and MichelineKamber, Data Mining: Concepts and Techniques, Morgan Kaufmann, 3rd edition

Course Name: Data Warehousing

Course Code: BCA155A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
3	0	0	3

Course Objectives:

- 1. To know the basic concept of data mining.
- 2. To provide the fundamental concepts of data warehousing technology.
- 3. To be able to incorporates a step-by-step approach to designing and building a data warehouse.
- 4. To provide numerous review questions, multiple choice questions and other exercises at the end of each chapter.
- 5. To contains a running fictitious case-study to bring out practical aspects of building a data warehouse.

Syllabus

Unit I

Data Warehousing: Introduction to Data Warehousing: Historical Background, Increasing Demand for Strategic Information, Data Warehouse Defined, Data Warehouse Users, Benefits of Data Warehousing, Concerns in Data Warehousing. Features of a Data Warehouse, Multidimensional data transformation, OLAP operations, Warehouse schema.

Unit II

Architecture: Architecture, Characteristics of Data Warehouse Architecture, Data Warehouse Architecture Goals, Data Warehouse Architecture, Data Warehouse and Data Mart, Building Data Marts and its issues, Building Data Marts, Other Data Mart Issues .

Unit III

Planning and Project Management: Project Management Principle, Data Warehouse Readiness Assessment, Data Warehouse Project Team, Planning for the Data Warehouse, Data Warehouse Project Plan, Planning for the Data Warehouse Server, Capacity Planning, Selecting the Operating System, Selecting the Database Software.

Unit IV

Schema & Dimensional Modeling: Schema: Dimensional Modeling, the Star Schema, the Snowflake Schema, Aggregate Tables, Fact Constellation Schema, the Strengths of Dimensional Modeling, Data Warehouse and the Data Model.

Dimensional Modeling: Characteristics of a Dimension Table, Characteristics of a Fact Table, T Types of Dimension Tables, Keys in the Data Warehouse (Star) Schema, Enhancing the Data Warehouse Performance, Technology Requirements.

Unit V

OLAP: Need For OLAP, OLAP and Multidimensional Analysis, OLAP Functions, OLAP Applications, OLAP Models, OLAP Design Considerations, OLAP Tools and Products, Existing OLAP Tools, Data Design, Administration and Performance, OLAP Platforms.

Course Outcomes (COs):

On successful completion of this course, the learner will be able to

CO1: Describe the fundamental concepts, benefits and problem areas associated with data warehousing.

CO2: Describe the various architectures and main components of a data warehouse.

CO3: Design a data warehouse, and be able to address issues that arise when implementing a data warehouse.

CO4: Understand various schemes and data models.

CO5: Compare and contrast OLAP and data mining as techniques for extracting knowledge from a data warehouse.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course	Program Outcome												
Outcome													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	
CO1	Н		Н					Н	М				
CO2				Н		Η				L			
CO3												М	
CO4				М				Н					
CO5		Н					М		Η		М		

H = Highly Related; M = Medium; L = Low

Text Books

- 1. Vikram Pudi, "Data Mining", Third Edition, Oxford university Press
- 2. Jiawei Han and Micheline Kamber, "Data Mining- Concepts and Techniques", (3e), Morgan Kaufmann Publishers, 2011

Reference Books

- 1. Paulraj Ponniah, "Data Warehousing", (2e), Wiley India Pvt. Ltd., 2010
- H. Witten and E. Frank, "Data Mining: Practical Machine Learning Tools and Techniques", Morgan Kaufmann, 2000.
- 3. M.H.Dunham, "Data Mining: Introductory and Advanced Topics", Pearson Education 2006.
Course Name: Mongo Database

Course Code: BCA156A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
3	0	0	3

Course Objectives:

- 1. To understand the need and advantage of no SQL database.
- 2. To provide students the right skills and knowledge needed to develop and run Applications on mongoDB.
- 3. To be able to understand NoSQL database.
- 4. To perform session management using MongoDB.
- 5. To be able to perform Aggregation Queries.

Syllabus

Unit I

MongoDB concepts - Databases, collections, and documents. Downloading Installing and running MongoDB, Installing PHP Driver for MongoDB on various OS Platforms.

Define NoSQL, its characteristics and history, and the primary benefits for using NoSQL databases.

Unit II

Application Development: Inserting documents in MongoDB, Querying documents in collection, Doing advance queries in MongoDB, Updating documents MongoDB, Deleting documents in MongoDB, Managing relationships between documents.

Session Management: Understanding HTTP sessions, Understanding PHP native session handling, Implementing session handling with MongoDB, Putting Session Manager, Building user authentication module, creating login, logout and user profile.

Unit IV

Aggregation Queries: Generating Sample Data, Understanding MapReduce, Performing MapReduce in MongoDB and PHP, Aggregation using group(),Listing distinct values for field,counting documents with count(). Using MongoDB for web analytics.

Unit V

Handling files with GridFS: What is Grid, Storing files in GridFS, Serving files from GridFS, Reading files in chunks

Course Outcomes (COs):

On successful completion of this course, the learner will be able to

CO1: Students will be able to understand basic terms related to MongoDB.

CO2: Students will be able to know application areas of MongoDB and to write simple queries on MongoDB.

CO3: To perform session management using MongoDB.

CO4: Student will be able to perform Aggregation Queries.

CO5: Student will be able to design file handling application using MongoDB.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course	Progr	Program Outcome										
Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Н		Н					Н	М			
CO2				Н		Н				L		
CO3												М
CO4				М				Н				

CO5	Н			М	Н	М	

H = Highly Related; M = Medium; L = Low

Text Books

- 1. Kyle Banker, 2012, "MongoDB in Action", Manning Publications Co.
- 2. Rick Copeland, 2013, "MongoDB Applied Design Patterns", First Edition, O"Reilly Media Inc.

- 1. MongoDB the definitive guide O'Reilly Kristina Chodorow & Michal Dirolf
- Gautam Rege, 2012, "Ruby and MongoDB Web Development Beginner's Guide", Packt Publishing Ltd
- Mike Wilson, 2013, ",Building Node Applications with MongoDB and Backbone", O"Reilly Media Inc.

Course Name: Soft Computing

Course Code: BCA157A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
3	0	0	3

Course Objectives:

- 1. To illustrative description of the inherent principles of soft computing, eliminating heavy mathematical treatment
- 2. To exclusive chapter on swarm intelligent systems
- 3. To extensive coverage of neural networks and fuzzy logic concepts
- 4. To understand basic concepts and working of generic algorithms.
- 5. To understand the concept of artificial neural network.

Syllabus

Unit I

Introduction to soft computing, Need for soft computing, Artificial Intelligence, Artificial Neural Networks, Fuzzy Systems, Genetic Algorithm and Evolutionary Programming, Swarm Intelligent Systems.

Unit II

Artificial Neural Networks- I: Introduction to Neural Networks, Biological Inspiration, Comparison between Brain and Computer, Biological Neural Networks to Artificial Neural Networks, Information Processing at the Neurons and Synapses, Classification of ANNs, Neural Network Architecture, Learning/Training, Training and Testing Modes.

Artificial Neural Networks- II: Backpropagation Neural Networks, Kohonen Neural Network, Learning Vector Quantization, Hamming Neural Network, Hopfield Neural Network, Bi-directional Associative Memory, ART Network, Boltzman Machine Neural Networks , Radial Basis Function Neural Networks.

Unit IV

Fuzzy Logic: Fuzzy Logic Introduction, Human Learning Ability, Undecidability, Imprecision, and Uncertainty, Probability Theory vs Possibility Theory, Fuzzy sets and Classical sets, Fuzzy set operations, Fuzzy relations, Fuzzy compositions, Natural Language and Fuzzy Interpretations, Structure of Fuzzy Inference System

Unit V

Genetic Algorithm: Basic concepts, working principle, procedures of GA, flow chart of GA, Genetic representations, (encoding) Initialization and selection, Genetic operators, Mutation, Generational Cycle, applications

Course Outcomes (COs):

On successful completion of this course, the learner will be able to :

CO1: To know about the basics of soft computing techniques and also their use in some real life situations.

CO2: To solve the problems using neural networks techniques.

CO3: To find the solution using different fuzzy logic techniques

CO4: To use the genetic algorithms for different modelling

CO5: To integrate the various soft computing techniques

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course		Program Outcome										
Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				Н						М		
CO2		Н			L			М				

CO3		Н					М	
CO4					Н			
CO5	Н		L			Μ		

H = Highly Related; M = Medium; L = Low

Text Books

- 1. Soft Computing with MATLAB Programming, Oxford University, Padhy and Simon, May 2015.
- 2. "Soft Computing :Fundamentals And Applications" by Pratihar D K

- 1. "Soft Computing and Intelligent Systems Design: Theory, Tools and Applications" by Karray
- "Soft Computing Applications and Intelligent Systems" by Shahrul Azman Noah and Siti Norul Huda Sheikh Abdullah
- "Soft Computing and Its Applications, Volume Two: Fuzzy Reasoning and Fuzzy Control: Volume 2" by Kumar S Ray

Course Name: Parallel Computing

Course Code: BCA158A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
3	0	0	3

Course Objectives:

- 1. To identify the scope for parallelism in a program.
- 2. To understand the various parallel programming models and the challenges involved in parallel programming.
- 3. To learn the basics of heterogeneous systems using CUDA and OpenCL.
- 4. To introduce the foundations of parallel computing, including parallel architectures, parallel programming methods and techniques.
- 5. To introduce parallel algorithm designs, and parallel performance analysis.

Syllabus

Unit I

Introduction to Parallel Computing: Motivating Parallelism, Scope of Parallel Computing, Organization and Contents of the Text, Parallel Programming Platforms, Implicit Parallelism: Trends in Microprocessor Architectures, Limitations of Memory System Performance.

Unit II

Principles of Parallel Algorithm Design: Introduction, Decomposition Techniques, Characteristics of Tasks and Interactions, Mapping Techniques for Load Balancing, Methods for Containing Interaction Overheads, Parallel Algorithm Models

Basic Communication Operations: One-to-All Broadcast and All-to-One Reduction, All-to-All Broadcast and Reduction, All-Reduce and Prefix-Sum Operations, Scatter and Gather, All-to-All Personalized Communication, Circular Shift, Improving the Speed of Some Communication Operations **Unit IV**

Analytical Modeling of Parallel Programs: Sources of Overhead in Parallel Programs, Performance Metrics for Parallel Systems, The Effect of Granularity on Performance, Scalability of Parallel Systems, Minimum Execution Time and Minimum Cost-Optimal Execution Time, Asymptotic Analysis of Parallel Programs.

Unit V

Programming Shared Address Space Platform: Thread Basics, The POSIX Thread API, Thread Basics: Creation and Termination, Synchronization Primitives in Pthreads, Controlling Thread and Synchronization Attributes, Thread Cancellation.

Course Outcomes (COs):

Upon successful completion of this subject students should be able to:

CO1: Able to understand the concept of parallelism and Routing Mechanisms for Interconnection Networks.

CO2: Able to understand the parallel algorithm design techniques.

CO3: To design the Analytical Models of Parallel Programs.

CO4: To understand the concept of thread, POSIX and Pthreads.

CO5: To understand the basic communication operations

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course	Prog	Program Outcome										
Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		L	Н				М		М			
CO2		Н			L			Μ				L
CO3	Н				Н	М			L			

CO4		Н	Н		L	М			
CO5	L						Н	М	

H = Highly Related; M = Medium; L = Low

Text Books

- 1. Introduction to parallel Computing, Oxford University, Petersen and Arbenz, July 2008.
- 2. "Computer Architecture and Parallel Processing" by Bharat Bhushan Agarwal and Sumit Prakash Tayal.

- 1. "Computer Architecture and Parallel Processing" by Kai Hwang
- 2. "Parallel Computers Architecture and Programming" by Rajaraman V
- "Advanced Computer Architecture for Parallel Processing (Mcgraw Hill Series in Electrical and Computer Engineering)" by Kai Hwang

Course Name: Mobile Computing Course Code: BCA159A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
3	0	0	3

Course Objectives:

- To understand the concept of mobile computing and mobile communication in equal measure 2G, 2.5G, 3G, 3G+, and 4G communication systems.
- 2. To know about mobile satellite communication networks, mobile IP, mobile TCP and digital audiovideo broadcasting
- 3. To be able to understand the concept of mobile systems and devices, mobile operating systems used for application development, mobile databases,
- 4. To know about Client-server computing agents, application servers.
- 5. To know about security protocols, mobile Internet, and ad-hoc and sensor networks.

Syllabus

Unit I

Mobile Communication and Mobile Devices: Mobile Computing introduction, Mobile Computing, Mobile Computing Architecture, Mobile Devices, Mobile System, Networks, Data Dissemination, Mobility Management, Security.

Unit II

Cellular Networks and Frequency Reuse Mobile Smartphones, Smart Mobiles, and Systems, Handheld Pocket Computers, Smart Systems, Limitations of Mobile Devices, Automotive Systems.

Wireless Medium Access Control, CDMA, 3G and 4G Communication: Modulation, Multiplexing, Controlling the Medium Access, Spread Spectrum, FHSS, Coding Methods, CDMA,OFDM, High Speed Packet Access (HSPA) 3G Network, Long-term Evolution, WiMax Rel 1.0 IEEE 802.16e, Broadband Wireless Access, 4G Networks.

Unit IV

Mobile IP Network Layer and Mobile Transport Layer: IP and Mobile IP Network Layers, Packet Delivery and Handover Management, Location Management, Registration, Tunnelling and Encapsulation, Route Optimization, DHCP, VoIP, Ipsec. Conventional TCP/IP Transport Layer Protocols, Indirect TCP, Snooping TCP, Mobile TCP.

Unit V

Mobile Ad-hoc and Wireless Sensor Networks: Introduction to Mobile Ad-hoc Network, Fixed Infrastructure Architecture, MANET Infrastructure Architecture, MANET, Properties, Spectrum; Applications Routing and Routing Algorithms, Security in Ad-hoc Network, Wireless Sensor Networks, Data Dissemination, Sensor Network Applications, Distributed Network and Characteristics, TinyOS.

Course Outcomes (COs):

Upon successful completion of this subject students should be able to:

CO1: Describe wireless and mobile communications systems and be able to choose an appropriate mobile system from a set of requirements.

CO2: To describe all layers, GSM and Architectures

CO3: To describe Interface a mobile computing system with CDMA, 3G and 4G communications.

CO4: To describe IP Network and layers.

CO5: To describe MANET and wireless sensor networks

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course	Progr	ram Ou	itcome									
Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				Н						М		
CO2		Н			L			М				
CO3			Н								М	
CO4							Н					
CO5	Н			L					М			

H = Highly Related; M = Medium; L = Low

Text Books

- 1. Mobile Computing, Oxford University, Raj Kamal, December 2011.
- 2. Mobile Computing by Asoke Talukder, Roopa Yavagal (Tata McGraw Hill)

- 1. Mobile Communication 2nd edition by Jochen Schiller, Pearson education
- 2. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober-"Principles of Mobile Computing"
- 3. Hazysztof Wesolowshi- "Mobile Communication Systems"

Course Name: Image Processing

Course Code: BCA160A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
3	0	0	3

Course Objectives:

- 1. To introduce students to the mathematical foundation of Image processing
- 2. To do detailed study of image processing Operations and Systems.
- 3. To learn students about Image transforms, Enhancement with algorithms of restoration and Compression.
- 4. To do detailed study about image segmentation.
- 5. To learn about Image Compression Model and Compression Algorithm.

Syllabus

Unit I

Introduction to Image Processing : Overview of Image Processing, Nature of Image Processing, Image Processing and Related Fields, Digital Image Representation Types of Images, Digital Image Processing Operations, Fundamental Steps in Image Processing, Image Processing Applications.

Unit II

Digital Imaging Systems and Processing Operations: Overview of Digital Imaging Systems, Physical Aspects of Image Acquisition, Biological Aspects of Image Acquisition, Review of Digital Cameras, Image Display Devices and Device Resolution, Digital Halftone Process, Image Storage and File Formats.

Unit III

Image Restoration: Introduction to Degradation, Types of Image Degradations, Point Spread Function and Modulation Transfer Function, Image Degradation Model, Noise Modelling, Image Restoration in Presence of Noise Only, Periodic Noise, and Band-pass and Band-reject Filtering, Image Restoration Techniques.

Unit IV

Image Compression: Image Compression Model, Compression Algorithm and its Types, Types of Redundancy, Lossless Compression Algorithms, Lossy Compression Algorithms, Image and Video Compression, Wavelet Transform and Multiresolution Analysis.

Unit V

Image Segmentation and Colour Image Processing: Segmentation: Introduction, Classification of Image Segmentation Algorithms, Detection of Discontinuities, Edge Detection, Hough Transforms and Shape Detection, Corner Detection, Principle of Thresholding, Principle of Region-growing, Active Contour Models, Validation of Segmentation Algorithms.

Colour Image Processing: Colour Image Storage and Processing, Colour Models, Colour Quantization, Pseudocolour Image Processing, Full Colour Processing.

Course Outcomes (COs):

On successful completion of this course, the learner will be able to :

CO1: Students are able to understand basic terms of Image Processing.

CO2: Students are able to understand Processing operations and its fundamentals.

CO3: Students will be able to describe the effect of transform operation on Digital Image .

CO4: Students will be able to understand the different-2 Image compressing algorithms.

CO5: Students will be able to describe segmentation and Color image processing.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course	Progr	ram Ou	itcome									
Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				Н						М		
CO2		Н			L			М				
CO3			Н								М	
CO4							Н					
CO5	Н			L					М			

H = Highly Related; M = Medium; L = Low

Text Books

- 1. Rafael C. Gonzalez, Richard E. Woods, "Digital Image Processing" (3e), Pearson Prentice Hall, 2008.
- 2. S. Sridhar, "Digital Image processing", Oxford University Press, 2011

Reference Books

- 1. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, "Digital Image Processing Using MATLAB", (2e), Tata McGraw Hill Publication, 2010.
- 2. Sonka, Hlavac, Boyle, "Digital Image Processing and Computer Vision", CENGAGE Learning.
- 3. "Digital Image Processing" by Rafael C Gonzalez and Richard E Woods.

Course Name: Big Data Analysis Course Code: BCA161A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
3	0	0	3

Course Objectives:

- 1. To know the fundamental concepts of big data and analytics.
- 2. To explore tools and practices for working with big data
- 3. To learn about stream computing.
- 4. To know about the research that requires the integration of large amounts of data.
- 5. To know about clustering and classification.

Syllabus

Unit I

Introduction To Big Data: Evolution of Big data - Best Practices for Big data Analytics - Big data characteristics - Validating- The Promotion of the Value of Big Data - Big Data Use Cases-Characteristics of Big Data Applications - Perception and Quantification of Value -Understanding Big Data Storage – A General Overview of High-Performance Architecture - HDFS – Map Reduce and YARN – Map Reduce Programming Model

Unit II

Clustering and Classification: Advanced Analytical Theory and Methods: Overview of Clustering - Kmeans - Use Cases -Overview of the Method - Determining the Number of Clusters - Diagnostics -Reasons toChoose and Cautions .- Classification: Decision Trees - Overview of a Decision Tree – TheGeneral Algorithm - Decision Tree Algorithms - Evaluating a Decision Tree - Decision Trees inR -Naïve Bayes - Bayes' Theorem - Naïve Bayes Classifier.

Unit III

Association and Recommendation System: Advanced Analytical Theory and Methods: Association Rules - Overview - Apriori Algorithm Evaluation of Candidate Rules - Applications of Association Rules - Finding Association& finding similarity - Recommendation System: Collaborative Recommendation- Content Based Recommendation - Knowledge Based Recommendation- Hybrid Recommendation Approaches.

Unit IV

Graph Memory: Using Graph Analytics for Big Data: Graph Analytics - The Graph Model - Representation as Triples - Graphs and Network Organization - Choosing Graph Analytics - Graph Analytics Use Cases - Graph Analytics Algorithms and Solution Approaches - Technical Complexity of Analyzing Graphs- Features of a Graph Analytics Platform - Considerations: Dedicated Appliances for Graph.

Unit V

Stream Memory: Introduction to Streams Concepts – Stream Data Model and Architecture -Stream Computing, Sampling Data in a Stream – Filtering Streams – Counting Distinct Elementsin a Stream – Estimating moments – Counting oneness in a Window – Decaying Window – Realtime Analytics Platform(RTAP) applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.

Course Outcomes (COs):

On successful completion of this course, the learner will be able to :

CO1: Identify the difference between structured, semi-structured and unstructured data.

- CO2: summarize the challenges of big data and how to deal with the same.
- CO3: Explain the significance of NoSQL databases.
- CO4: Explain about Hadoop Ecosystem.
- CO5: Identify the difference between Pig and Hive.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		М				М				М		
CO2				М				М				
CO3					М						М	
CO4							Н					
CO5	Н	М				М			М			

H = Highly Related; M = Medium; L = Low

Text Books

- 1. AnandRajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.
- 2. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration

- 1. Tom White, "Hadoop: The Definitive Guide", Second Edition, O'Reilly Yahoo Press.
- 2. Robert D. Schneider, "Hadoop for Dummies", Wiley.
- 3. VigneshPrajapati, "Big Data Analytics with R and Hadoop", Packt Publishing.

Course Name: Organization Behavior

Course Code: BCA162A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
3	0	0	3

Course Objectives:

- 1. To discuss the development of the field of organizational behavior and explain the micro and macro approaches
- 2. To analyze and compare different models used to explain individual behavior related to motivation and rewards
- 3. To identify the processes used in developing communication and resolving conflicts
- 4. To explain group dynamics and demonstrate skills required for working in groups (team building)
- 5. To discuss the implementation of organizational change.

Syllabus

Unit I

Organization behavior: The Importance of Interpersonal Skills, Management Functions, Management Roles, Management Skills, Effective versus Successful Managerial Activities, Enter Organizational Behavior, Complementing Intuition with Systematic Study, Challenges and Opportunities for Organizational Behavior

Unit II

Diversity in organization: Demographic Characteristics of the U.S. Workforce, Levels of Diversity, Discrimination, Biographical Characteristics, Ability: Intellectual Abilities, Physical Abilities 55, The Role of Disabilities, Implementing Diversity Management Strategies, Attracting, Selecting, Developing, and Retaining Diverse Employees, Effective Diversity Programs.

Attitudes and job Satisfaction: What Are the Main Components of Attitudes, Does Behavior Always Follow from Attitudes, What Are the Major Job Attitudes, Job Satisfaction, Measuring Job Satisfaction, How Satisfied Are People in Their Jobs, What Causes Job Satisfaction, The Impact of Satisfied and Dissatisfied Employees on the Workplace

Unit IV

Emotions and Moods: The Basic Emotions, The Basic Moods: Positive and Negative Affect, The Function of Emotions, Sources of Emotions and Moods, Emotional Labor, Affective Events Theory, Emotional Intelligence, The Case for EI, The Case Against EI, Emotion Regulation, OB Applications of Emotions and Moods.

Unit V

Perception and Decision Making: Factors That Influence Perception, Making Judgments About Others, Attribution Theory, Common Shortcuts in Judging Others, Specific Applications of Shortcuts in Organizations, The Link Between Perception and Individual Decision Making, Decision Making in Organizations, The Rational Model, Bounded Rationality and Intuition, Common Biases and Errors in Decision Making, Influences on Decision Making: Individual Differences and Organizational Constraints, Ethics in Decision Making, Three Ethical Decision Criteria, Improving Creativity in Decision Making.

Course Outcomes (COs):

On successful completion of this course, the learner will be able to :

CO1: To identify the various leadership styles and the role of leaders in a decision making process.

CO2: To explain organizational culture and describe its dimensions and to examine various organizational designs

CO3: Able to understand negative and positive emotions and moods.

CO4: Able to know the concept of Diversity in organization

CO5: Able to understand attitude and job satisfaction.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course		Program Outcome										
Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		М				М				М		
CO2				М				М				
CO3					М						М	
CO4							Н					
CO5	Н	М				М			М			

H = Highly Related; M = Medium; L = Low

Text Books

- "Organizational Behavior" Stephen P. Robbins —San Diego State University Timothy A. Judge —University of Notre Dame, 15th edition, Pearson.
- McShane, S.L. and Von Glinow, M.A., Organizational Behaviour, New Delhi, Tata McGrawHill Publishing company ltd.

- 1. P. Jyothi, P. and Venkatesh, D.N., Human Resource Management, New Delhi, Oxford University Press.
- Denhardt, R.B., Denhardt, J.V., and Aristigueta, M.P. (2009), Managing Human Behaviour in Public and Non-Profit Organizations, Second edition. California, Sage Publications.
- Pynes, J.E. (2004). Human Resources Management for Public and Nonprofit Organizations, Second Edition. San Francisco, CA: Jossey- Bass Publishers.

Course Name: Introduction to Cloud Computing Course Code: BCA163A

L (Hr.)	T (Hr.)	Pr (Hr.)	Credits
3	0	0	3

Course Objective:

- 1. To provide students with the fundamentals, essentials of Cloud Computing and cloud models.
- 2. To be able to work with cloud services and to provide a sound foundation of the Cloud Computing so that they are able to start using and adopting Cloud Computing services and tools in their real life scenarios.
- 3. To learn about the cloud environment, building software systems and components that scale to millions of users in modern internet.
- 4. To understand basic and advance services provide by the cloud and basic architecture on which cloud is based upon.
- 5. To enable students exploring some important cloud computing driven commercial systems such as Google Apps, Microsoft Azure and Amazon Web Services and other businesses cloud applications.

Syllabus

Unit I

Introduction: Business and IT perspective, Cloud and virtualization, Cloud services requirements, cloud and dynamic infrastructure, cloud computing characteristics, cloud adoption.

Cloud models: Cloud characteristics, Measured Service, Cloud models, security in a public cloud, public verses private clouds, cloud infrastructure self service.

Unit II

Cloud at a service: Gamut of cloud solutions, principal technologies, cloud strategy, cloud design and implementation using SOA, Conceptual cloud model, cloud service demand.

Cloud solutions: Cloud ecosystem, cloud business process management, cloud service management, cloud stack, computing on demand, cloud sourcing.

Unit IV

Cloud management: Resiliency, Provisioning, Asset management, cloud governance, high availability and disaster recovery, charging models, usage reporting, billing and metering.

Unit V

Cloud and SOA: SOA journey to infrastructure, SOA and cloud, SOA defined, SOA defined, SOA and IAAS, SOA based cloud infrastructure steps, SOA business and IT services.

Course Outcomes (COs):

Upon successful completion of this subject students should be able to:

CO1: To provide students with the fundamentals, essentials of Cloud Computing and cloud models.

CO2: Students are able to work with cloud services and to provide a sound foundation of the Cloud Computing so that they are able to start using and adopting Cloud Computing services and tools in their real life scenarios.

CO3: Understand about the cloud solutions, Cloud ecosystem, cloud business process management.

CO4: To learn about designing and implement cloud computing application and cloud management.

CO5: Demonstrate the SOA journey to infrastructure, SOA and cloud and IT services.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course	Prog	ram Ou	itcome									
Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		Н				L					Н	
CO2				Н						М		
CO3	Н							М				М
CO4				Н								
CO5		М			Н				М			

H = Highly Related; M = Medium; L = Low

Text Books:

- 1. RajkumarBuyya, James Broberg, Andrzej M. Goscinski,"Cloud Computing:Principles and Paradigms", Edition1, Wiley,2011
- 2. Gautam Shroff, Enterprise Cloud Computing Technology Architecture Applications

- 1. Toby Velte, Anthony Velte, Robert Elsenpeter, Cloud Computing, A Practical Approach
- 2. Barrie Sosinsky,"Cloud Computing Bible",Edition1, Wiley-India, 2010
- Ronald L. Krutz, Russell Dean Vines,"Cloud Security: A Comprehensive Guide to Secure Cloud Computing", Edition 1, Wiley- India, 2010

Course Name: Introduction to Sales Force

Course Code: BCA164A

L (Hr.)	T/P (Hr.)	Pr (Hr.)	Credits
3	1	0	4

Course Objective:

- 1. To introduce cloud computing and sales force approaches.
- 2. To understand the concept and features of CRM, Data Migration Import Wizard and Data Loader.
- 3. To describe needs of APEX as a Programming Language, Various Statements and Operators.
- 4. To demonstrate class and visual force.
- 5. To be able to understand the concept of Trigger Context Variables, Validation and Automation, Components, Client Controller and Server Controller.

Syllabus

Unit I

Introduction to Cloud Computing & Sales force: On premise and Cloud approach, IaaS, PaaS and SaaS, Clouds, Versions, Editions & Environments, Product & Project Development

MVC Pattern and Multitenent Architecture: Configuration, Development, Testing and Admin, along with 15 steps of Salesfroce.com, MVC Diagram, Multi-Tenant Diagram

Starting Designing Applications on Force.com: Basic Vocabulary, Registration, Navigation and Principles, Understanding the Same with Lightning, Relationships, All 6 Types, Validation, Page Layouts and Record Types

Unit II

CRM: Campaign, Lead, Account, Contact and Opportunity, Campaign, Lead, Account, Contact and Opportunity, Product, Proce Book, Quote, Forecast, Order, Asset, Case, Solution, Activity, Task, Event, Calendar, PaaS features for CRM.

Introduction to Programming: Need of APEX as a Programming Language, Various Statements and Operators, 9 types of operators and 5 types of statements, System.debug, Comments, Indentation, Naming Conventions, OOP, Business Class, Test Class, Test Methods, Creating object, calling methods, executing a program, Constructor / Method / Operator Over Loading / this, Default, Parameterised.

Unit IV

Class and Visual Force: Static and non-static members of a class, Class Summary, try catch, Collections list: Set, Map, Exception Handling, Assertions and Annotations: 6 types of Assertions and 3 Annotations, Database Statements: DML, MC inter relation, Database Statements : SOQL / SOSL, Visual Force - Types of Tags: 6 Types

Unit V

Custom List Controller: Insert and fetch Records, Schedule Apex: Interface, Batch Apex: 50 K, 50 Million, Triggers: if and its types, Trigger Context Variables, Validation and Automation, Components, Client Controller, Server Controller

Course Outcomes (COs):

Upon successful completion of this subject students will able

CO1: Introduce cloud computing and sales force approaches.

CO2: Able to understand the concept and features of CRM, Data Migration Import Wizard and Data Loader.

CO3: Describe needs of APEX as a Programming Language, Various Statements and Operators.

CO4: To demonstrate class and visual force.

CO5: Able to understand the concept of Trigger Context Variables, Validation and Automation, Components, Client Controller and Server Controller.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course	Progr	ram Ou	itcome									
Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		Н				L					Н	
CO2				Н						М		
CO3	Н							М				М
CO4				Н								
CO5		М			Н				М			

H = Highly Related; M = Medium; L = Low

Text Books:

- David Taber, "Salesforce.com Secrets of Success: Best Practices for Growth and Profitability", 1 edition, Prentice Hall, 2009.
- 2. Wes Nolte, Jeff Douglas, "Salesforce Handbook" (3e), Lulu.com, 2011.

Reference Books:

- 1. Tom Wong, Liz Kao & Matt Kaufman "Salesforce for Dummies",4th Revised edition edition ,John Wiley & Sons, 2010
- 2. Visual force practices by Michael Floyd, Don Robins, Dan Appleman, et al.
- 3. Development with the Force.com Platform, Jason Ouellette

Course Name: Robotics Process Automation

Course Code: BCA171A

L (Hr.)	T/P (Hr.)	Pr (Hr.)	Credits
3	0	0	3

Syllabus

Unit-1

Programming Basics & Recap:- Programming Concepts Basics, Understanding the application, Basic Web Concepts, Protocols, EmailClients, DataStructures, DataTables, Algorithms, Software.

Processes, Software Design, SDLC:- Programming Concepts Basics – 2 Scripting, Net Framework, Net ,Fundamentals, XML, Control structures and functions, XML, HTML, CSS, Variables & Arguments.

RPA Basics:- History of Automation, What is RPA,RPA vs Automation, Processes & Flowcharts, Programming Constructs in RPA, What Processes can be Automated, Types of Bots, Workloads which can be automated.

Unit- II

RPA Advanced Concepts :Standardization of processes,RPADevelopemtmethodologies,Difference from SDLC,Robotic control flow architecture,RPA business case,RPATeam,Proccess Design Document/Solution Design Document,Industries best suited for RPA,Risks& Challenges with RPA,RPA and emerging ecosystem

Installation :Installing Studio community edition,The User Interface,KeyboardShortcuts,AboutUpdating,About Automation Projects,Introduction to Automation Debugging,Managing Activation Packages,Reusing Automations Library,Installing the Chrome Extension,

Installing the Firefox Extension, Connecting your project to a source control system, Activities Guide

Variables :Managing Variables,Naming Best Practices,The Variables Panel,Generic Value Variables,TextVariables,True or False Variables,NumberVariables,ArrayVariables,Date and Time Variables,Data Table Variables,ManagingArguments,Naming Best Practices,The Arguments Panel,UsingArguments,About Imported Namespaces,Importing New Namespaces

Unit-III

Control Flow :Control Flow Introduction,If Else Statements,Loops,Advanced Control Flow,Sequences,Flowcharts,About Control Flow,Control Flow Activities,The Assign Activity,The Delay Activity,The Do While Activity,The If Activity,The Switch Activity,The While Activity,The For Each Activity,The Break Activity

Data Manipulation :Data Manipulation Introduction,Scalar variables, collections and Tables,TextManipulation,DataManipulation,Gathering and Assembling Data.

Recording and Advanced UI Interaction :Recording Introduction,Basic and Desktop Recording, WebRecording, Input/Output Methods, ScreenScraping,DataScraping,Scraping advanced techniques.

Selectors: Selectors, Defining and Assessing Selectors, Customization, Debugging, Dynamic Selectors, Partial Selectors, RPA Challenge.

Unit-IV

Advanced Automation concepts and techniques: Image, Text & Advanced Citrix Automation: Introduction to Image & Text ,Automation,Image based automation,Keyboard based automation,InformationRetrieval,Advanced Citrix Automation challenges,BestPractices,Using tab for Images,Starting Apps.

Excel Data Tables & PDF :Data Tables in RPA,Excel and Data Table basics,Data Manipulation in excel,Extracting Data from PDF,Extracting a single piece of data,Anchors,Using anchors in PDF Email Automation :Email Automation,Incoming Email automation,Sending Email automation Exceptional Handling & Best Practices

Debugging and Exception Handling :Debugging Tools,Strategies for solving issues,Catching errors Project Organization:What is project organization,Bestpractices,Avoidingpitfalls,Invoke Activity

Unit-V

Introduction to Orchestrator: Orchestrator: Tenants, Authentication, Users, Roles, Robots, Environments, Queues & Transactions, Schedules.

Emerging and Future Trends in IT: Emerging and Future Trends in IT: Artificial Intelligence, MachineLearning, Agentawareness, Natural Language Processing, Computer Vision

Capstone Project: Real life case studies which can be used to apply the concepts learnt during the course. The projects shall test student's skills right from process transformation and documentation to the design and development of the actual robot.

** All the practical topics are covered in respective Lab sessions

List of Courses for Specialization in Data Science

EC Council Certified Security Specialist (ECSS)

L (Hr.)	T/P (Hr.)	Pr (Hr.)	Credits
3	0	2	5

Unit – I

Information Security Fundamentals, Networking Fundamentals, Secure Network Protocols, Information Security Threats and Attacks, Social Engineering, Hacking Cycle

Unit – II

Identification, Authentication, and Authorization, Cryptography, Firewalls, Intrusion Detection System

Unit – III

Data Backup, Virtual Private Network, Wireless Network Security, Web Security

Unit – IV

Ethical Hacking and Pen Testing, Incident Response, Computer Forensics Fundamentals, Digital Evidence, Understanding File Systems, Windows Forensics

Unit – V

Network Forensics and Investigating Network Traffic, Steganography, Analyzing Logs, E-mail Crime and Computer Forensics, Writing Investigative Report

Certified Network Defender (CND)

L (Hr.)	T/P (Hr.)	Pr (Hr.)	Credits
3	0	2	5

Unit – I

- 1. Computer Network and Defense Fundamentals
- Understanding computer network
- Describing OSI and TCP/IP network Models
- Comparing OSI and TCP/IP network Models
- Understanding different types of networks
- Describing various network topologies
- Understanding various network components
- Explaining various protocols in TCP/IP protocol stack
- Explaining IP addressing concept
- Understanding Computer Network Defense (CND)
- Describing fundamental CND attributes
- Describing CND elements
- Describing CND process and approaches
- 2. Network Security Threats, Vulnerabilities, and Attacks
- Understanding threat, attack, and vulnerability
- Discussing network security concerns
- Reasons behind network security concerns
- Effect of network security breach on business continuity
- Understanding different types of network threats
- Understanding different types of network security vulnerabilities
- Understanding different types of network attacks
- Describing various network attacks

- 3. Network Security Controls, Protocols, and Devices
- Understanding fundamental elements of network security
- Explaining network access control mechanism
- Understanding different types of access controls
- Explaining network Authentication, Authorization and
- Auditing (AAA) mechanism
- Explaining network data encryption mechanism
- Describing Public Key Infrastructure (PKI)
- Describing various network security protocols
- Describing various network security devices

Unit – II

- 4. Network Security Policy Design and Implementation
- Understanding security policy
- Need of security policies
- Describing the hierarchy of security policy
- Describing the characteristics of a good security policy
- Describing typical content of security policy
- Understanding policy statement
- Describing steps for creating and implementing security policy
- Designing of security policy
- Implementation of security policy
- Describing various types of security policy
- Designing of various security policies
- Discussing various information security related standards, laws and acts
- 5. Physical Security Understanding physical security
- Importance of physical security
- Factors affecting physical security
- · Describing various physical security controls

- Understanding the selection of Fire Fighting Systems
- Describing various access control authentication techniques
- Understanding workplace security
- Understanding personnel security
- Describing Environmental Controls
- Importance of physical security awareness and training

6. Host Security • Understanding host security

- Understanding the importance of securing individual hosts
- Understanding threats specific to hosts
- Identifying paths to host threats
- Purpose of host before assessment
- Describing host security baselining
- Describing OS security baselining
- Understanding and describing security requirements for different types of servers
- Understanding security requirements for hardening of routers
- Understanding security requirements for hardening of switches
- Understanding data security concerns when data is at rest, in use, and in motion
- Understanding virtualization security

Unit – III

- 7. Secure Firewall Configuration and Management
- Understanding firewalls
- Understanding firewall security concerns
- Describing various firewall technologies
- Describing firewall topologies
- Appropriate selection of firewall topologies
- Designing and configuring firewall ruleset
- Implementation of firewall policies
- Explaining the deployment and implementation of firewall
- Factors to considers before purchasing any firewall solution

- Describing the configuring, testing and deploying of firewalls
- Describing the management, maintenance and administration of firewall implementation
- Understanding firewall logging
- Measures for avoiding firewall evasion
- Understanding firewall security best practices
- 8. Secure IDS Configuration and Management
- Understanding different types of intrusions and their indications
- Understanding IDPS
- Importance of implementing IDPS
- Describing role of IDPS in network defense
- Describing functions, components, and working of IDPS
- Explaining various types of IDS implementation
- Describing staged deployment of NIDS and HIDS
- Describing fine-tuning of IDS by minimizing false positive and false negative rate
- Discussing characteristics of good IDS implementation
- Discussing common IDS implementation mistakes and their remedies
- Explaining various types of IPS implementation
- Discussing requirements for selecting appropriate IDPS product
- Technologies complementing IDS functionality
- 9. Secure VPN Configuration and Management
- Understanding Virtual Private Network (VPN) and its working
- Importance of establishing VPN
- Describing various VPN components
- Describing implementation of VPN concentrators and its functions
- Explaining different types of VPN technologies
- Discussing components for selecting appropriate VPN technology
- Explaining core functions of VPN
- Explaining various topologies for implementation of VPN

- Discussing various VPN security concerns
- Discussing various security implications to ensure VPN security and performance

Unit – IV

10. Wireless Network Defense

- Understanding wireless network
- · Discussing various wireless standards
- Describing various wireless network topologies
- Describing possible use of wireless networks
- Explaining various wireless network components
- Explaining wireless encryption (WEP, WPA, WPA2) technologies
- Describing various authentication methods for wireless networks
- Discussing various types of threats on wireless networks
- Creation of inventory for wireless network components
- Appropriate placement of wireless Access Point (AP)
- Appropriate placement of wireless antenna
- Monitoring of wireless network traffic
- Detection and locating of rogue access points
- Prevention of wireless network from RF interference
- Describing various security implications for wireless network
- 11. Network Traffic Monitoring and Analysis
- Understanding network traffic monitoring
- Importance of network traffic monitoring
- Discussing techniques used for network monitoring and analysis
- Appropriate position for network monitoring
- · Connection of network monitoring system with managed switch
- Understanding network traffic signatures
- Baselining for normal traffic
- Disusing the various categories of suspicious traffic signatures
- Various techniques for attack signature analysis

- Understanding Wireshark components, working and features
- Demonstrating the use of various Wireshark filters
- Demonstrating the monitoring LAN traffic against policy violation
- Demonstrating the security monitoring of network traffic
- Demonstrating the detection of various attacks using Wireshark
- Discussing network bandwidth monitoring and performance improvement
- 12. Network Risk and Vulnerability Management
- Understanding risk and risk management
- · Key roles and responsibilities in risk management
- Understanding Key Risk Indicators (KRI) in risk management
- · Explaining phase involves in risk management
- Understanding enterprise network risk management
- · Describing various risk management frameworks
- Discussing best practices for effective implementation of risk management
- · Understanding vulnerability management
- Explaining various phases involved in vulnerability management
- Understanding vulnerability assessment and its importance
- Discussing requirements for effective network vulnerability assessment
- Discussing internal and external vulnerability assessment
- Discussing steps for effective external vulnerability assessment
- Describing various phases involve in vulnerability assessment
- Selection of appropriate vulnerability assessment tool
- Discussing best practices and precautions for deploying vulnerability assessment tool
- Describing vulnerability reporting, mitigation, remediation and verification

Unit – V

- 13. Data Backup and Recovery
- Understanding data backup
- Describing the data backup plan
- Describing the identification of data to backup
- Determining the appropriate backup medium for data backup
- Understanding RAID backup technology and its advantages
- Describing RAID architecture
- Describing various RAID levels and their use
- Selection of appropriate RAID level
- Understanding Storage Area Network (SAN) backup technology and its advantages
- Best practices of using SAN
- Understanding Network Attached Storage (NAS) backup technology and its advantages
- Describing various types of NAS implementation

14. Network Incident Response and Management

- Understanding Incident Handling and Response (IH&R)
- Roles and responsibilities of Incident Response Team (IRT)
- Describing role of first responder
- Describing first response activities for network administrators
- Describing Incident Handling and Response (IH&R) process
- Understanding forensic investigation
- People involved in forensics investigation
- Describing forensics investigation methodology

Certified Ethical Hacker CEH

L (Hr.)	T/P (Hr.)	Pr (Hr.)	Credits
3	0	0	3

Unit – I

- 1. Background Network and Communication Technologies
- Networking technologies (e.g., hardware, infrastructure)
- Web technologies (e.g., web 2.0, skype)
- Systems technologies
- Communication protocols
- Telecommunication technologies
- Mobile technologies (e.g., smartphones)
- Wireless terminologies
- Cloud computing
- Cloud deployment models

Information Security Threats and Attack Vectors

- Malware (e.g., Trojan, virus, backdoor, worms)
- Malware operations
- Information security threats and attack vectors
- Attacks on a system (e.g., DoS, DDoS, session hijacking, webserver and web application attacks, SQL
- injection, wireless threats)
- Botnet
- Cloud computing threats and attacks
- Mobile platform attack vectors
- Cryptography attacks

Information Security Technologies

• Information security elements

- Information security management (e.g. IA, Defense-in-Depth, incident management)
- Security trends
- Hacking and ethical hacking
- Vulnerability assessment and penetration testing
- Cryptography
- Encryption algorithms
- Wireless encryption
- Bring Your Own Device (BYOD)
- Backups and archiving (e.g., local, network)
- IDS, firewalls, and honeypots

Unit – II

- 2. Analysis / Assessment Information Security Assessment and Analysis
- Data analysis
- Systems analysis
- Risk assessments
- Vulnerability assessment and penetration testing
- Technical assessment methods
- Network sniffing
- Malware analysis

Information Security Assessment Process

- Footprinting
- Scanning (e.g., Port scanning, banner grabbing, vulnerability scanning, network discovery, proxy chaining, IP spoofing)
- Enumeration
- System hacking (e.g., password cracking, privilege escalation, executing applications, hiding files, covering tracks)

Unit – III

3. Security Information Security Controls

- Systems security controls
- Application/file server
- IDS
- Firewalls
- Cryptography
- Disk Encryption
- Network security
- Physical security
- Threat modeling
- Biometrics
- Wireless access technology (e.g., networking, RFID, Bluetooth)
- Trusted networks
- Privacy/confidentiality (with regard to engagement)

Information Security Attack Detection

- Security policy implications
- Vulnerability detection
- IP Spoofing detection
- Verification procedures (e.g., false positive/negative validation)
- Social engineering (human factors manipulation)
- Vulnerability scanning
- Malware detection
- Sniffer detection
- DoS and DDoS detection
- Detect and block rogue AP
- Evading IDS (e.g., evasion, fragmentation)
- Evading Firewall (e.g., firewalking, tunneling)
- Honeypot detection
- Steganalysis

Information Security Attack Prevention

- Defend against web server attacks
- Patch management
- Encoding schemes for web application
- Defend against web application attacks
- Defend against SQL injection attacks
- Defend against wireless and Bluetooth attacks
- Mobile platforms security
- Mobile Device Management (MDM)
- BYOD Security
- Cloud computing security

Unit – IV

- 4. Tools / Systems / Programs Information Security Systems
- Network/host based intrusion
- Boundary protection appliances
- Access control mechanisms (e.g., smart cards)
- Cryptography techniques (e.g., IPSec, SSL, PGP)
- Domain name system (DNS)
- Network topologies
- Subnetting
- Routers / modems / switches
- Security models
- Database structures

Information Security Programs

• Operating environments (e.g., Linux,

Windows, Mac)

• Anti-malware systems and programs (e.g., anti-keylogger, anti-spyware, anti-rootkit, anti-trojan, antivirus)

- Wireless IPS deployment
- Programming languages (e.g. C++, Java, C#, C)

• Scripting languages (e.g., PHP, Javascript)

Information Security Tools

- Network/wireless sniffers (e.g., Wireshark, Airsnort)
- Port scanning tools (e.g., Nmap, Hping)
- Vulnerability scanner (e.g., Nessus, Qualys, Retina)
- Vulnerability management and protection systems (e.g., Founds tone, Ecora)
- Log analysis tools
- Exploitation tools
- Footprinting tools (e.g., Maltego, FOCA, Recon-ng)
- Network discovery tools (e.g., Network Topology Mapper)
- Enumeration tools (e.g., SuperScan, Hyena, NetScanTools Pro)
- Steganography detection tools
- Malware detection tools
- DoS/DDoS protection tools
- Patch management tool (e.g., MBSA)
- Webserver security tools
- Web application security tools (e.g., Acunetix WVS)
- Web application firewall (e.g., dotDefender)
- SQL injection detection tools (e.g., IBM Security AppScan)
- Wireless and Bluetooth security tools
- Android, iOS, Windows Phone OS, and BlackBerry device security tools
- MDM Solutions
- Mobile Protection Tools
- Intrusion Detection Tools (e.g., Snort)
- Hardware and software firewalls (e.g., Comodo Firewall)
- Honeypot tools (e.g., KFSenser)
- IDS/Firewall evasion tools (e.g., Traffic IQ Professional)
- Packet fragment generators
- Honeypot Detection Tools
- Cloud security tools (e.g., Core CloudInspect)

- Cryptography tools (e.g., Advanced Encryption Package)
- Cryptography toolkit (e.g., OpenSSL)
- Disk encryption tools
- Cryptanalysis tool (e.g., CrypTool)

Unit – V

- 5. Procedures / Methodology Information Security Procedures
- Cryptography
- Public key infrastructure (PKI)
- Digital signature and Pretty Good Privacy (PGP)
- Security Architecture (SA)
- Service oriented architecture
- Information security incident
- N-tier application design
- TCP/IP networking (e.g., network routing)
- Security testing methodology

Information Security Assessment Methodologies

- Web server attack methodology
- Web application hacking methodology
- SQL injection methodology and evasion techniques
- SQL injection evasion techniques
- · Wireless and Bluetooth hacking methodology
- Mobile platform (Android, iOS, Windows
- Phone OS, and BlackBerry) hacking methodology
- Mobile Rooting and Jailbreaking
- 6. Regulation / Policy Information Security Policies/ Laws/Acts
- Security policies
- Compliance regulations (e.g., PCI-DSS,SOX)

- 7. Ethics Ethics of Information Security
- Professional code of conduct
- Appropriateness of hacking