

SNDT Women's University, Mumbai



Syllabus

Bachelor Of Computer Applications (B.C.A.)

(2020-2021)

1, Nathibai Thackersey Road, Mumbai- 400020
www.sndt.ac.in

ELIGIBILITY

DEGREE COURSE – BACHELOR OF COMPUTER APPLICATIONS (B.C.A.)

Course Name Bachelor of Computer Applications (B.C.A.)

Level Degree

Duration 3 Years

Medium of Instructions English

Eligibility A candidate for being eligible for admission to the three year course leading to the degree of Bachelor of Computer Applications must have passed the Higher Secondary School Certificate (Std. XII) examination conducted by the different Divisional Boards of the Maharashtra State Board of Secondary and Higher Secondary Education with 45% marks (40% for candidates belonging to Reserved category) with the following subjects :- (from any stream).

- English
- Any one of the Modern Indian Languages or Modern Foreign Languages or any classical Language or Information Technology/ Any four subjects carrying 100 marks each.

OR

- English
- Any one vocational subject carrying 200 marks
- Any three subjects carrying 100 marks each.

OR

Must have passed the Higher Secondary School Certificate (Std. XII) examination with the Minimum Competency based vocational courses (MCVC) conducted by the different Divisional Boards of the Maharashtra State Board of Secondary and Higher Secondary Education.

- English
- Any one of the Modern Indian Languages or Modern Foreign Languages

- or any classical
- Language or Information Technology
- General Foundation Course.
- Any one subject carrying 300 marks from among the Minimum Competency based vocational courses prescribed by the Higher Secondary School Certificate examination from time to time.

OR

Must have passed an examination of other Board or Body Recognized as equivalent thereto.

OR

1. Must have passed any three year Government recognized Diploma programme.

B.C.A.II year :

- For a student from our University - should have cleared or has ATKT as admissible in first year in the same subject
- For a student from another university - studied at least two courses of four credits each in the I year in the same subject. Passed I year without ATKT.
- Should have passed three years Govt./ D.T.E. recognized Diploma Course.

B.C.A.III Year:

- For a student from our University - should have cleared second year in the same subject or has passed with admissible ATKT

For a student from another university – should have completed at least six courses of 4 credits each or 24 credits in the I and II year in the same subject. Passing in I and II year without ATKT.

BCA SEMESTER-I

Code	Subject	L	Pr./ Tu	Cr	Ext. Exam.	Int. Exam.	Total Marks
1101	Business and technical communication skills	2	-	2	25	25	50
1102	Problem Solving using C	4	-	4	75	25	100
1103	Web Programming	4	-	4	75	25	100
1104	Computer Fundamentals and Operating System	4	-	4	75	25	100
1105	Office Automation Tools	-	2	2	25	25	50
1201	Problem Solving using C Lab	-	2	2	25	25	50
1202	Web Programming Lab	-	2	2	25	25	50
	Total			20			500

SEMESTER-I	1 Credit = 25 Marks Total Credits = 20 Total Marks = 20*25=500
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BCA SEMESTER-II

Code	Subject	L	Pr./ Tu	Cr	Ext. Exam.	Int. Exam.	Total Marks
2101	Environmental science & RTI	2	-	2	25	25	50
2102	Programming Methodology and C++	4	-	4	75	25	100
2103	Database Management System	4	-	4	75	25	100
2104	Mathematics I	4	-	4	75	25	100
2105	Principles & Practice of Accounting	2	-	2	25	25	50
2201	Programming Methodology and C++ Lab	-	2	2	25	25	50
2202	Database Management System Lab	-	2	2	25	25	50
	Total			20			500

SEMESTER-II	1 Credit = 25 Marks Total Credits = 20 Total Marks = 20*25=500
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BCA SEMESTER-III

Code	Subject	L	Pr./ Tu	Cr	Ext. Exam.	Int. Exam.	Total Marks
3101	Data structures	4	-	4	75	25	100
3102	JAVA Programming	4	-	4	75	25	100
3103	Mathematics II	4	-	4	75	25	100
3104	Computer Organisation & Architecture	4	-	4	75	25	100
3201	Data structures Lab	-	2	2	25	25	50
3202	JAVA Programming Lab	-	2	2	25	25	50
	Total			20			500

SEMESTER-III	1 Credit=25 Marks Total Credits = 20 Total Marks = 20*25=500
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BCA SEMESTER-IV

Code	Subject	L	Pr./ Tu	Cr	Ext. Exam.	Int. Exam.	Total Marks
4101	Python Programming	4	-	4	75	25	100
4102	Introduction to Microprocessor	4	-	4	75	25	100
4103	Computer Networks	4	-	4	75	25	100
4104	Software Engineering	4	-	4	75	25	100
4201	Python Programming Lab	-	2	2	25	25	50
4202	Introduction to Microprocessor Lab	-	2	2	25	25	50
	Total			20			500

SEMESTER-IV	1 Credit=25 Marks Total Credits = 20 Total Marks = 20*25=500
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BCA SEMESTER-V

Code	Subject	L	Pr./ Tu	Cr	Ext. Exam.	Int. Exam.	Total Marks
5101	Mobile Application	4	-	4	75	25	100
5102	Artificial Intelligence	4	-	4	75	25	100
5103	Cyber Security	4	-	4	75	25	100
5104	Multimedia and Application	2	-	2	25	25	50
5105	Elective1-Management Information System	4	-	4	75	25	100
5106	Elective 2 - Search Engine Optimization	4	-	4	75	25	100
5107	Elective 3 - Data Analysis and Visualization	4	-	4	75	25	100
5108	Mobile (Android) Application Lab		2	2	25	25	50
	Total			20			500

SEMESTER-V	1 Credit=25 Marks Total Credits = 20 Total Marks = 20*25=500
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BCA SEMESTER-VI

Code	Subject	L	Pr./ Tu	Cr	Ext. Exam	Int. Exam.	Total Marks
6101	Cyber Laws and Intelligent Property Rights.	4	-	4	75	25	100
6102	Data Warehousing & Data Mining	4	-	4	75	25	100
6103	IOT	2	-	2	25	25	50
6104	Elective 1 - Machine Learning	4	-	4	75	25	100
6105	Elective 2 - Block Chain Technology	4	-	4	75	25	100
6106	Elective 3 - Big Data & Cloud Computing	4	-	4	75	25	100
6107	Project	-	6	6	75	75	150
	Total			20			500

SEMESTER-VI	1 Credit=25 Marks Total Credits = 20 Total Marks = 20*25=500
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SEMESTER- I

Branch: BCA	Semester-I
Subject Code: 1101	Lecture: 02 Credit: 02
Course Opted	Ability Enhancement Compulsory Course – 1
Subject Title	BUSINESS AND TECHNICAL COMMUNICATION SKILLS

Course Objectives

- To demonstrate the fundamental concepts of interpersonal and professional communication.
- To encourage active listening with focus on content, purpose, ideas.
- To facilitate fluent speaking skills in social, academic and professional situations.
- To train in reading strategies for comprehending academic and business correspondence.
- To promote effective writing skills in business, technology and academic arenas.

Course Outcomes

- Enable the students' ability to write error free while making an optimum use of correct Business Vocabulary & Grammar.
- Will enable the students to distinguish among various levels of organizational communication and communication barriers while developing an understanding of Communication as a process in an organization.
- They will be able to draft effective business correspondence with brevity and clarity.
- Enhance critical thinking by designing and developing clean and lucid writing skills.
- Enhance verbal and non-verbal communication ability through presentations.

Module	Sr. No.	Topic and Details	No. of Lectures Assigned	Marks Weightage
UNIT- I	1.	Communication Basics of Communication, Process of Communication, Components of Communication, Factors of Communication, Barriers to Communication – Physical, Psychological, Semantics, Organizational and Interpersonal Barriers; How to overcome Barriers.	3	6
	2.	Methods of Communication Verbal (Written & Oral) Non-verbal - Non Verbal Communication- Personal appearance; Facial Expression, Movement, Posture, Gesture, Eye Contact	2	4
UNIT- II	3.	Basic grammar and Grammar in context Parts of speech, Verb, Tenses: Form and use, Articles and Prepositions, Transformations of sentences, Common Errors	3	6
	4.	Vocabulary Building Root words (Etymology), Meaning of Words in Context, Synonyms & Antonyms, Collocations, Prefixes & Suffixes, Standard Abbreviations	2	4
UNIT -	5.	Parts of a Formal Letter and Formats Parts/Elements of a Formal Letter - Letter heads	5	10

III		and/or Sender's Address, Dateline, Inside Address, Reference		
		Line(Optional), Attention Line(Optional), Salutation, o Subject Line, Body, Complimentary Close, Signature Block, Enclosures/Attachments, Complete/Full Block Format		
	6.	Types of Letters in Both Formal Letter Format and Emails Claim & Adjustment Letters, Request/Permission Letters Emails- Format of Emails, Features of Effective Emails, Language and style of Emails	3	6
UNIT-IV	7.	Reading and Summarization of passages, reports, chapters, books Graphic Organizers for Summaries - Radial Diagrams like Mind Maps, Flow Charts, Tree Diagrams, Cyclic Diagrams. Point-form Summaries- One-sentence Summaries of Central Idea	3	6
	8.	Technical Writing: What is Technical Writing, Role of a Technical Writer, Steps of Technical Writing Process SRS Software Requirement Specifications: Introduction, Goals Report Writing: Characteristics of writing a good report, Steps in Report Writing, Structure of Report, Types of Reports	4	8
TOTAL			25	50

Text Book:

1. Urmila Rai, S M Rai, "Business Communications", Himalaya Publishing House, 2004

Reference Books:

1. Fluency in English - Part II, Oxford University Press, 2006.
2. Business English, Pearson, 2008.
3. Language, Literature and Creativity, Orient Blackswan, 2013.
4. Language through Literature, Dr. Gauri Mishra, Dr. Ranjana Kaul, Dr. Brati Biswas, 2016
5. Sanjay Kumar & PushpLata (2018). Communication Skills with CD. New Delhi: Oxford University Press.
6. Hemphill, P.D., McCormick, D. W., & Hemphill, R. D. (2001). Business Communication with writing improvement exercises. Upper Saddle River, NJ: PrenticeHall.
7. Locker, KittyO. Kaczmarek, Stephen Kyo. (2019). Business Communication: Building Critical Skills, Mcgraw-hill.
8. Murphy, H.(1999). EffectiveBusiness Communication. Mcgraw-Hill.
9. Raman, M., &Sharma, S. (2016). Technical Communication: Principles and Practice. New Delhi: Oxford University Press.

Branch: BCA	Semester-I
Subject Code: 1102	Lecture: 04 Credit: 04
Course Opted	Core Course-1 (Theory)
Subject Title	PROBLEM SOLVING USING C

Course Objectives:

- To teach students a programming language.
- To help them learn problem solving techniques.
- To teach the student to write programs in C and to solve the problems

Course Outcomes:

Students will be able

- To develop logic which will help them to create programs in C.
- Demonstrate an understanding of computer programming language concepts.
- Design and develop computer programs, analyze, and interpret the concept of pointers, declarations, initialization, operations on pointers and their usage.
- By learning the basic programming constructs they can easily switch over to any other language in future.
- Develop applications

Module	Sr. No.	Topic and Details	No. of Lectures Assigned	Marks Weightage
UNIT- I	1.	Introduction to problem solving : Concept: Steps in problem solving - (Define Problem, Analyze Problem, Explore Solution), Problem solving techniques - (Trial& Error, Brain Storming, Divide & Conquer) , Algorithms and Flowcharts (Definitions, Characteristics, Advantage& Disadvantages, Symbols, Examples), Pseudo-code(Definition, Conditional statements, Loops), etc.	5	10
	2.	Overview of programming languages: Definition of the program, Concept- Source code, Object code, Compilation, Interpretation, Execution, Input and Output, Debugging etc., Expressions, control structures; subroutines, Storage management; scoping rules; bindings for names, Storage types: Automatic , external, register and static variables	4	8
UNIT - II	3	Introduction to 'C' Language : History of C Programming , Structures of 'C' , Programming, Simple example, Basic Input/ Output, Function as building blocks. Language Fundamentals : Character set, C Tokens, Keywords, Identifiers, Variables, Constant, Data Types, Comments	4	8
	4	Operators : Types of operators, Precedence and Associativity, Expression. Statement and types of statements, Built in	6	12

		Operators and function., Console based I/O and related built in I/O Function: printf(), scanf(), getch(), getchar(), putchar(),etc; Concept of header files, Preprocessor directives: #include, #define, Conditional statements and Loops		
UNIT-III	5	Control structures Decision making structures : If, If-else , Nested If –else, Switch, Loop Control structures : While, Do-while, For, Nested for, while, do-while loop, Jumping statements: break, continue, goto, exit.	8	16
	6	Functions: Definition, Basic types of function, Declaration and definition, Function call, Types of function, Parameter passing, Call by value, Call by reference, Scope of variables, Recursion, String: Declaration, string Functions, String Manipulations	6	12
	7.	Pointers : Introduction to pointers, Pointer notation, Pointer arithmetic, Null Pointer	3	6
UNIT-IV	8.	Arrays: Definition, Declaration, Initialization, Bounds checking, One-Dimensional Array, Two-Dimensional Array, Passing array to a function, pointer to Array.	6	12
	9.	Structure and Union: Introduction to Structure, Definition, Declaration of Structure Variables, .Dot Operator, Nested Structure, Array of Structure, pointer to structure, Introduction to Union, Difference between Structure and Union .	4	8
	10.	File Handling: Concept of File, Definition, File operations(create, open, read, move , write, close), File opening Mode, Closing a file, Input/output operations, Creating and reading a file, Command Line Argument.	4	8
TOTAL			50	100

Text Book:

1. C – programming E.Balagurusamy, Tata McGray Hill, 1990

Reference Books:

1. C: The Complete Reference (Fourth Edition), Herbert Schildt, Tata McGraw-Hill Education Pvt. Ltd., 2000
2. Ramkumar and Agrawal, "Programming in ANSI C", Tata McGraw Hill, 1996.
3. Y.P Kanetkar, "Let Us "C", , Infinity Science Press,2008

Branch: BCA	Semester-I
Subject Code: 1201	Lecture: 02 Credit: 02
Course Opted	Core Course-1 (Practical)
Subject Title	PROBLEM SOLVING USING C LAB

Course Objectives:

- To enable the students to learn a programming language.
- To learn problem solving techniques
- To teach the student to write programs in C and to solve the problems.

Course Outcomes:

The student would be able

- Read, understand and trace the execution of programs written in C language.
- Write the C code for a given algorithm.
- Implement Programs with pointers and arrays, perform pointer arithmetic, and use the pre-processor. •
- Write programs that perform operations using derived data types.
- Implement simple file operations

Module	Sr. No.	Topic and Details	No. of Lectures Assigned	Marks Weightage
UNIT- I	1.	Simple Program, Implementation of Operators : Built in Operators and function, Arithmetic, Logical, Relational, bitwise, Precedence and Associativity, composite statements. Unary, binary and ternary operators.	5	10
	2.	Concept of header files, Preprocessor directives: #include, #define. And macros implementations , Implementation of Storage types: Automatic external, register and static variables		
UNIT- II	3.	Console based I/O and related built in I/O function: printf(), scanf(), getch(), getchar(), putchar();	12	24
	4.	Control Statement: Decision Making Statements, if, Nested if, if-else, Nested if-else, if-else-if, switch, etc. The Conditional Expression; Iterative Statements- The for loop, . The while loop, The do-while loop; Jumping Statements- The goto& label ,The break & continue, The exit() function		
UNIT- III	5.	Implementation of Functions: Defining and accessing, passing arguments, Function prototypes, function calling mechanism, call by value, call by reference, recursive function; String Manipulations	5	10
	6.	Pointer Declaration and Initialization of Pointer variables, pointer Arithmetic, Pointers and Character Strings		
	7.	Implementation of 1-D and multi dimension Array, One- Dimensional Array, Two-Dimensional Array, Passing array to a function, pointer to Array.	5	10

UNIT-IV	8.	Programs Using Structure and Union : Defining and Declaring Structure Variables, .Dot Operator, Nested Structure, Array of Structure, pointer to structure, Examples of Union.		
	9.	Programs using I/O Operations File Handling : File operations(create, open, read, move, write, close)	3	6
	10.	Input/output operations on file Character by –(fgetc, fputc), Reading and writing files		
TOTAL			25	50

Text Book:

1. C – programming E.Balagurusamy, Tata McGray Hill, 1990

Reference Books:

1. C: The Complete Reference (Fourth Edition), Herbert Schildt, Tata McGraw-Hill Education Pvt. Ltd., 2000
2. Ramkumar and Agrawal, "Programming in ANSI C", Tata McGraw Hill, 1996.
3. Y.P Kanetkar, "Let Us "C", , Infinity Science Press,2008

Branch: BCA	Semester-I
Subject Code: 1103	Lecture: 04 Credit: 04
Course Opted	Core Course-2 (Theory)
Subject Title	WEB PROGRAMMING

Course Objectives:

- To give insight about latest technologies to design and develop web applications using client- side scripting, server-side scripting, and database connectivity.

Course Outcomes:

- To design web pages using HTML5 language, applying stylish information to web pages using CSS.
- To develop interactive web pages using JavaScript.
- To develop dynamic pages on the web server using PHP language and implement Database Driven Websites.
- Understand the various platforms, devices, display resolutions, viewports, and browsers that render websites
- To develop and implement client-side and server-side scripting language programs

Module	Sr. No.	Topic and Details	No. of Lectures Assigned	Marks Weightage
UNIT- I	1.	Introduction to web and Security Concepts HTTP:Overview – HTTP Basics, Client request, Server response; HTTP Headers; Session Management – Persistent connections, Cookies. General concepts on web server: Configuration and Administration; virtual hosting, General concepts of caching proxy server , Web security, Digital signatures, Digital Certificates, Encryption, and Authentication	8	16
	2.	HTML5 Basics of HTML elements and Tags. Introduction of HTML5 (evolutions, limitation of HTML4, advantages of HTML5, Overview of HTML5)	2	4
UNIT- II	3.	Page Layout of Semantic Elements (Header, Navigation, Section & Articles, Footer, aside and more. Organizing Text in HTML, Links and URLs in HTML, Tables in HTML, Images on a Web Page, Image Formats, Image Maps, Colors, FORMs in HTML, Frames in HTML Interactive Elements, Working with Multimedia - Audio and Video File Formats, HTML elements for inserting Audio / Video on a web page	7	14
	4.	HTML5 Web Forms HTML 5 Global Attributes Displaying a Search Input Field, Contact Information Input Fields, Utilizing Date and Time Input Fields, Number Inputs, Selecting from a Range of Numbers, Selecting Colors, Creating an Editable Drop-Down, Requiring a Form Field, Autofocusing a Form Field, Displaying Placeholder Text, Disabling Autocomplete,	7	14

		Restricting Values		
UNIT-III	5.	CSS: Understanding the Syntax of CSS, CSS Selectors, Inserting CSS in an HTML Document, CSS properties to work with background of a Page, CSS properties to work with Fonts and Text Styles, CSS properties for positioning an element	8	16
	6.	JavaScript: Using JavaScript in an HTML Document, Programming Fundamentals of JavaScript - Variables, Operators, Control Flow Statements, Popup Boxes, Core JavaScript (Properties and Methods of Each) : Array, Boolean, Date, Function, Math, Number, Object, String, RegExp, Events and Event Handlers, Browser Objects - Window, Navigator, History, Location, Document, Cookies, Document Object Model, Form Validation using JavaScript.	12	24
UNIT-IV	7.	INTRODUCTION TO PHP AND SQL: - Server-side web scripting, Installing PHP, SQL, Adding PHP to HTML, Syntax and Variables, Passing information between pages.	6	12
TOTAL			50	100

Text Book :

1. Web Programming, Guy W. Lecky Thompson, 2009, Cengage Learning

Reference Books:

1. Web Design The complete Reference, Thomas Powell, Tata McGrawHill
2. HTML and XHTML The complete Reference, Thomas Powell, Tata McGrawHill
3. JavaScript 2.0 : The Complete Reference, Second Edition by Thomas Powell and Fritz Schneider
4. PHP : The Complete Reference By Steven Holzner, Tata McGrawHill

Branch: BCA	Semester-I
Subject Code: 1202	Lecture: 02 Credit: 02
Course Opted	Core Course-2 (Practical)
Subject Title	WEB PROGRAMMING LAB

Course Objectives:

- To develop web applications using client-side scripting, server-side scripting, and database connectivity.

Course Outcomes:

- To design web pages using HTML5 language, applying stylish information to web pages using CSS.
- To develop interactive web pages using JavaScript.
- To develop dynamic pages on the web server using PHP language and implement Database Driven Websites.
- To develop and implement client-side and server-side scripting language programs

Module	Sr. No.	Topic and Details	No. of Lectures Assigned	Marks Weightage
UNIT-I	1.	Use of Basic Tags, Image maps, Tables, Forms and Media Design webpages using the given tools in HTML Navigation, Section & Articles, Footer, aside and more. Organizing Text in HTML, Links and URLs in HTML, Tables in HTML, Images on a Web Page, Image Formats, Image Maps, Colors, FORMs in HTML, Frames in HTML Interactive Elements, Working with Multimedia - Audio and Video File Formats, HTML elements for inserting Audio / Video on a web page	12	25
UNIT-II	2.	CSS Syntax of CSS, CSS Selectors, Inserting CSS in an HTML Document, CSS properties to work with background of a Page, CSS properties to work with Fonts and Text Styles, CSS properties for positioning an element	5	10
UNIT-III	3.	Java Script Control and looping statements and Java Script reference Using JavaScript design, a web page; Control Flow Statements, Design a web page demonstrating different conditional statements. Design a web page demonstrating different looping statements; Popup Boxes, Core JavaScript (Properties and Methods of Each) : Array, Boolean, Date, Function, Math, Number, Object, String, regExp, Events and Event Handlers	5	10

UNIT-IV	4.	PHP & SQL Demonstrate program in PHP, Installing PHP, SQL, Adding PHP to HTML, Syntax and Variables, Passing information between pages.	3	5
TOTAL			25	50

Text Book :

1. Web Programming, Guy W. Lecky Thompson, 2009, Cengage Learning

Reference Books:

1. Web Design The complete Reference, Thomas Powell, Tata McGrawHill
2. HTML and XHTML The complete Reference, Thomas Powell, Tata McGrawHill
3. JavaScript 2.0 : The Complete Reference, Second Edition by Thomas Powell and Fritz Schneider
4. PHP : The Complete Reference By Steven Holzner, Tata McGrawHill

Branch: BCA	Semester-I
Subject Code: 1104	Lecture: 04 Credit: 04
Course Opted	Core Course 3
Subject Title	COMPUTER FUNDAMENTALS AND OPERATING SYSTEM

Course Objectives:

- To understand the proper working of operating system.
- To develop understanding of Computer operating system, its structures, functioning and algorithms.
- To ensure that students gain a solid understanding of the fundamental concepts modern multitasking operating system.

Course Outcomes:

- Learners will be able to describe basic concepts, mechanisms used by operating systems.
- Learners will be able to compare process scheduling algorithms, apply synchronization primitives and evaluate deadlock conditions and to analyze virtual memory management algorithms.

Module	Sr. No.	Topic and Details	No. of Lectures Assigned	Marks Weightage
UNIT- I	1.	Introduction: Definition of Computer, Features, Block Diagram of Computer System, Computer Generations. Primary Memory Devices: RAM, ROM, PROM, EPROM, CACHE Memory, Registers. Number Systems: Binary, Octal Decimal Hexadecimal and Their interconversion, Computer Arithmetic. Computer Software: System and Application Software. Utility programs: Anti-plagiarism software, Anti-virus, Disk Cleaning, Defragmentation, Compression/ Decompression of files. Types of Computers : Digital, Analog, Hybrid Computers, General purpose Computers, Micro Computers, Mini Computers, Mainframes, Super Computers	4	8
	2.	Secondary Storage Devices: : Sequential and Direct Access Devices, Magnetic and Optical Storage, Flash Drive/USB Pendrive; I/O Devices- Keyboards, Scanners, Digitizers, Plotters, LCD, Plasma Display, Pointing Devices –Mouse, Joystick, Touch Screens Introduction to Network devices – Hubs, Switches, Routers, NAS, MODEM, Access Points Printers: Impact and Non-Impact Printers. Computer Languages: Machine, Assembly, High Level. Operating System: Purpose of Operating Systems, OS Structure, Services of Operating System.	4	8

UNIT-II	3.	Computer System: Architecture, Instruction cycle, Process Control Block. Types of Operating System(Explain concepts): Single processor systems, Multiprogrammed, Batch, Time sharing- Interactive, Multitasking, Multiprocessor systems, Parallel systems, Distributed systems, Special purpose systems, Real Time systems, Multimedia systems Handheld Systems	8	16
	4.	Processes: Concept, process states:-5 state model, Scheduling, Operations on Processes, Cooperating Process and Process Synchronization. Threads: Concept, Multithreading models, Threading issues	8	16
UNIT-III	5.	CPU Scheduling: I/O burst cycle, Context Switching, Scheduling:-Short Term, Long Term, Scheduling Criteria, Algorithms (FCFS, SJF, RR, Priority). Memory Management:- Main memory organization and management, Virtual memory organization:-Paging, Segmentation, Virtual memory management algorithms and issues.	8	16
	6.	Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock	8	16
UNIT-IV	7.	Main Memory: Background, Logical address space, Physical address space, MMU, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table Virtual Memory: Background, Demand Paging, Copy-on-Write, Page, Replacement, Allocation of Frames, Thrashing Mass-Storage Structure: Overview, Disk Structure, Disk Scheduling, Disk Management.	6	12
	8	File-System Interface: File Concept, Access Methods, Directory and Disk Structure	4	8
TOTAL			50	100

Text Books:

1. P. K. Sinha&PritiSinha , “Computer Fundamentals”, BPB Publications, Sixth Edition
2. Silberschatz, Galvin, Gagne ”Operating System Principles” John Wiley & Sons, 7th Edition

Reference Books:

1. Dr. Madhulika Jain, “Information Technology Concept”, BPB Publication 2nd Edition.
2. Andrew Tanenbaum, Modern Operating Systems, Prentice Hall.
3. William Stallings, Operating Systems, Prentice Hall.
4. Harvey M. Deitel, An introduction to operating systems. Addison-Wesley.
5. Andrew Tanenbaum& Albert Woodhull, Operating Systems: Design and Implementation. Prentice-Hall.
6. Naresh Chauhan, Principles of Operating Systems, Oxford Press
7. Achyut S. Godbole, AtulKahate, Operating Systems, Tata McGraw Hill
8. Abraham Silberschatz, Peter Galvin, Greg Gagne, Operating System Concepts, Wiley,8thEdition

Branch: BCA	Semester-I
Subject Code: 1105	Lecture: 02 Credit: 02
Course Opted	Skill Enhancement -1
Subject Title	OFFICE AUTOMATION TOOLS

Course Objective:

- To familiarize the students in preparation of documents and presentations with office automation tools, internet and internet tools.

Course Outcomes:

- On completion, the students would be able to make word documents, spreadsheets, power point presentations using the Microsoft suite of office tools.

Module	Sr. No.	Topic and Details	No. of Lectures Assigned	Marks Weightage
UNIT-I	1.	Operating Computer using GUI based OS, Communicating using the Internet, WWW & Web Browsers, Communication & Collaboration. Browsers and its types, internet browsing, searching - Search Engines - Portals - Social Networking sites- Blogs - viewing a webpage, downloading and uploading the website. Creating an email-ID, e-mail reading, saving, printing, forwarding and deleting the mails, checking the mails, viewing and running file attachments, addressing with cc and bcc.	4	8
UNIT-II	2.	Introduction to MS-WORD: Applications and its Usages; Working with documents: Basics, starting Word, creating document, parts of Word window, mouse and keyboard operations, designing a document, opening, closing of document creating styles / tables / drawing tools / printing documents- selection, cut, copy, paste; Toolbars, operating on text; Printing, saving, Creating a template; Tables, borders, pictures, text box operations; Mail Merge, hyperlink, bookmark, cross-reference, Track changes, page layouts, Wrapping, Setting Document styles, Table of Contents, Index, Page Numbering; Shortcut keys	7	14
UNIT-III	3.	Introduction to MS EXCEL:- Applications and its Usages; Working with spreadsheets: navigating, Excel toolbars and operations, Formatting; copying data between worksheets; entering formula, chart creation; data forms, Formatting Spreadsheets, Mathematical Formulas, Working with sheets – Sorting, Filtering, Validation, Consolidation, and Subtotal, Creating & Using Templates, Pivot Tables, Tracking Changes Functions in Excel ROUND(), SQRT (), MAX(), MIN(), AVERAGE(), COUNT(), SUMIF(), SUMIF(), ABS(), ROMAN(), UPPER(), LOWER(), CELL(), TODAY(), NOW(),	7	14

UNIT-IV	4.	Introduction to MS POWER POINT:- Working with Power Point Window, Standard Tool Bar, Formatting tool bar, Drawing tool Bar, Moving the Frame, Inserting Clip Art, Picture, Slide, Text Styling, Send to back, Entering data to graph, Organization Chart, Table, Design template, Master Slide, Animation Setting, Saving and Presentation , auto Content Wizard, Adding Effects to the Presentation- Setting Animation & transition effect. Printing Handouts, Generating Standalone Presentation viewer. INTRODUCTION TO MS-ACCESS:- Introduction, What is Database, Creating a New Database, Creating Tables, Working with Forms, Creating queries, running queries, Creating Reports, Types of Reports, Printing of documents, Importing data from other databases viz. MS Excel etc.	7	14
TOTAL			25	50

Text Book:

1. Computer fundamentals by P.K. Sinha, BPB Publications, 2004

Reference Books:

1. Computers today by Sanders, McGraw-Hill, 1988
2. W.Stallings “ Data and Computer Communication”, 7th Edition, Prentice Hall, 2004
3. Dr. S. B. Kishor, INFORMATION AND COMMUNICATION TECHNOLOGY, 3rd Ed. published by DAS GANU Prakashan, Nagpur on Sep. 2015. (1st Ed. July 2013, 2nd Ed. Sep. 2014)) (ISBN : 978-93-81660-73-7)

SEMESTER - II

EeBranch: BCA	Semester-II
Subject Code: 2101	Lecture: 02 Credit: 02
Course Opted	Ability Enhancement Compulsory Course – 2
Subject Title	ENVIRONMENTAL SCIENCE AND RTI

Course Objectives:

- To help the students to acquire knowledge of pollution and environmental degradation.
- To help students acquire knowledge of the environment beyond the immediate environment including distant environment.
- To help students acquire a set of values for environmental protection.
- To provide students with an opportunity to be actively involved at all levels in environmental decision making.
- Describe the benefits of RTI.
- Identify the legal and historical foundations for RTI

Course Outcomes:**Students will learn to**

- Appreciate concepts and methods from ecological and physical sciences and their application in environmental problem solving.
- Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
- Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.
- Understand the practical applicability of the Right to Information Act, 2005

Module	Sr. No.	Topic and Details	No. of Lectures Assigned	Marks Weightage
UNIT- I	1.	The Multidisciplinary nature of Environmental Studies Definition, scope and importance, Need for public awareness.	2	4
UNIT- II	2	Natural Resources Renewable and non-renewable resources, Natural resources and associated problems. a) Forest Resources: Use and over-exploitation, deforestation. Timber extraction, mining, dams and their effects on forests and tribal people. b) Water resources: Use and over-utilization of surface and groundwater, floods, drought, conflicts over water, Dams: benefits and problems. c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, waterlogging, and salinity. e) Energy resources: Growing energy needs, renewable	8	16

		and non-renewable energy sources, use of alternate energy sources. f) Land resources: Land as a resource, land degradation, man-induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.		
UNIT - III	3	Ecosystem Concept of an ecosystem, Structure and function of an ecosystem, Energy flow in the ecosystem, Food chains, food webs and ecological pyramids. Introduction, types, characteristics features, structure and function of the following ecosystem: Forest ecosystem Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)	6	12
UNIT- IV	4	Environmental Pollution Definition, Causes, effects and control measures of: Air pollution, Water pollution, Soil pollution, Noise pollution, Thermal pollution, Nuclear Hazards. Solid waste Management: Causes, effects and control measures of urban and industrial wastes—biodegradable and non-biodegradable wastes. Role of an individual in prevention of pollution.	6	12
	5	Right to Information Act: Introduction, Right to information and obligations of public authorities, central information commission, state information commission and their duties, powers and functions of information commissions, appeals and penalties, Miscellaneous.	3	6
TOTAL			25	50

Text Book:

1. P. Sharma 2013. Environmental Studies. University Science Press, New Delhi.

Reference Books:

1. Rajagopalan, R. 2018 Environmental Studies- From Crisis To Cure, Oxford University Press, New Delhi.
2. Agarwal, K.C. 2001 Environmental Biology, Nidipubl. Ltd. Bikaner.
3. Bharucha Erach, Textbook on Environmental Studies, UGC, New Delhi
4. Borua P.K., J.N. Sarma and others, A Textbook on Environmental Studies, Banlata, Dibrugarh
5. Brunner R.C., 1989 Hazardous Waste Incineration, McGraw Hill Inc. 480p.
6. Clark R.S., Marine Pollution, Clarendon Press Oxford (TB).
7. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jacio Publ. House, Mumbai, 1196p.
8. Joshi P.C. and Namita Joshi, A Text book of Ecology and Environment, Himalaya Publishing
9. Kaushik Anubha and C.P. Kaushik, Perspective in Environmental Studies, New Age International
10. The Right to Information Act, 2005, Sudhir Naib, Oxford University Press; 2011 edition

Branch: BCA	Semester-II
Subject Code: 2102	Lecture: 04 Credit: 04
Course Opted	Core Course -4
Subject Title	PROGRAMMING METHODOLOGY AND C++

Course Objectives:

- To understand how C++ improves C with object-oriented features.
- To learn how to design C++ classes for code reuse.
- To learn how to implement copy constructors and class member functions.
- To understand the concept of data abstraction and encapsulation.
- To learn how to overload functions and operators in C++.
- To learn how inheritance and virtual functions implement dynamic binding with polymorphism.
- To learn how to design and implement generic classes with C++ templates.

Course Outcomes:

- Students will be able to
- Describe the object-oriented programming approach in connection with C++
- Apply the concepts of object oriented programming
- Analyze a problem and construct a C++ program that solves it
- Discover errors in a C++ program and describe how to fix them
- Illustrate the process of data file manipulations using C++

Module	Sr. No.	Topic and Details	No. of Lectures Assigned	Marks Weightage
UNIT- I	1.	Evolution of OOP: Advantages and disadvantages of OOP over its predecessor paradigms. Characteristics of Object Oriented Programming: Abstraction, Encapsulation, Data hiding, Inheritance, Polymorphism, Code Extensibility and Reusability, User defined Data Types. C++Program Structure, Simple Input/ Output Program, Program Comments, Identifiers, Literals, String, Character, Integer, Floating Point, Constants, Keywords, Data Types Operators in C++, Control Structures in C++	3	6
	2.	Advanced Language Constructs: Arrays, Multi dimensional arrays, Pointers, Structures	3	6
UNIT- II	3.	Object and Classes : Core object concepts, Encapsulation, Abstraction, Polymorphism, Classes, Messages Association, Interfaces, Implementation of class in C++, C++ Objects as physical object, C++ object as data types constructor Object as function arguments. Functions and Variables: Functions: Declaration and Definition, Variables: Definition,	4	8

		Declaration, and Scope, Dynamic Creation and Derived Data, Arrays and Strings in C++		
	4.	Inheritance: Concept of inheritance, Derived class and based class, Types of inheritance, Classes within classes, Functions and Friend Functions Constructors: Multiple Constructors and Initialization, Using Destructors to Destroy Instances	8	16
UNIT - III	5.	Polymorphism: Syntax for Operator overloading, Overloading unary operations, Overloading binary operators, Data conversion, Pitfalls of operators overloading and conversion keywords.	8	16
	6.	Memory management: New and Delete, Pointers to objects, Debugging pointers.	8	16
UNIT- IV	7.	Files and streams: iostream hierarchy , Standard Input/output Stream Library, Programming using Streams, Basic Stream Concepts. File input and output: Reading a File, Managing I/O Streams, Opening a File – Different Methods, Checking for Failure with File Commands, Checking the I/O Status Flags, Dealing with Binary Files	8	16
	8.	Class templates: Implementing a class template, Implementing class template member functions, Using a class template, Function templates, Class template specialization, Template parameters, Static members and variables Exception Handling: Try, throw and catch constructs, rethrowing an exception, Catch all Handlers.	8	16
TOTAL			50	100

Text Books:

1. E. Balguruswamy, 'Object Oriented Programming with C++', Tata McGraw – Hill Education, 2008
2. K.R Venugopal 'Mastering C++', Tata McGraw-Hill Education, 1997

References:

1. B.Stroustrup 'C++ Programming Language' (3rd Edition). Addison Wesley, 1997
2. B.chandraNarosa 'A Treatise On Object Oriented programming using C++'- Publications, 1998
3. Herbert Schildt, "The Complete Reference CN", Tata McGraw-Hili, 2001

Branch: BCA	Semester-II
Subject Code: 2201	Lecture: 02 Credit: 02
Course Opted	Core Course -4 Practical
Subject Title	PROGRAMMING METHODOLOGY AND C++ LAB

Course Objectives:

Will enable students to

- Identify and practice the object-oriented programming concepts and techniques
- Practice the use of C++ classes and class libraries, arrays, vectors, inheritance and file I/O stream concepts.

Course Outcomes:

Students will be able to:

- Create simple programs using classes and objects in C++.
- Implement Object Oriented Programming Concepts in C++.
- Develop applications using stream I/O and file I/O.
- Implement simple graphical user interfaces.
- Implement Object Oriented Programs using templates and exceptional handling

Module	Sr. No.	Topic and Details	No. of Lectures Assigned	Marks Weightage
UNIT- I	1.	Evolution of OOP: Simple Programs on fundamental Data Types and I/O operators, Derived data types, Symbolic constants, variables and Reference variables Operators and decision control structures: Programs to implement if statements, Switch statements, Loop statements, Functions in C++: Main function, function proto type, Call by reference, return by reference, Inline functions, Default arguments, Const Arguments, Function overloading,	3	6
	2.	Advanced Language Constructs: Programs on Arrays, Multi dimensional arrays, pointers and structures.	2	4
UNIT- II	3.	Objects and Classes: Classes and Object, Programs for memory allocation for objects, Arrays of objects, Returning objects, Const Member functions, Pointers to members. Functions and Variables: Programs to implement Defining a function, declaration and calling a function, function arguments, Default values for parameters, friend function, Dynamic creation and derived data and use of arrays and strings with functions.	2	6

	4.	Inheritance : Programs for Inheritance Single, Multiple, Multilevel, Hierarchical inheritance, Hybrid inheritance, Virtual base class, Abstract class, Constructors in derived classes, Nesting of classes. Constructors and Destructors : Implementations of Constructors(Parameterized Constructors, Multiple constructors in a class, Constructors with default arguments, Copy constructors, Dynamic constructors)Destructors	4	8
UNIT - III	5.	Polymorphism: Programs for Operator Overloading (Unary, Binary, Using friend functions etc.)	2	5
	6.	Memory Management : Programs on memory management using new and delete and pointers to objects	2	5
UNIT- IV	7.	Files and Streams : Programs for Managing Console I/O Operations and Working with files: C++ Stream and Classes, Unformatted I/O operations, Put(),get(), getline(),write(), Formatted console I/O operations, ios class functions and flags, Manipulators, User defined output functions. File input and output: Implementation of Opening and closing files, Detecting End of file, File modes, File pointers and their manipulations, Sequential input and output operations, Reading and writing class object, Command line arguments.	5	8
	8.	Templates: Implementations of Class template, Class template with multiple parameters, Function template. Exception Handling: Implementations of try, catch and throw statement for handling the exceptions.	5	8
TOTAL			25	50

Text Books:

1. E. Balguruswamy, 'Object Oriented Programming with C++', Tata McGraw – Hill Education, 2008
2. K.R Venugopal 'Mastering C++', Tata McGraw-Hill Education, 1997

Reference Books:

1. B.Stroustrup 'C++ Programming Language' (3rd Edition). Addison Wesley, 1997
2. B.chandraNarosa 'A Treatise On Object Oriented programming using C++'- Publications, 1998
3. Herbert Schildt, "The Complete Reference CN", Tata McGraw-Hill, 2001

Branch: BCA	Semester-II
Subject Code: 2103	Lecture: 04 Credit: 04
Course Opted	Core Course -5
Subject Title	DATABASE MANAGEMENT SYSTEM

Course Objectives:

- To introduce the concept of database management systems
- Learn to organize, maintain and retrieve - efficiently, and effectively - information from a database management system
- To present the concepts and techniques relating to query processing by SQL
- To introduce the concepts of transactions and transaction processing
- To present the issues and techniques relating to concurrency and recovery in multiuser database environments

Course Outcomes:

- Able to find and understand the Concept Of database approach.
- Able to find and understand database architecture and data modeling, data Normalization.
- Design and draw ER and EER diagram for real life problem.
- Able to find and understand the commands of SQL.
- Able to understand the concept of transaction, concurrency and recovery.

Module	Sr. No.	Topic and Details	No. of Lectures Assigned	Marks Weightage
UNIT- I	1.	Introduction to Database Systems: Database Approach, Traditional File system, Actors, Data Abstraction, Database Applications	6	14
	2.	Database Systems and Architecture: Three Tier Architecture, Centralized and Client-Server Architecture	3	6
UNIT- II	3.	Data Models: Network data model, Hierarchical data model, Relational data model.	3	6
	4.	Introduction to RDBMS, Object-oriented database, Distributed Database, No SQL, Graph Database	3	8
	5.	Data Modeling: ER Diagram Concepts, EER Diagram, Relational Database Design by ER and EER to Relational Mapping	7	12
UNIT - III	6.	Normalization: Functional Dependencies, 1NF, 2NF, 3NF, BCNF, 4NF, 5NF	7	10
	7.	Structure Query Language: DDL, DML, TCL, DCL, Triggers, Functions, Query Optimization	7	16
UNIT- IV	8.	Transaction Processing System Concepts: Why concurrency control, ACID Properties, Schedule &	6	12

		Serialiability		
	9	Concurrency Control Techniques: 2PL, Timestamp Ordering, Optimistic Concurrency Control technique	5	10
	10.	Database Recovery: Recovery concepts, Caching, Checkpoints, Transaction Rollback	3	6
TOTAL			50	100

Text Book:

- 1) Korth,Siberschatz,"Database System Concepts",McGraw-Hill,27-Jan-2010

Reference Books::

- 1) Elmarsai and Navathe,"Fundamentals of Database Systems",McGraw-Hill,2010
- 2) Bayross,"Oracle-the complete reference",Ivan: BPB Publications
- 3) "Upgrade to oracle 8",DataproInfoWorld Ltd.
- 4) GioWiderhold,"Database Design",McGraw-Hill 1995

Branch: BCA	Semester-II
Subject Code: 2202	Lecture: 02 Credit: 02
Course Opted	Core Course -5 Practical
Subject Title	DATABASE MANAGEMENT SYSTEM LAB

Course Objectives:

- Understand, appreciate and effectively explain the underlying concepts of database technologies

Course Outcomes:

- Design and implement a database schema for a given problem-domain
- Normalize a database
- Populate and query a database using SQL DML/DDI commands.
- Programming PL/SQL including stored procedures, stored functions, cursors, packages.

Module	Sr. No.	Topic and Details	No. of Lectures Assigned	Marks Weightage
UNIT- I	1.	Database Creation, Table Creation & DDL commands	4	8
	2.	Operation on Databases: DML Commands	3	6
UNIT- II	3.	Data Query language: Select Commands	3	6
	4.	Altering table & fields, Views	4	8
UNIT - III	5.	Writing and defining Constraints	3	6
	6.	Join Command	4	8
UNIT- IV	7.	Implementation of Nested Queries	4	8
TOTAL			25	50

Text Book:

1. Korth,Siberschatz,"Database System Concepts",McGraw-Hill,27-Jan-2010

Reference Books::

1. Elmars and Navathe,"Fundamentals of Database Systems",McGraw-Hill,2010
2. Bayross,"Oracle-the complete reference",Ivan: BPB Publications
3. "Upgrade to oracle 8",DataproInfoWorld Ltd.
4. GioWiderhold,"Database Design",McGraw-Hill 1995.
5. Oracle 8i The Complete Reference: Loney, Koch

Branch: BCA	Semester-II
Subject Code: 2104	Lecture: 04 Credit: 04
Course Opted	Core Course -6
Subject Title	MATHEMATICS I

Course objectives:

- To understand the concepts of discrete structures viz. sets, relations and functions etc. and graph theory.
- To understand, apply and solve problems using given method.

Course Outcomes:

- Have a better understanding of sets, relations and functions
- Be able to understand Permutation and Combinations, Mathematical induction, Binomial Theorem and Graph Theory.
- Apply logic and construct simple mathematical proofs and solve problems.
- Demonstrate different traversal methods for graph

Module	Sr. No.	Topic and Details	No. of Lectures Assigned	Marks Weightage
UNIT- I	1.	Set Theory: Definition of Sets, Subsets, Cardinality of Sets, types of sets: Equal Sets, Universal Sets, Finite and Infinite Sets, proper set, power sets, Operations on Sets: Union, Intersection, Complement of Sets, set difference, Cartesian Product, Venn Diagrams, and Algebra of sets	6	12
	2.	Properties of integers: Definition of GCD, LCM, Theorems Euclidean algorithm and problems	6	12
UNIT- II	3.	Relations: Definitions of Relation, Reflexive Relation, Symmetric Relation, Transitive relation, Equivalence Relation Recurrence relation: Definitions and problems	6	12
	4.	Functions : Define Function ,Injective functions ,Surjective functions, Bijjective functions, Composite function, Inverse of a function, Domain and Range	6	12
UNIT - III	5.	Permutations and Combinations : Definitions: Permutation, Combination and problems	6	12
	6.	Binomial theorem and Mathematics Induction: Binomial Theorem : Statement and problems, Mathematical Induction: principles and problems	6	12
UNIT- IV	7.	Matrices and Determinants Definition of a matrix; Operations on matrices; Square Matrix and its inverse; determinants; properties of determinants; the inverse of a matrix; solution of equations	8	16

		using matrices and determinants; solving equations using determinants.		
	8.	Graph theory: Graphs, types of graphs, Handshaking Lemma, Isomorphism of graphs, Subgraphs, Complement of graph.	6	12
TOTAL			50	100

Text Book:

1. Kolman, Busby and Ross, "Discrete mathematical Structures and graph theory"

Reference Books:

1. Alan Doerr, K. Levasseur, "Applied discrete structure for computer science", Galgotia publications, 1988
2. Trembley&Manohar, "Discrete mathematical Structures with application to computer science", McGraw Hill, 1987.
3. Swapan Kumar Chakraborty, BikashKantiSarkar, Discrete Mathematics, Oxford Higher Education, 2011
4. 5.C. L. Liu, D. P. Mohapatra, Elements of Discrete Mathematics A Computer Oriented Approach, Tata Mcgraw-Hill, 3 rd Edition, 2008.S.

Branch: BCA	Semester-II
Subject Code: 2105	Lecture: 02 Credit: 02
Course Opted	Skill Enhancement Course - 2
Subject Title	PRINCIPLES & PRACTICES OF ACCOUNTS

Course objective:-

- Introduces students to the world of accounting and understanding basics concepts of accounting to final account.
- The objective of the course is to strengthen the fundamentals of accounting and provide strong foundation for other accounting courses.
- It will be demonstrated how a practical understanding and interpretation of accounting reports and other accounting tools can improve decision-making in the organization.

Course Outcomes:-

- Students will be able to learn fundamental accounting concepts, Conventions & terminologies.
- Students will be able to describe the importance, functions & objectives of books of entry, subsidiary books, bank reconciliation statement and Final accounts.
- Students will be able to prepare books of entry, subsidiary books, bank reconciliation statement and Final accounts using double entry book keeping.

Module	Sr. No.	Topic and Details	No. of Lectures Assigned	Marks Weightage
UNIT- I	1.	Introduction to Book – Keeping & Accountancy Accounting Terminologies, Accounting Principles, Basic Concepts, Double Entry Book – keeping System, Types of Vouchers & Specimen of Vouchers. Journal: Meaning, Importance and Utility of Journal Specimen of Journal ; Writing of Journal Entries on the basis of vouchers	6	12
UNIT- II	2.	Ledger Meaning, Need and Specimen of Ledger Posting of Entries from Journal to Ledger. Subsidiary Books Meaning, Need and Types of Subsidiary Books, Purchase Book, Sales Book, Purchase Return Book, Sales Return Book, Simple Cash Book with Only Cash Column, Cash Book with Cash and Discount Columns, Cash Book with Cash, Bank and Discount Columns & Analytical Petty Cash Book.	6	12
UNIT - III	3.	Bank Reconciliation Statement:- Importance, Types Trial Balance and Rectification of Errors:- Objective, Preparation of Trial Balance	6	12
UNIT- IV	4.	Final Accounts: Trading and Profit & Loss Account, Balance Sheet	7	14
TOTAL			25	50

Text Book:

1. S.N. Maheshwari & S.K. Gupta "Introduction to Accounting" 2016

Reference Books:

1. Fundamentals of Accounting, Kalyani Publishers, S P Jain and K L Narang 2017.
2. Fundamentals of Accounting, Universal Publications, B S Raman, 2017
3. Accounting for Managers, Himalaya Publishing House, R Venkata Raman and Srinivas, 2017

SEMESTER - III

Branch: BCA	Semester-III
Subject Code: 3101	Lecture: 04 Credit: 04
Course Opted	Core Course - 7
Subject Title	DATA STRUCTURES

Course objectives:

- To impart basic concepts of data structures and algorithms
- To learn fundamental concepts about arrays, linked list, stack, queue, trees and graphs
- To understand concepts about searching and sorting techniques.
- To gain knowledge about writing algorithm and step by step approach in solving problems with the help of fundamental data structures.
- To find complexity of various algorithmic methods.

Course Outcomes:

- Understand basic data structures such as array, linked list, stack, queue, binary tree and graph along with algorithms.
- Ability to analyze algorithm and algorithm correctness.
- Apply searching and sorting techniques.

Modules	Sr. No.	Topic and Details	No. of Lectures Assigned	Marks Weightage %
UNIT -I	1	Introduction: Definition of Data Structures, Data Types vs. Data Structures, Classification of Data Structures, Description of various data structures, Arrays, Lists, Stacks, Queues, Trees and Graphs, Operations performed on Data Structures	4	8
	2	Arrays: One dimensional array, its Initialization, Implementation of One dimensional array in memory, Insertion, deletion of an element from one dimensional array, Traversing of an array	4	8
UNIT-II	3	Linked Lists: Introduction, Key terms, Advantages & disadvantages, Linear linked lists () - Types (Singly, Doubly, Circular) Operations (Inserting, Deleting nodes)	6	12
	4	Stack: Introduction, Stack implementation, Operations on stack (Push Pop), Implementation of stack using pointer, Applications of stack, Infix prefix, postfix notations, Algorithms for converting from one form to another, Recursion	6	12
	5	Queue: Introduction and Queue implementation, Operations on queue (Insertion & deletion), Limitations of simple queue, Circular queue, Double ended queue (dequeue), Application queue & its types	6	12
UNIT-III	6	Trees: Introduction, terminology, Binary tree,, Strictly Binary tree, Complete Binary tree, Binary tree representation as Array and Linked lists, Traversal	6	12

		(Inorder, Preorder, Postorder), Binary Search Tree, Threaded Binary Tree		
	7	Graphs: Introduction, terminology, Graph representation, Applications of graph, Graph traversal (BFS, DFS, Shortest path), Spanning tree, Minimum spanning tree	6	12
UNIT-IV	8	Sorting: Bubble Sort , Selection Sort , Quick Sort, Heap Sort, Insertion Sort. Searching & Hashing: Searching - Sequential search, Binary Search Hash Function, Hashing Techniques, Collision Resolution	6	12
	9	Algorithms Complexity: Performance Analysis, Time –Space Trade off, Big O, Omega and Theta Notation, Analysis of all Sorting Techniques. Recurrences: The substitution method, Recursion tree method, Master method	6	12
	Total		50	100

Text Book:

1. S.Sawhney & E. Horowitz, "Fundamentals of Data Structure", Computer Science Press, 1987

References:

1. Trembley&Sorrenson, " Data Structure", 2005
2. Lipschuiz, "Data structures" , (Schaum's Outline Series Mcgraw Hill Publication)
3. Ellis Horowitz and SartajSawhney, "Fundamentals of Computer Algorithms"
4. Aho, Hopcroft and Ullman, "Data Structures and Algorithms"
5. AbhayAbhyankar, "Data Structures and Files"
6. G.S. Baluja, "Data Structures Through C"
7. Mary E. S. Loomis, "Data Management and File Structures", Prentice Hall, 2nd ed. edition (January 1989)
8. Classical Data Structures : D. Samanta, PHI, New Delhi

Branch: BCA	Semester-III
Subject Code: 3201	Lecture: 04 Credit: 02
Course Opted	Core Course Practical - 7
Subject Title	DATA STRUCTURES- LAB

Course Objectives:

- To introduce the concepts of data structures including arrays, linked list, stack and queues.
- To design and implement various data structure algorithms.
- To introduce various techniques for representation of the data in the world.
- To create programs using algorithms and also techniques of sorting and searching.

Course Outcomes:

- Select appropriate data structures as applied to specified problem definition.
- Implement operations like traversing, insertion, deletion, searching etc. on data structures.
- Students will be able to implement linear and non - linear data structures.
- Implement appropriate sorting and searching techniques for given problems.

Modules	Sr. No.	Topic and Details	No. of Practicals Assigned	Marks Weightage %
UNIT-I	1	Arrays: Implementation & Operations of Array - Insertion, deletion from one dimensional array, Traversing of array	2	4
	2	Linked Lists: Singular Implementation of List and Linked List and Operations- Inserting, Deleting of nodes etc	2	4
UNIT-II	3	Linked Lists: Implementation of Two way Doubly and Circular Linked List and Operations- Inserting, Deleting nodes	3	6
	4	Stack: Stack Implementation, Operations on stack(Push Pop). Implementation of stack using pointer	4	8
UNIT-III	5	Queue: Implementation, Operations - Insertion & deletion	3	6
	6	Trees: Implementation of tree as Array and Linked lists and Traversal (Inorder, Preorder, Postorder)	4	8
UNIT-IV	7	Graphs: Implementation of Graph traversal(BFS,DFS,Shortest path)	3	6
	8	Searching & Sorting: Implementation of searching (Sequential, Binary search),Sorting (Bubble sort, Selection sort, Quick sort etc.)	4	8
Total			25	50

Text Book:

1. S.Sawhney & E. Horowitz, "Fundamentals of Data Structure", Computer Science Press, 1987

References:

1. Lipschuiz, "Data structures" , (Schaum's Outline Series Mcgraw Hill Publication)

Branch: BCA	Semester-III
Subject Code: 3102	Lecture: 04 Credit: 04
Course Opted	Core Course - 8
Subject Title	JAVA PROGRAMMING

Course Objectives:

- To gain knowledge about basic Java language syntax and semantics.
- To write Java programs and use concepts such as variables, conditional and iterative execution methods etc.
- To understand the fundamentals of object-oriented programming in Java, including defining classes, objects, etc.
- To understand the principles of inheritance, packages and interfaces.
- To design and program stand-alone Java applications.
- To learn how to use exception handling in Java applications.

Course Outcomes:

- To teach Object-Oriented programming concepts, techniques, and applications using the Java programming language.
- Problem solving skills – to analyze real life problem, find and develop algorithmic steps to solve it and then implement these steps in JAVA.
- Experience with developing and debugging software in Java.
- To develop real life projects using database connectivity with JDBC.

Modules	Sr. No.	Topic and Details	No. of Lectures Assigned	Marks Weightage %
UNIT-I	1	Introduction and Programming with java: Introduction to java: Creation of java, Difference between java & C++. Java's Magic: Byte Code, JVM, Run time Environment, Just-in-time, Compiler, JDK, Buzzwords/Features, OOP Principles, Data Types & Operators, Simple Data Types, Variables, Declaring Variables, Dynamic Initialisation, Scope & Life time, Type conversion & Casting Incompatible Types. Arrays: one, Multi-dimensional, Arithmetic, Modulus Assignment, Increment & Decrement, Relational Boolean – Logical operators. Control Statements- All Control Statements, Jump Statement. Classes & Objects: Class Fundamentals- General form, Simple class, Declaring Objects, Assigning Object reference variables	5	10
	2	Constructor & Methods: Introduction to Methods, Constructor, Types of Constructors, This keyword, Garbage Collection, Finalise() method, A stack Class	4	8
UNIT-II	3	Method Overloading : Overloading Methods, Using Object as Parameters, Argument Passing, Returning Objects, Recursion, Understanding Static, Introducing to Final, Inner & Nested Classes, Inheritance & Method Overriding, Dynamic Method dispatch, Abstract Classes, Final With Inheritance	6	12

	4	Special Features of java: Interface & packages, Packages access Protection, Importing Package, Interface.	3	6
	5	Exception Handling: Fundamentals, Exception Types Uncaught Exception, Using try catch, Multiple Catch, Nested try, throw, throws, finally, java's Built-in-exception, creating own exception subclasses, chained exception, using exception	4	8
UNIT-III	6	Threading: Thread Model, Thread priorities, synchronization, Messaging, The thread class and the runnable interface. The main Thread, Creating a thread, Implementing Multi thread, using isAlive() & join().	5	10
	7	I/O Applets: The I/O Classes, I/O Basics, Streams, Byte Streams and character streams, Byte stream, classes and character stream classes, Byte Stream class, Buffered InputStream, BufferedOutputStream, ByteArrayInput, ByteArrayOutput, DataInput, Data Output, PrintStream, Character Stream Class, BufferedReader, BufferedWriter, InputStreamReader, OutputStreamWriter, PrintWriter, Reading Console Input, Writing Console output, Applet Initialisation and Termination, Init(), Start(), Paint(), Stop(), Destroy(), Overriding update(), Simple Applet Display Methods(), Repainting, Using Status window, The HTML Applet tag, Passing parameters to Applets.	7	14
UNIT-IV	8	The Java Library: String Handling- length(), equals(), charAt(), toString(), getChar(), compareTo(), indexOf(), lastIndexOf(), concat(), valueOf(), substring(), replace(), trim(), toUpperCase(), toLowerCase(), Networking- Networking Basics, Socket overview, Client/Server, Reserved Socket, Internet Addressing, DNS, Java & The Net, Networking classes and interfaces- InetAddress, Factory Methods, Instance Methods, TCP/IP client sockets, whois URL, Format URL connection, TCP/IP Server sockets, Datagrams, DatagramPacket, Datagram server and client, The Collections Framework, Collections Overview, Collections Interfaces, The collection Interface, The list Interface, Set Interface, Sorted Set Interface.	6	12
	9	Basics of AWT and Swing: Control fundamentals, Adding & Removing controls, Responding to controls, Using Buttons, ActionListener, itemsStateChanged(), Choice Control, Handling choice Lists, Using Lists, Handling Lists, Managing Scroll bar, Textfield, Using TextArea, Panels, Checkbox, Dialogs and frames, Using menus, Using the adapter class, LayOut Manager-Flow, Border Grid, Card Using Insets, Event Handling –Events, Event Sources, Event Listeners, Event Classes(In details)-	6	12
	10	Database Connectivity: Database connectivity with JDBC, Java Security.	4	8

Total	50	100
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Text Book:

1. Herb Schildt, "Java 2 the Complete Reference J2se", 5TH Edition , 2003.

References:

1. Jim Farley, William Crawford, David Flanagan, "Java Enterprise in a Nutshell: A Desktop Quick Reference": (Nutshell Handbook).
2. Elliot B. Koffman, "Problem Solving with Java", Temple University Ursula Wolz, College of New Jersey, Copyright 1999, 848 pp. ISBN 0201357437.
3. Jan Skansholm, "Java from the Beginning", Chalmers University of Technology, Sweden, Copyright 2000, 540 pp. ISBN 0201398125.

Branch: BCA	Semester-III
Subject Code: 3202	Lecture: 04 Credit: 02
Course Opted	Core Course Practical - 8
Subject Title	JAVA PROGRAMMING - LAB

Course Objectives:

- To develop software skills for developing real world applications using Java Programming language.
- To enable implementation of frontend and backend of an application.
- To implement classical problems using Java programming.
- To be able to use the Java SDK environment to create, debug and run simple Java programs.

Course Outcomes:

- Basic knowledge of programming in JAVA.
- Experience with developing and debugging software in Java.
- Implementation of AWT.
- Able to develop real life projects using database connectivity with JDBC.

Modules	Sr. No.	Topic and Details	No. of Practicals Assigned	Marks Weightage %
UNIT-I	1	Introduction and Programming with java: Implementation of Data Types, Type conversion & Casting, Java Automatic Conversions, Casting Incompatible Types, Arrays: one, Multi-dimensional, Arithmetic, Modulus Assignment, Increment & Decrement, Relational Boolean – Logical operators. Control Statements- All Control Statements, Jump Statement. Classes & Objects: Class Fundamentals- General form, Simple class, Declaring Objects, Assigning Object reference variables.	2	4
	2	Implementation of Constructor & Methods: Constructors, This keyword, Garbage Collection, Finalise() method, A stack Class	2	4
UNIT-II	3	Implementation of Method Overloading: Overloading Recursion, Static, Inheritance& Method Overriding: Basics, Using Super, Multilevel, Overriding, Dynamic Method dispatch, Abstract Classes.	3	6
	4	Special Features of java: Interface & packages, Packages Access Protection, Importing Package, Interface.	3	6
UNIT-III	5	Exception Handling: Implementation of try catch, Multiple catch , Nested Try, throw, throws, finally statements Java's Built-in- Exception	3	6
	6	Implementation of threading: Single and Multiple thread	2	4
	7	I/O Applets: Implementation of I/O functions, Implementation of Applet- Initialisation and Termination, Init(), Start(), Paint(), Stop(), Destroy(), Overriding update(), Simple Applet Display Methods(),	3	6

		Repainting, Using Status window, The HTML Applet tag, Passing parameters to Applets.		
UNIT-IV	8	The Java Library: Implementations String Handling functions	2	4
	9	Implementation of AWT& Layout Managers: Control fundamentals, Adding & Removing controls, Responding to controls, Basic of Swings: Panels, Checkbox, Dialogs and frames, Using menus, Using the adapter class , Using Buttons, Listeners.	3	6
	10	Database Connectivity: Database connectivity with JDBC	2	4
Total			25	50

Text Book:

1. Herb Schildt, "Java 2 the Complete Reference J2se", 5TH Edition , 2003.

References:

1. Jim Farley, William Crawford, David Flanagan,"Java Enterprise in a Nutshell: A Desktop Quick Reference": (Nutshell Handbook).
2. Elliot B. Koffman, "Problem Solving with Java", Temple University Ursula Wolz, College of New Jersey, Copyright 1999, 848 pp. ISBN 0201357437.
3. Jan Skansholm, "Java from the Beginning", Chalmers University of Technology, Sweden, Copyright 2000, 540 pp. ISBN 0201398125.

Branch: BCA	Semester-III
Subject Code: 3103	Lecture: 04 Credit: 04
Course Opted	Core Course - 9
Subject Title	MATHEMATICS II

Course objectives:

- To provide suitable and effective methods called numerical methods for obtaining approximate numerical results of the problems.
- To deal with various topics like finding roots of the equations, solving systems of linear algebraic equations, interpolation, numerical integration and differentiation, solution of differential equations and solution of matrix problems.
- To facilitate numerical computing.

Course Outcomes:

- Apply numerical methods to find solutions of algebraic equations using different methods viz. Bisection method, Regula - Falsi, Newton Raphson's, Ramanujan's method, Matrix Inversion and Gauss Elimination
- Apply Least squares Curve fitting procedures.
- Derive numerical methods for various mathematical operations and tasks such as interpolation, differentiation, integration, the solution of linear and non linear equations and solution of differential equations.

Modules	Sr. No.	Topic and Details	No. of Lectures Assigned	Marks Weightage %
UNIT-I	1	Floating Point Arithmetic and Errors: Floating Point Representation, Sources of Errors . Propagated Errors	4	8
	2	Roots of non-linear equations a)Bisection Method b)Regula-falsi Method c)Newton-Raphson Method d)Ramanujan's Methods	6	12
	3	Direct solution of linear equation a) Matrix Inversion, b) Gauss-Elimination Method c) Gauss Jordan Method	6	12
UNIT-II	4	Interpolation: Finite Differences, a) Newton-Gregory Forward and Backward Formula b) Lagrange's Interpolation Formula for unequal Intervals c) Newton divided difference formula for unequal intervals	8	16
UNIT-III	5	Numerical Integration a) Trapezoidal Rule b) Simpson's 1/3 Rule c) Simpson's 3/8 Rule Error estimation for all above 3 methods	6	12

	6	Numerical Differentiation Differentiating Newton's Forward and Backward formula	6	12
UNIT-IV	7	Numerical solution of Differential equation Taylor's Series, Euler's Method, Runge-Kutta Method	8	16
	8	Curve Fitting Least Square regression Fitting, Multiple linear regression, m conditioning in Least square	6	12
Total			50	100

Text Book:

1. S.S. Shastri "Introductory methods of numerical analysis" Vol-2, PHI, SECOND edition, 1994.

Reference:

1. Numerical Methods: V. Rajaraman "Computer oriented numerical methods (third edition) 1993.
2. Gupta and Kapoor Fundamental of Mathematical Statistics.
3. E. Balaguruswamy, Numerical Methods - Tata McGraw Hill Publication.

Branch: BCA	Semester-III
Subject Code: 3104	Lecture: 04 Credit: 04
Course Opted	Core Course - 10
Subject Title	COMPUTER ORGANISATION AND ARCHITECTURE

Course Objectives:

- To introduce fundamental concepts of Boolean algebra, logic gates and combinational circuits
- To give a basic understanding of concepts and structure of computers.
- To understand the organization of Cache memory and memory management hardware.
- To study the working of different interrupts & Mapping Techniques.
- To study register organization.
- To understand the different addressing modes.
- To Demonstrate the working of central processing unit and RISC and CISC Architecture.

Course Outcomes:

- Understand the architecture and functionality of central processing unit.
- Analyze some of the design issues in terms of speed, technology, cost, performance.
- Learn the concepts of parallel processing, pipelining and inter-processor communication.
- Exemplify the I/O and memory organization.

Modules	Sr. No.	Topic and Details	No. of Lectures Assigned	Marks Weightage %
UNIT – I	1	Basic Structure of computers: Comparison of Computer Organization & Architecture, Structure and function, evolution of Intel x86 Architecture, Basic Measures of Computer Performance, Computer Components, Computer Function (Instruction Cycle, Interrupts), Interconnection Structures, Bus Interconnection, Peripheral Component Interconnection (PCI).	8	16
UNIT – II	2	Memory Organization: Cache Memory: Computer Memory System Overview, Cache Memory Principles, Elements of cache design (Size, Mapping, Replacement, Write policies, Block size) Internal Memory: Semiconductor Main memory, Error detecting & correcting codes	7	14
	3	Input/Output: External devices, I/O Modules, Programmed I/O, Interrupted-Driven I/O, Direct Memory Access	7	14
UNIT – III	4	Arithmetic and Logic: Computer Arithmetic, Integer representation, Floating point representation Digital Logic : Boolean algebra, Gates	8	16

	5	Central Processing Unit: Instruction sets : Instruction characteristics, Types of operands, Types of operations, addressing modes Processor Organization, Register organization, Instruction cycle.	12	24
UNIT –IV	6	RISC: Instruction Execution Characteristics, RISC characteristics and RISC Pipelining, RISC Vs.CISC Parallel organization: Multiple processor organizations (SISD, SIMD, MISD and MIMD)	8	16
Total			50	100

Text Book:

1. William Stallings “Computer Organization and Architecture” , Prentice Hall, 10th Edition

References:

1. Douglas V. Hall, “Microprocessor and Interfacing”, Tata McGraw-Hill 2nd Edition
2. Barry B. Brey, “The Intel Microprocessors 8086/8088...”, PHI, 4th Edition
3. Morris Mano, “Computer System Architecture”, Pearson Custom Publishing, 2001
4. Hwang, “Advanced Computer Architecture”, Tata McGraw Hill Education, 2003
5. Michael J. Flynn, “Computer Architecture”, Narosa Publishing, 1995
6. P.R. Devale, “Computer Organisation and Architecture”, 2004

SEMESTER - IV

Branch: BCA	Semester-IV
Subject Code: 4101	Lecture: 04 Credit: 04
Course Opted	Core Course - 11
Subject Title	PYTHON PROGRAMMING

Course Objective:

- Learn the fundamentals of writing Python scripts.
- Learn core Python scripting elements such as variables and flow control structures.
- Discover how to work with lists and sequence data.
- Write Python functions to facilitate code reuse.

Course Outcome:

- Able to apply the principles of pythonprogramming.
- Write clear and effective pythoncode.
- Create applications using pythonprogramming.
- Implementing database usingSQLite.
- Access database using pythonprogramming.
- Develop web applications using pythonprogramming.
- Develop and use Web Services usingpython.

Modules	Sr. No.	Topic and Details	No. of Lectures Assigned	Marks Weightage %
UNIT-I	1	Introduction to Python Programming Language: Understandingpython blocks, Introduction to Python Language,Installation and Working with Pytho, Understanding Python variables, Python basic Operators, Strengths andWeaknesses	8	16
	2	Python Data Types: Declaring and using Numeric data types: int, float, complex, Using string data type and string operations, Defining list and list slicing,Use of Tuple data type, Conversions, Built InFunctions		
UNIT-II	3	PythonProgramFlowControl Conditional blocks using if, else and elif, Simple for loops in python, For loop using ranges, string, list and dictionaries, Use of while loops in python, Loop manipulation using pass, continue, break and else, Programming using Python conditional and loops block	10	20
UNIT-III	4	Functions and Modules : Organizing python codes using functions, Organizing python projects into modules, Importing own module as well as external modules, Understanding PackagesPowerful Lamda function in python, Programming using functions, modules and external packages	16	32

	5	Python File Operation: Reading config files in python, Writing log files in python, Understanding read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines()		
UNIT-IV	6	Creating the GUI Form and Adding Widgets: Widgets: Button, Canvas, Checkbutton, Entry, Frame, Label, Listbox, Menubutton, Menu, Message, Radiobutton, Scale, Scrollbar, text, Toplevel, spinbox, PanedWindow, LabelFrame, tkinter messagebox. Handling Standard attributes and Properties of Widgets.	16	32
	7	Layout Management: Designing GUI applications with proper Layout Management features.		
Total			50	100

Text Book:

1. Learning With Python, by Allen Downey, Jeff Elkner and Chris Meyers

References:

1. Dive into Python, Mike
2. Learning Python, 4th Edition by Mark Lutz
3. Programming Python, 4th Edition by Mark Lutz
4. Python Cookbook, Third edition by David Beazley and Brian K. Jones
5. Head First Python: A Brain-Friendly Guide, by Paul Barry
6. Learn Python The Hard Way, by Zed A. Shaw

Branch: BCA	Semester-IV
Subject Code: 4201	Lecture: 04 Credit: 02
Course Opted	Core Course Practical - 11
Subject Title	PYTHON PROGRAMMING - LAB

Course objectives:

- Install and run the Python interpreter
- Gain knowledge of Python syntax
- Learn variable declarations in Python
- Learn control structures
- Understand modules

Course Outcomes:

- Will be able to interpret the fundamental Python syntax use Python control flow statements.
- Enable the handling of strings and functions.
- Will be able to create and run Python programs by utilizing the data structures like lists, dictionaries, tuples and sets.

Modules	Sr. No.	Topic and Details	No. of Practicals Assigned	Marks Weightage %
UNIT-I	1	Installation of Python Implementation of Numeric int, float, complex data types and type conversions Implementation of string data type, list, data type Conversions, Use of Built in Functions	4	8
UNIT-II	2	Programs to Implement if, else and elif, loops, Loop manipulation using pass, continue, break and else and loops block	5	10
UNIT-III	3	Programs using functions, modules and external packages Programs to implement file operations	8	16
UNIT-IV	4	Creation of GUI Form and Adding Widgets: Designing GUI applications with proper Layout Management features.	8	16
Total			25	50

Text Book:

1. Learning With Python, by Allen Downey, Jeff Elkner and Chris Meyers

References:

1. Dive into Python, Mike
2. Learning Python, 4th Edition by Mark Lutz
3. Programming Python, 4th Edition by Mark Lutz
4. Python Cookbook, Third edition by David Beazley and Brian K. Jones
5. Head First Python: A Brain-Friendly Guide, by Paul Barry

Branch: BCA	Semester-IV
Subject Code: 4102	Lecture: 04 Credit: 04
Course Opted	Core Course - 12
Subject Title	INTRODUCTION TO MICROPROCESSORS

Course Objectives:

- To learn and understand technical aspect of 8085 microprocessor.
- To understand the standard instruction set available for 8085 IC.
- To Design and develop various assembly language programs for 8085 IC and 8255 PPL.
- To learn the concept of interrupts
- To understand serial communication and interfacing.
- To understand advance microprocessor 8088/8086.

Course Outcomes:

- Understand the architecture and addressing modes of 8085 microprocessor and memory organization and its Interfacing.
- Understand various types of instructions and Instruction Cycled with proper timing diagrams.
- Develop various assembly language programs by using different types of instructions and understand PPL interfacing.
- Understand 8259 interrupt controller IC with its internal organization and single and cascade operation.
- To understand 8086/8088 microprocessor, architecture, instruction set, addressing modes, simple programs, memory organization and interfacing.

Modules	Sr. No.	Topic and Details	No. of Lectures Assigned	Marks Weightage %
UNIT-I	1	8086 Architecture: 8086 Architecture-Functional diagram, Register Organization, Memory Segmentation, Programming Model, Memory addresses, Physical Memory Organization, Architecture of 8086, Signal description of 8086, interrupts of 8086.	8	16
UNIT-II	2	Instruction Set and Assembly Language Programming of 8086: Instruction formats, Addressing modes, Instruction Set, Assembler Directives, Macros, and Simple Programs involving Logical, Branch and Call Instructions, Sorting, String Manipulations	8	16
UNIT-III	3	Programming in 8085: Assembly language programming using 8085, 8255PPL and its interfacing	8	16
	4	Interrupts: Introduction, purpose of interrupts, Interrupt vectors, 8259-Interrupt Controller, Internal organization, pin out, Single and cascaded operation	8	16

UNIT-IV	5	I/O Interface: Serial data transmission, USART 8251 & its organization & interfacing with 8085, 8259 interrupt controller, its organization & interfacing with 8085,DMA controller 8257 & its organization.	8	16
	6	Advance Microprocessor: 8086/8088 microprocessor, architecture, instruction set, addressing modes, simple programs, memory organization and interfacing.	10	20
Total			50	100

Textbooks:

1. Microprocessor Architecture Programming ~ Application, with 8080/8085 by Ramesh S. Gaonkar.

References:

1. Microprocessor and Digital Systems by D.V.Hall.
2. 16 bit Microprocessor by Triebel and A. Singh.
3. 16 bit microprocessor by Liu and Gibson.

Branch: BCA	Semester-IV
Subject Code: 4202	Lecture: 04 Credit: 02
Course Opted	Core Course Practical - 12
Subject Title	INTRODUCTION TO MICROPROCESSORS - LAB

Course Objectives:

- To become familiar with the architecture and Instruction set of Intel 8085 microprocessor..
- To be able to develop simple assembly level programs

Course Outcomes:

- The student will be familiar with the architecture and Instruction set of Intel 8085 microprocessor
- Will be able to implement assembly level programs

Modules	Sr. No.	Topic and Details	No. of Practicals Assigned	Marks Weightage %
UNIT-I	1	Program to find addition of two 8-bit numbers	1	2
	2	Program to find subtraction of two 8-bit numbers	1	2
	3	Program to find addition of two 16-bit numbers	1	2
	4	Programs to find subtractiob of two 16-bit numbers	1	2
UNIT-II	5	Program to find addition of two 16-bit BCD numbers	1	2
	6	Program to find subtraction of two 8-bit BCD numbers	1	2
	7	Program to find multiplication of two 8-bit numbers using successive addition method.	1	2
	8	Program to find multiplication of two 8-bit numbers using shift and add method	1	2
	9	Program to divide 16-bit number by an 8-bit number	1	2
UNIT-III	10	Program to transfer a block of N bytes from source to destination	1	2
	11	Program to find Maximum number in an array	1	2
	12	Program to find Minimum number in an array	1	2
	13	Program to sort the numbers in ascending order	1	2
	14	Program to sort the numbers in descending order	1	2
	15	Program to convert two BCD numbers to their HEX equivalent	1	2
UNIT-IV	16	Program to convert HEX number to BCD	1	2

	17	Write a sub routine for 8085 to generate delay of 100 ms	1	2
	18	Write a sub routine for 8085 to generate delay of 10 ms	2	4
	19	Write a program to generate Fibonacci series	2	4
	20	To interface DAC with 8085 to demonstrate the generation of square, saw tooth and triangular wave.	2	4
	21	Serial communication between two 8085 through RS-232 C port.	2	4
Total			25	50

Textbooks:

1. Microprocessor Architecture Programming ~ Application, with 8080/8085 by Ramesh S. Gaonkar.

References:

1. Microprocessor and Digital Systems by D.V.Hall.
2. 16 bit Microprocessor by Triebel and A. Singh.
3. 16 bit microprocessor by Liu and Gibson.

Branch: BCA	Semester-IV
Subject Code: 4103	Lecture: 04 Credit: 04
Course Opted	Core Course - 13
Subject Title	COMPUTER NETWORKS

Course Objectives:

- To study TCP/IP & OSI protocol suites
- Learn how computer network hardware and software operate
- Investigate the fundamental issues of network design
- Learn about dominant network technologies

Course Outcomes:

- Distinguish between analog and digital signals and understand their characteristics
- Understand the basic concepts of data communications.
- Understand the purpose of network layered models, network communication using the layered concept, and able to compare and contrast Open System Interconnect (OSI) and the Internet Model.
- Understand basic computer network technology.
- Identify the different types of network topologies and protocols.

Module	Sr. No.	Topic and Details	No of Lectures Assigned	Marks Weightage %
UNIT-I	1	Introduction to Networking: Introduction to computer network, network application, network software and hardware components (Interconnection networking devices), Network topology, protocol hierarchies, design issues for the layers, connection oriented and connectionless services.	4	15
	2	Reference models: Layer details of OSI, TCP/IP models. Communication between layer.	4	
UNIT-II	3	Physical Layer: Data and signals, periodic analog signals, digital signals, transmission impairment, data rate limits, performance.	5	5
	4	Digital and Analog transmission: Digital-to-digital conversion, analog-to-digital conversion, transmission modes, digital-to-analog conversion, analog-to-analog conversion.	5	10
	5	Multiplexing, Transmission Media and Switching: Multiplexing – FDM, WDM and TDM Transmission Media – Guided Media (Twisted Pair, Coaxial and Fibre Optics) and Unguided Media i.e. Wireless Media (Radio waves, Microwave, Bluetooth, Infrared) Switching – Circuit and Packet Switching.	5	10

UNIT-III	6	Data link Layer: DLL Design Issues (Services, Framing, Error Control, Flow Control), Error Detection and Correction(Hamming Code, CRC, Checksum), Elementary Data Link protocols, Stop and Wait, Sliding Window(Go Back N, Selective Repeat).	5	10
	7	Medium Access Protocols: Channel Allocation problem, Multiple access Protocol(Aloha, Carrier Sense Multiple Access (CSMA/CD).	4	10
UNIT-IV	8	Network Layer : Network Layer design issues, Communication Primitives: Unicast, Multicast, Broadcast. IPv4 Addressing (classfull and classless) Routing algorithms : Shortest Path (Dijkstra's), Link State Routing, Distance Vector Routing (Bellmen- Ford) Congestion control algorithms: Open loop congestion control, Closed loop congestion control, Token & Leaky bucket algorithms Virtual Network: VPN, VDA and Cloud Model	8	20
	9	Transport Layer : Introduction, Transport layer protocols (Simple protocol, Stop-and-wait protocol, Go-Back-n protocol, Selective repeat protocol, Bidirectional protocols), Transport layer Services. TCP Segment Format, TCP State Machine, The User Datagram Protocol (UDP).	5	10
	10	Application Layer : Introduction, Services, Architecture, Client Server Model Protocols : DNS, HTTP, SMTP, FTP, Telnet	5	10
Total			50	100

Text Books:

1. A.S. Tannenbaum , "Computer Networks", 4th edition Prentice hall of India

References:

1. Internetworking with TCO/IP: Principles and Architecture, 5th Edition
2. TCP/IP illustrated volume 1 , W. Richard Steven , Addison Westey.
3. Dougals Comer, Computer Networks and Internets , 4 th Edition

Branch: BCA	Semester-IV
Subject Code: 4104	Lecture: 04 Credit: 04
Course Opted	Core Course - 14
Subject Title	SOFTWARE ENGINEERING

Course Objectives:

- To understand the nature of software development and software life cycle process models, agile practices.
- To Explain methods of capturing, specifying, visualizing and analyzing software requirements.
- To understand concepts and principles of software design and user-centric approach and principles of effective user interfaces.
- To understand need of project management and project management life cycle.
- To understand project scheduling concept and risk.

Course Outcomes:

- Provide the ability to select and apply the knowledge of defined engineering technology activities.
- Able to describe key activities in software development and the role of modeling.
- Able to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
- Able to explain key concepts in software development such as change management, testing and quality.

Module	Sr. No.	Topic and Details	No of Lectures Assigned	Marks Weight age %
UNIT-I	1	Introduction to Software Engineering: Definition, need, software engineering methods, Tools, procedures, Software engineering layers, SEI- CMM, process framework	6	12
	2	Software Process Model: waterfall, spiral, iterative, enhancement and phased development, RAD model, Prototyping model, V life cycle	7	14
	3	Software project planning: Overview, objectives, scope, resources.	2	4
UNIT-II	4	Requirement analysis: Requirement Engineering, Requirements Elicitation and Analysis model, QFD, FAST & Use-cases, Requirements Specification	5	10
	5	Software Project Scheduling: Importance, Work breakdown structure, effort distribution, Gantt chart & tracking the schedule. scheduling Methods: PERT and CPM	5	10
	6	Software Metrics: Direct and indirect methods, size oriented and function oriented metrics, COCOMO	3	6

UNIT-III	7	Design representations: Flow charts, pseudo code, HIPO, DFD, Decision Table Modular design: coupling and cohesion, its various types	5	10
	8	Project Management Spectrum Software Quality assurance: overview, definitions for software quality, roles, verification and validation, FTR, ISO	4	8
	9	Software configuration management: identification, control, auditing, status accounting	2	4
UNIT-IV	10	Software testing Overview: Strategy for testing, White Box Testing & Black box testing, cyclomatic complexity, Debugging	6	12
	11	Agile Software Development: Coping with Change, The Agile Manifesto: Values and Principles, agile project management	5	10
Total			50	100

Text Book:

1. Pressman, "Software Engineering A Practitioner's Approach" McGraw-Hill, 5th Edition, 2005

References:

1. Shooman, "Software Engineering Design, Reliability and Management" McGraw Hill 198
2. Fairley "Software Engineering Concepts" " McGraw--Hill Series, New York,

SEMESTER - V

Branch: BCA	Semester-V
Subject Code: 5101	Lecture: 04 Credit: 04
Course Opted	Core Course – 15
Subject Title	MOBILE APPLICATION

Course Objectives:

- Understand the application development lifecycle.
- Develop a grasp of the Android OS architecture.
- Create an android based mobile application
- Familiarize with Android's APIs for data storage, retrieval, user preferences, files and content providers
- Experiment with database to store data locally
- Identify, analyze and choose tools for Android development including device emulator, profiling tools and IDE

Course Outcomes:

- Recognizes mobile development environments...
- Write clear and effective Android code.
- Create Native & Hybrid Mobile applications using Android App Development
- Implementing database using SQLite & Firebase Real-time Database.
- Be exposed to technology and business trends impacting mobile application
- Be competent with designing and developing mobile applications using one application development framework.

Modules	Sr. No.	Topic and Details	No. of Lectures Assigned	Marks Weightage %
UNIT-I	1	Programming Revision (Object Oriented Programming Concepts & Java Fundamental): Class, Object & methods, Constructors in Java, Inheritance, Polymorphism, Abstraction, Encapsulation, Exception Handling in Java, Multithreading in Java, File I/O Introduction to Android Programming Language: What is Android, History and Version, Software Stack, Core Building Blocks, Android Emulator, Hello Android example, Internal Details, Dalvik VM, AndroidManifest.xml	8	16
	2	Android Application Layout: Android Linear Layout, Android Relative Layout, Android Table Layout, Scroll View in Android, Android Frame Layout	8	12
UNIT-II	3	Android Activity & Intent, Android Fragments: Activity Lifecycle, Implicit Intent, Explicit Intent, Android Fragments	8	12
	4	Android UI widgets: Working with Button, Toast, Toggle Button, Checkbox, Image View, Image Button, Alert Dialog, Spinner, AutoComplete Text View, Rating Bar, Date Picker, Date Picker, Time Picker, Progress Bar	10	24
	5	Building Android Application with Web View: Building Simple Web View Application, Load	4	8

		HTML Date on Web View, Embed/Display YouTube Video in Web View, Convert Custom Design Website into Android App.		
UNIT-III	6	Menus in Android & Services: Option Menu, Context Menu, Popup Menu, It can be used to perform any task in background. It doesn't have any user interface (UI).	2	4
	7	Android Database (SQLite) & Android Multimedia: SQLite Example with GUI, Fire Base (Real time), Playing Audio in android Example, Playing Video in android Example, Playing Media Player in android Example.	2	4
	8	Android Speech & Telephony API: Speech API is used to convert text into speech, Text to Speech Example with Speed option, Telephony Manager, Get Call State, Call State Broadcast Receiver, How to make a Phone Call, How to Send SMS, How to Send Email.	4	8
UNIT-VI	9	Device Connectivity & Android sensor: Bluetooth, List Paired Device, Wi-Fi, Android Sensor.	2	4
	10	Android Material Design Using Design Support Library & Animation: Navigation Drawer View, Splash Screen, Android animation enables you to rotate, slide and flip images and text, Fade In Animation in Android, Fade Out Animation in Android, Zoom In Animation in Android, Zoom Out Animation in Android, Implementing Ripple Effect in Android, Add Ripple Effect/Animation to a Android Button.	2	8
TOTAL			50	100

Text Book:

1. Android Studio 3.0 Development Essentials

Reference Books:

1. Android Programming: The Big Nerd Ranch Guide
2. Android Application Development - Black book
3. Android Development for Gifted Primates
4. Android Cookbook focuses
5. Practical Android
6. Head First Android: A Brain-Friendly Guide, by Paul Barry.

Branch: BCA	Semester-V
Subject Code: 5201	Lecture: 02 Credit: 02
Course Opted	Core Course Lab– 15
Subject Title	MOBILE (ANDROID) APPLICATION LAB

Course Objectives:

- Install and run the Android studio & JDK 1.8
- Gain knowledge of Android syntax
- The student will learn the basics of Android platform and get to understand the application lifecycle
- Android programming wherein students will be able equipped with skills for analyzing, designing, developing and troubleshooting java applications.
- Students understand the operation of the application, application lifecycle, configuration files, intents, and activities.

Course Outcomes:

- Build and deploy his/ her Android application.
- The candidates get a better understanding of the UI - components, layouts, event handling, and screen orientation.
- Students also develop a working knowledge of the custom UI elements and positioning.
- The candidates may also have an in-depth understanding of broadcast receivers and services.

Modules	Sr. No.	Topic and Details	No. of Lectures Assigned	Marks Weightage %
UNIT- I	1	Installation of Android studio & JDK 1.8: Java program to perform example of Class, Object & methods, Java program to perform Example of Constructors in Java, Java program to perform Example of Inheritance, Write a java program to perform Example of Polymorphism, Java program to perform Example of Abstraction, Java program to perform Example of Encapsulation, Java program to perform Example of Exception Handling in Java , Java program to perform Example of Multithreading in Java, Java program to perform Example of File I/O, Android Program to Build a Simple Android Application, Android Program to Demonstrate Usage of String.xml File, Java Android Program to Change the Background of Your Activity, Android Program to Demonstrate Action Button by Implementing on Click Listener (Use Intent).	4	8
	2	Android Program to Demonstrate the use of Scroll View, Android Program to Demonstrate the use of Liner Layout, Android Program to Demonstrate the use of Relative Layout, Android Program to Demonstrate the use of Table Layout.	4	4
	3	Android Program to Create Multiple Activities within an Application, Android Program to Demonstrate	2	4

UNIT- II		Explicit Intent, Android Program to Demonstrate Implicit Intent.		
	4	Android Program to perform all Operations using Calculators: Android Program to Demonstrate Alert Dialog Box, Android Program to Demonstrate Toast in an Application, Android Program to Demonstrate the use of Checkbox, Android Program to Demonstrate the use of Image Button, Android Program to Demonstrate the use of Image View, Android Program to Demonstrate the use of Spinner, Android Program to Demonstrate the use of Rating bar.	4	8
	5	Android Program to Demonstrate the Building Simple Web View Application, Android Program to Demonstrate the Load HTML Data on Web View, Android Program to Demonstrate the Embed/Display YouTube Video in Web View, Android Program to Demonstrate the Convert Custom Design Website into Android App.	2	8
UNIT-III	6	Android Program to Demonstrate the Option Menu, Android Program to Demonstrate the Context Menu, Android Program to Demonstrate the Popup Menu, Android Program to Demonstrate the It can be used to perform any task in background. It doesn't have any user interface (UI).	2	4
	7	Android Program to Demonstrate the SQLite Example with GUI, Android Program to Demonstrate the FireBase (real time), Android Program to Demonstrate the Playing Audio in android Example, Android Program to Demonstrate the Playing Video in android Example, Android Program to Demonstrate the Playing Media Player in android Example.	2	2
	8	Android Program to Demonstrate the Speech API is used to convert text into speech, Android Program to Demonstrate the TextToSpeech Example with Speed option, Android Program to Demonstrate the Telephony Manager, Android Program to Demonstrate the Get Call State, Android Program to Demonstrate the Call State Broadcast Receiver, Android Program to Demonstrate the How to make a Phone Call, Android Program to Demonstrate the How to Send SMS, Android Program to Demonstrate the How to Send Email.	2	4
	9	Android Program to Demonstrate the Bluetooth, Android Program to Demonstrate the List Paired	1	4

UNIT-IV		Device, Android Program to Demonstrate the Wi-Fi, Android Program to Demonstrate the Android Sensor.		
	10	Android Program to Demonstrate the Navigation Drawer View, Android Program to Demonstrate the Splash Screen, Android Program to Demonstrate the Android animation enables you to rotate, slide and flip images and text, Android Program to Demonstrate the Fade In Animation in Android, Android Program to Demonstrate the Fade Out Animation in Android, Android Program to Demonstrate the Zoom In Animation in Android, Android Program to Demonstrate the Zoom Out Animation in Android, Android Program to Demonstrate the Implementing Ripple Effect in Android, Android Program to Demonstrate the Add Ripple Effect/Animation to a Android Button.	2	4
TOTAL			25	50

Text Book:

1. Android Studio 3.0 Development Essentials

Reference Books:

1. Android Programming: The Big Nerd Ranch Guide
2. Android Application Development - Black book
3. Android Development for Gifted Primates
4. Android Cookbook focuses
5. Practical Android
6. Head First Android: A Brain-Friendly Guide, by Paul Barry.

Branch: BCA	Semester-V
Subject Code: 5102	Lecture: 04 Credit: 04
Course Opted	Core Course – 16
Subject Title	ARTIFICIAL INTELLIGENCE

Course Objectives:

- To understand the basic principles, techniques, and applications of Artificial Intelligence.
- To understand the historical perspective of AI and its foundations.
- To understand a basic understanding of the building blocks of AI.
- To understand intelligent agents: Search, Knowledge representation, inference, logic, and learning.

Course Outcomes:

- Students will be able to demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations.
- Students will be able to understand the fundamentals of various applications of AI techniques in intelligent agents, expert systems models.

Modules	Sr. No.	Topic and Details	No. of Lectures Assigned	Marks Weightage %
UNIT-I	1	Introduction: History and Application of AI, AI Techniques, Types, Intelligent Agent: Types, Environment, Solving problems by searching-Toy problems, Real-World problems, 8 puzzle game, chess-board problem, tic-tac toe, Water-jug Problem, Travelling salesman Problem, The wampus world Problem.	12	24
UNIT-II	2	Informed Search Strategies: Greedy best first search, A* algorithm, Heuristic function, Games: Single player and multiplayer game. The minimax strategy, Maximin Strategy, Alpha Beta Pruning and cut-off.	6	12
	3	Uniformed Search Strategies: Breadth-first search, Depth-first search, Comparing uniformed search techniques. Informed search strategies: Generate-and-test, Hill climbing, Best-first search, problem reduction, constraint satisfaction, Mean-ends analysis.	8	16
UNIT-III	4	Knowledge Representation: Issues in knowledge representation, Approaches to knowledge representation, introduction to ontology Logic and Inferences: Formal logic, history of logic and knowledge, propositional logic, resolution method in propositional logic.	6	12

UNIT-IV	5	Expert System: Knowledge acquisition methods, knowledge engineering process, goals in knowledge system development, basic architecture of expert system, problem domain versus knowledge domain, Development of ES and life cycle of ES. Advantages of expert system, structure of Rule based expert system, characteristics of conventional system and expert system.	10	20
	6	Statistical Reasoning: Probability and Bayes theorem, Certainty factor, Dempster-Shafer theory, Fuzzy logic: crisp sets, application of fuzzy logic.	8	16
TOTAL			50	100

Text Book:

1. Artificial Intelligence (Third Edition) McGraw-Hill Elaine Rich, Kevin Knight.

Reference Books:

1. A First course in Artificial Intelligence (McGraw-Hill) Deepak Khemani.
2. Artificial Intelligence A modern approach (Second Edition) Pearson, Stuart Russell, and Peter Norvig.
3. Fuzzy Logic with Engineering application (Third edition) Timothy J. Rose.
4. Artificial Intelligence and Intelligence system: N. P. Padhy
5. Artificial Intelligence: Patrick Henry Winston
6. Artificial Intelligence (Structure & Strategies for Complex Problem solving): George F. Luger

Branch: BCA	Semester-V
Subject Code: 5103	Lecture: 04 Credit: 04
Course Opted	Core Course – 17
Subject Title	CYBER SECURITY

Course Objectives:

- The learner will gain knowledge about protect personal data, and secure computer networks.
- The learner will be able to examine secure software and web security. The learner will be able to find solution to the key distribution problem by using functional key pair; public key cryptography
- The learner will develop an understanding of security policies (such as confidentiality, integrity, and availability), as well as protocols to implement such policies.
- The learner will be able to examine certain attacks on networks and security related services.

Course Outcomes:

The student will

- Understand the basic security principals
- Understand the concepts of data confidentiality security concern and its solution through cryptography
- Be able to verify identity through various authentication mechanisms
- Learn about Safeguarding the network at the network layer
- Learn about attacks on the networks and security related services

Modules	Sr. No.	Topic and Details	No. of Lectures Assigned	Marks Weightage %
UNIT-I	1	Introduction to Cyber Security: Introduction to Cyber Security, History, Goals, Need of Security, Principles, Elements, Type of Cyber Attacks, Security Policies, Security Techniques, Steps for Better Security, Basics Security Terminology (Cryptography, Hacking, Encryption, Decryption)	6	12
	2	Data Encryption techniques: Introduction: Encryption Methods (Symmetric Encryption & Asymmetric Encryption), Cryptography. Substitution Ciphers: Ceaser, Monoalphabetic, Playfair, Hill, Polyalphabetic, One-time Pad or Vernam. Transposition Ciphers: Single Columnar, Double Columnar. Cryptanalysis, Steganography. Data Encryption Standards: Working of DES, Cracking of DES, Simplified Data Encryption Standards. Symmetric Ciphers: Introduction, Blowfish Architecture, RC5, RC4, RC6, Comparison between	6	12

		RC6 and RC5, IDEA (International Data Encryption Algorithm)		
UNIT-II	3	Public Key Cryptosystems: Introduction, Public Key Cryptography, RSA Algorithm (Working of RSA, Key length and Security) Authentication: Introduction, Authentications Methods (Password-based, Two-factor, Biometric, Extensible). Kerberos: Basics, Ticket Granting Approach, Public Key Cryptography, Advantages, Weakness and attacks, Applications and Limitations, Comparison of Kerberos with SSL, Authentication Servers	6	12
	4	Digital Signatures: Introduction, Implementation, Association of Digital Signatures and Encryption, Using Different Key pairs for Signing and Encryption. Algorithms for Digital Signature: DSA (Digital Signature Algorithm), ECDSA (Elliptic Curve Digital Signature Algorithm), DSS, Attacks on Digital Signature. Electronic Mail Security: Introduction, Pretty Good Privacy (PGP), MIME, S/MIME, Comparison of PGP and S/MIME. IP Security: Introduction, IP Security Architecture, IPv6, IPsec, IPv4 and IPv6, IPsec Protocols and Operations Web Security: Introduction, SSL, SSL Session and Connection, SSL Record Protocol, Secure Electronic Transaction.	7	14
UNIT-III	5	Intrusions: Introduction, Intrusion Detection, Intrusion Detection System, Password Management Practices, Limitations, Challenges Malicious Software: Introduction, Malicious Code, Viruses, Worms, Trojans, Spyware, Ransom ware, Bots, Best Practices, Attacks	6	12
	6	Firewall: Introduction, Characteristics, Types, Benefits and Limitations, Architecture, Cyber Laws: Introduction, Cyber Security Regulations, Role of International Law, Cyber Security Standards, Indian Cyber Space, National Cyber Security Policies.	6	12
UNIT-IV	7	Digital Forensic: Introduction to cyber crimes & Digital Forensic, Types of Digital Forensics, Digital Forensics Process, Areas of Application of computer forensics, Understanding the Suspects, Examples of Computer Forensics, Free space and Slack Space.	6	12

	8	Case Studies on Cryptography and security: Cryptographic Solutions, SSO, Secure inter-branch Payment Transactions, Denial of Service (DOS) attacks, IP Spoofing attacks, CSSV, secrete splitting, Contract signing.	7	14
TOTAL			50	100

Text Book:

1. Atul Kahate, Cryptography and Network Security, McGraw Hill

Reference Books:

1. Cybersecurity Fundamentals: A Real-World Perspective
2. CRYPTOGRAPHY AND INFORMATION SECURITY, THIRD EDITION, PACHGHARE, V. K. Eastern Economy Edition, 2019.
3. Kaufman, C., Perlman, R. & Speciner, M., Network Security, Private Communication in a Public world, 2nd ed., Prentice Hall PTR, 2002
4. Stallings, W., Cryptography and Network Security: Principles and Practice, 3rd ed., Prentice Hall PTR., 2003.
5. Stallings, W., Network Security Essentials: Applications and Standards, Prentice Hall, 2000
6. A Course in Cryptography, By Heiko Knospe, The Sally Series, AMS.

Branch: BCA	Semester-V
Subject Code: 5104	Lecture: 02 Credit: 02
Course Opted	Skill Enhancement Course-3
Subject Title	MULTIMEDIA AND APPLICATION

Course Objectives:

- To learn and understand technical aspect of Multimedia Systems.
- To understand the standards available for colour model and different images, video and text applications.
- To Design and develop various Multimedia Systems applicable in real time
- To learn various multimedia authoring systems, computer graphics used for multimedia applications and Display devices.
- To understand Video signal formats and TV broadcasting system.

Course Outcomes:

- Learner will Developed understanding of technical aspect of Multimedia Systems.
- Learner will understand various file formats for images, video, text media, colour models and software tools.
- Learner will develop various Multimedia Systems applicable in real time with action script.
- Learner will design interactive multimedia softwareprogram multimedia data and be able to design and implement media applications.
- Learner will understand different graphics algorithm, Display devices, Video signal formats and TV broadcasting system.

Modules	Sr. No.	Topic and Details	No. of Lectures Assigned	Marks Weightage %
UNIT- I	1	Fundamental concept of multimedia: An overview of multimedia, Multimedia presentation and production, multiple media, Hardware-software requirement, uses of multimedia, steps for creating multimedia presentation. Graphics & Image Data Representations: Graphics/Image Data types: 1 Bit Image, 8 Bit Gray level Image, Image Data types, 24-Bit color images, Higher-Bit-Depth Images, 8-Bit color Image, color Lookup Tables. Popular File Formats: GIF, JPEG, PNG, TIFF, Windows BMP, Windows WMF, Netpbm format, EXIF.	12	24
UNIT- II	2	Color in Image & Video: Color Science & Color Models in Image Color, Models in Video. Fundamental Concepts in Video: Analog Video, Digital Video, Video Display Interfaces, 3D Video and TV Basics of Digital Audio: Digitization of Sound, MIDI. Multimedia Anchoring:	13	26

		Basic Concepts, Anchoring Tools, Macromedia Director Flash. Multimedia Applications: Media preparation, Media Editing, Integration: Interactive Services, Multimedia Distribution Services, Media Usage (Electronic Books & Magazines, Kiosks, Tele-shopping, Entertainment).		
TOTAL			25	50

Text Books:

1. Fundamentals of Multimedia by Ze- Nian Li and Mark S. Drew PHI/Pearson Education.
2. Principles of Multimedia by Ranjan Parekh (McGraw-Hill).
3. Multimedia Applications by Ralf Steinmetz, Klara Nahrstedt.
4. Multimedia: Computing Communications & Applications by Ralf Steinmetz

Reference Books:

1. Digital Multimedia, Nigel chapman and jenny chapman, Wiley- Dreamtech
2. Macromedia Flash MX Professional 2004 Unleashed, Pearson.
3. Multimedia and communications Technology, Steve Heath, Elsevier(Focal Press).
4. Multimedia Applications, Steinmetz, Nahrstedt, Springer.
5. Multimedia Basics by Weixel Thomson.
6. Multimedia Technology and Applications, David Hilman, Galgotia.
7. Multimedia System Design, P K Andleigh &Thakrar (PHI).
8. Advanced Graphics Programming in C & C++ By Roger.

Branch: BCA	Semester-V
Subject Code: 5105	Lecture: 04 Credit: 04
Course Opted	Discipline Specific Elective -1
Subject Title	MANAGEMENT INFORMATION SYSTEM

Course Objectives:

- Understand the Management Information concept with role of management in an organization.
- Explain relationships between concepts of information systems, organization, management and strategy.
- Explain managerial activities and roles with decision making process.
- Understand MIS concepts working in development stages through various case studies.

Course Outcomes:

- Enable Learners to describe the role of information technology and information systems in business and analyze how information technology impacts a firm.
- It is help learners to interpret how to use information technology to solve business problems.
- Analyze the relationship between information systems and organizations.
- Describe how managers make decisions in organizations.
- Evaluate the role of information systems in supporting various levels of business strategy.

Modules	Sr. No.	Topic and Details	No. of Lectures Assigned	Marks Weightage %
UNIT-I	1	Management Information System in Digital Firm:- Introduction to MIS: MIS concept, definition, role of MIS, Impact, MIS and the User, MIS effectiveness, MIS for a Digital Firm.	5	10
	2	E-Business Enterprise: Introduction, organization of business in Digital Firm, e-business, e-commerce, e-communication, e-collaboration, real-times enterprise, Technology used in RTE (Real Time Enterprise).	6	12
UNIT-II	3	Basic of Management Information System:- Decision Making: Decision making concept, decision making process, MIS and decision making, Decision Analysis by Analytical Modelling, Behavioural concepts in DM, organizational DM.	7	14
	4	Information Concepts: Information concept, information - a quality product, classification of information, methods of data and information collection, value of information, general model, MIS and Information.	5	10
	5	System Engineering: System concept, types of systems, general model of MIS, need for system analysis, system analysis of existing system, system analysis of new requirement, system development model, computer system design.	7	14

UNIT-III	6	Development of MIS: Long range plans of MIS, Development and implementation of MIS.	5	10
	7	Business Intelligence for MIS: BI & MIS, tools & techniques of BI, BI Development, BI used, process of generation of BI.	5	10
UNIT-IV	8	Applications of MIS to e-Business: Applications in manufacturing sector / Service Sector/DSS & KM /Management of global Enterprise.	5	10
	9	Comprehensive Cases in MIS.	5	10
TOTAL			50	100

Text Book:

1. W.S. Jawadekar, "Management Information Systems, Text and Cases: A global Digital Enterprise"
Tata McGraw Hill Publishing, 2013.

References Books:

1. V. Rajaraman, "Analysis & Design of Information System," PHI.
2. J. Kanter, "Management/Information Systems", PHI, 1996
3. Gordon B. Davis & M.H. Olson, "Management Information Systems: Conceptual Foundation, structure and Development" 1984.
4. MIS Managerial Perspective (2e) -D.P Goyal ; MacMillan
5. MIS practices in the new millenium-S. Shajahan.

Branch: BCA	Semester-V
Subject Code: 5105	Lecture: 04 Credit: 04
Course Opted	Discipline Specific Elective -2
Subject Title	SEARCH ENGINE OPTIMIZATION

Course Objectives:

- To optimize a website involving editing its content, adding content, doing HTML, and associated coding to both increase its relevance to specific keywords and to remove barriers to the indexing activities of search engines.
- To learn to promote a site to increase the number of back links, or inbound links, is another SEO tactic.
- To explore the legal relationships among the various industries.

Course Outcomes:

- To remember and learn the practical aspects of Search Engine Optimization.
- To understand and learn how to promote sites.
- To Apply and differentiate the concept of back links or inbound links.
- To Create and develop the technical skills related to digital marketing activities.

Modules	Sr. No.	Topic and Details	No. of Lectures Assigned	Marks Weightage %
UNIT-I	1	Introduction to SEO, Types of SEO (White Hat, Red Hat) and techniques, How Search Engine Work?, Domain. Research and Analysis: Marketing Research, keyword research and Analysis, competitor's website, choosing best keywords, tools available for keyword research) SEO Guidelines: Website Design guidelines, Content optimization, SEO Design and layout, XML Sitemap / URL List Sitemap.	6	12
	2	On-page Optimization: The Page Title, Meta Descriptions, Meta Keywords, Headings, Bold Text, Domain Names & Suggestions, Canonical Tag, Meta Tags, Images and Alt Text, Internal Link Building, The Sitemap, Invisible Text, Server and Hosting Check, Robots Meta Tag, Doorway Pages, 301 Redirects, 404 Error, Duplicate content.	7	14
UNIT-II	3	Off-page Optimization: Page Rank, Link Popularity, Link Building in Detail, Directory Submission, Social Bookmark Submission, Blog Submission, Articles, Links Exchange, Reciprocal Linking, Posting to Forums, Submission to Search Engine, RSS Feeds Submissions, Press Release Submissions, Forum Link Building, Competitor Link Analysis.	8	16

	4	Analytics: Google Analytics, Installing Google Analytics, How to Study Google Analytics, Interpreting Bars & Figures, How Google Analytics can Help SEO, Advanced Reporting, Webmaster Central, Bing/Yahoo, Open Site Explorer, Website Analysis using various SEO Tools available.	8	16
UNIT-III	5	SEO Tools: Keyword Density Analyzer Tools, Google Tools, Yahoo / Bing Tools, Rich Snippet Text Tool, Comparison Tool, Link Popularity Tools, Search Engines Tools, Site Tools, Miscellaneous Tools.	8	16
	6	SEO Reporting: Google analysis, Tracking and Reporting, Reports Submission, Securing Ranks.	6	12
UNIT-IV	7	Optimizing Search Strategies: Adding your site to Directories, Pay-for-inclusion services, robots, spiders and crawlers, adding social media optimization.	7	14
	8	Mobile Search Engine Optimization: Monetizing Traffic as an SEO Strategy, Plugging into to SEO, Automated optimization.		
TOTAL			50	100

Text Book:

1. Jerry L. Ledford, "SEO: Search Engine Optimization Bible", John Wiley & Sons, 2007

References Books:

1. Todd Kelsey, "Introduction to Search Engine Optimization: A Guide for Absolute Beginners", Apress Publication.
2. Bruce Clay, Susan Esparza, "Search Engine Optimization – All-in-one for Dummies", John Wiley & Sons
3. Eric Enge, Stephan Spencer, Rand Fishkin, Jessie Strichhiola, "The Art of SEO: Mastering Search Engine Optimization", O'Reilly Media Inc. Publication.

Branch: BCA	Semester-V
Subject Code: 5105	Lecture: 04 Credit: 04
Course Opted	Discipline Specific Elective -3
Subject Title	DATA ANALYSIS AND VISUALIZATION

Course Objectives:

- Conduct exploratory data analysis using visualization.
- Design and evaluate color palettes for visualization based on principles of perception.
- Apply data transformations such as aggregation and filtering for visualization.
- Identify opportunities for application of data visualization in various domains.
- Use JavaScript with D3.js to develop interactive visualizations for the Web.

Course Outcomes:

- Learner will be able to present data with visual representations for your target audience, task, and data.
- Learner will be able to Experiment with and compare different visualization tools;
- Learner will be able to Create multiple versions of digital visualizations using various software packages and also to identify appropriate data visualization techniques imposed by the data;
- Learner will be able to apply appropriate design principles in the creation of presentations and visualizations and also to analyze, critique, and revise data visualizations

Modules	Sr. No.	Topic and Details	No. of Lectures Assigned	Marks Weightage %
UNIT –I	1	The role of statistics: Graphical and numerical methods for describing and summarising data. Probability. Population distributions. Sampling variability and sampling distributions.	8	16
	2	Estimation using a single sample: Hypothesis testing a single sample. Comparing two populations or treatments. Simple linear regression and correlation.	6	12
UNIT –II	3	Overview of Data Visualization, Introduction to Web Technologies.	4	8
	4	Introduction to SVG , CSS, JavaScript, VizHub.	4	8
	5	Data Abstraction, Task Abstraction: Input for Visualization: Data and Tasks, Loading and Parsing Data with D3.js	4	8
UNIT -III	6	Marks and channels: Encoding Data with Marks and Channels, Rendering Marks and Channels with D3.js and SVG, Introduction to D3 Scales, Creating a Scatter Plot with D3.js	4	8

	7	Arrange tables, Types of charts: Reusable Dynamic Components using the General Update Pattern, Reusable Scatter Plot, Common Visualization Idioms with D3.js, Bar Chart, Vertical & Horizontal, Pie Chart and Coxcomb Plot, Line Chart, Area Chart.	6	12
UNIT -IV	8	Arrange spatial data, Geographic data: Isocontours, Arrange network and trees, Map colors and other channels Making Maps, Visualizing Trees and Networks, Encoding Data using Color, Encoding Data using Size, Stacked & Grouped Bar Chart, Stacked Area Chart & Streamgraph, Line Chart with Multiple Lines.	6	12
	9	Manipulate view, Facet into multiple view: Adding interaction with Unidirectional Data Flow, Using UI elements to control a scatter plot, Panning and Zooming on a Globe, Adding tooltips.	4	8
	10	Reduce items and attributes: Small Multiples, Linked Highlighting with Brushing, Linked Navigation: Bird's Eye Map.	4	8
TOTAL			50	100

Text Books:

1. Sosulski, K. (2018). Data Visualization Made Simple: Insights into Becoming Visual. New York: Routledge.
2. Visualization Analysis & Design by Tamara Munzner (2014) (Links to an external site.) (ISBN 9781466508910)

Reference Books:

1. Few, S. (2012). Show me the numbers: Designing tables and graphs to enlighten. Burlingame, CA: Analytics Press.
2. Few, S. (2006). Information dashboard design: The effective visual communication of data. Sebastopol: O'Reilly.
3. Ware, C & Kaufman, M. (2008). Visual thinking for design. Burlington: Morgan Kaufmann Publishers.
4. Wong, D. (2011). The Wall Street Journal guide to information graphics: The dos and don'ts of presenting data, facts and figures. New York: W.W. Norton & Company. Yau, N. (2011). Visualize This: The Flowing Data Guide to Design, Visualization, and Statistics. Indianapolis: O'Reilly.

SEMESTER - VI

Branch: BCA	Semester-VI
Subject Code:6101	Lecture: 04 Credit: 04
Course Opted	Core Course – 18
Subject Title	INTELLECTUAL PROPERTY RIGHTS, PATENTS AND CYBER LAWS

Course Objectives:

- To understand the importance of Intellectual property.
- To gain knowledge of Intellectual property to protect creative work.
- To understand the registration process of various Intellectual Property.
- To learn how to protect intellectual property.
- To understand the concept of cyber law and IT Act.

Course Outcomes:

- Students will learn how to protect their creative work using Intellectual Property Rights.
- Identify the use of Intellectual Property.
- An ability to use Intellectual property to protect their work.
- Understand the registration process of Copyright, Patent and Trademark.

Modules	Sr. No.	Topic and Details	No. of Lectures Assigned	Marks Weightage %
UNIT-I	1	Basic Principles and Acquisition of Intellectual Property Rights: Philosophical Aspects of Intellectual Property Laws, Basic Principles of Patent Law, Patent Application procedure, Drafting of a Patent Specification, Understanding Copyright Law, Basic Principles of Trade Mark, Basic Principles of Design Rights, International Background of Intellectual Property.	5	10
	2	Information Technology Related Intellectual Property Rights: Computer Software and Intellectual Property- Objective, Copyright Protection, Reproducing, Defences, Patent Protection. Database and Data Protection- Objective, Need for Protection, UK Data Protection Act, 1998, US Safe Harbor Principle, Enforcement. Protection of Semi-conductor Chips- Objectives, Justification of protection, Criteria, Subject matter of Protection, WIPO Treaty, TRIPs, SCPA. Domain Name Protection- Objectives, domain name and Intellectual Property, Registration of domain names, disputes under Intellectual Property Rights, Jurisdictional Issues, and International Perspective.	5	10
	3	Patents (Ownership and Enforcement): Patents: Objectives, Rights, Assignments, Defences in case of Infringement.	5	10

UNIT-II	4	Copyright (Ownership and Enforcement): Copyright: Objectives, Rights, Transfer of Copyright, work of employment Infringement, Defences for infringement.	5	10
	5	Trademark (Ownership and Enforcement): Trademarks: Objectives, Rights, Protection of goodwill, Infringement, Passing off, Defences. Designs: Objectives, Rights, Assignments, Infringements, Defences of Design Infringement.	5	10
UNIT-III	6	Enforcement of Intellectual Property Rights: Civil Remedies, Criminal Remedies, Border Security measures. Practical Aspects of Licensing: Benefits, Determinative factors, important clauses, licensing clauses.	5	10
	7	Cyber Law: Basic Concepts of Technology and Law: Understanding the Technology of Internet, Scope of Cyber Laws, Cyber Jurisprudence Law of Digital Contracts: The Essence of Digital Contracts, The System of Digital Signatures, The Role and Function of Certifying Authorities, The Science of Cryptography.	5	10
UNIT-IV	8	Cyber Law: Information Technology Act 2000: Objectives of IT Act 2000 Following sections to be explained in detail Sections 43(Penalty for damage to the computer), Section 66(Hacking of computer systems), Section 67(publishing of obscene information), Section 72(penalty for breach of privacy), Section 73(penalty for publishing false digital signature certificates).	5	10
	9	Cyber Law: Intellectual Property Issues in Cyber Space: Copyright in the Digital Media, Patents in the Cyber World. Rights of netizens and E-Governance: Privacy and Freedom Issues in the Cyber World, E-Governance, Cyber Crimes and Cyber Laws, Ethical hacking.	5	10
	10	Case studies: Case studies related to different cyber crimes and punishment can be given.	5	10
TOTAL			50	100

Text Books:

1. Cyber law by Vivek Sood

Reference Books:

1. Licensing Art & Design by Caryn R. Leland, Allworth Press
2. A Professional's Guide to Licensing and Royalty Agreements by Caryn R. Leland Allworth Press IT2000 Bill
3. How To Register Your Own Copyright by Marx Warda, Sphinx Publishing
4. Web sites: online information, handouts

Branch: BCA	Semester-VI
Subject Code:6102	Lecture: 04 Credit: 04
Course Opted	Core Course – 19
Subject Title	DATA WAREHOUSING AND DATA MINING

Course Objectives:

- Be familiar with mathematical foundations of data mining tools.
- Understand and implement classical models and algorithms in data warehouses and data mining
- Characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering.
- Master data mining techniques in various applications like social, scientific and environmental context.
- Develop skill in selecting the appropriate data mining algorithm for solving practical problems.

Course Outcomes:

- Understand the functionality of the various data mining and data warehousing component
- Appreciate the strengths and limitations of various data mining and data warehousing models
- Explain the analyzing techniques of various data
- Describe different methodologies used in data mining and data warehousing.
- Compare different approaches of data warehousing and data mining with various technologies.

Modules	Sr. No.	Topic and Details	No. of Lectures Assigned	Marks Weightage %
UNIT -I	1	Overview and Concepts: Need for data warehousing, Basic elements of data warehousing, Trends in data warehousing.	4	8
	2	Data Marts, Data Staging, Meta Data, Data Warehousing & ERP, Data Warehousing & KM, Data Warehousing & CRM.	4	8
	3	Planning & Project Management: Life-cycle approach, Collecting the requirements, The Development phases, Dimensional analysis, Dimensional modelling, Star Schema, Snow Flake Schema. Data Design and Data Representation: Principles of dimensional modelling.	6	12
UNIT -II	4	OLAP: OLAP Architecture, Relational OLAP, Multidimensional OLAP, Relational Vs Multidimensional OLAP, Web based OLAP.	4	8
	5	Major features & functions: Drill down and Roll-up, Slice and Dice or Rotation.	4	8
	6	Recent Trends in Data Analysis: Introduction to Data lake and Hybrid Databases	4	8

		Introduction to Big Data: Definition of Big Data, Challenges with Big Data.		
UNIT -III	7	Data Mining Primitives, Languages, and System Architectures: Data mining primitives, Query language, Designing GUI based on a data mining query language, Architectures of data mining systems.	6	12
	8	Data mining Algorithms: Classification, clustering, association rules. Knowledge discovery: KDD process. Decision trees, Neural Networks, Genetic Algorithms.	6	12
	9	Information Privacy and Data Mining: Basic principles to protect information piracy, Primary aims of data mining, pitfalls of data mining.	4	8
UNIT -IV	10	Categories of Web Mining: Web Content Mining, Web Structure Mining, Web Usage Mining, Applications of Web Mining, and Agent based and Data base approaches, Web mining Software.	4	8
	11	Search Engines: Characteristics, Functionality, Architecture, Ranking of web pages, the search engine industry, the enterprise search.	2	4
	12	Data mining applications: Benefits of data mining, Applications in Retail industry, Applications in Telecommunications Industry, Applications in Banking and Finance.	2	4
TOTAL			50	100

Text Books:

1. Data Warehousing Fundamentals – Paulraj Ponnaiah, Wiley student Edition
2. Han, Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann.

Reference Books:

1. Alex Berson, S.J. Smith, "Data Warehousing, Data Mining and OLAP", Tata McGraw Hill
2. Margaret Dunham, "Data Mining: Concepts and Techniques", Morgan Kaufmann Pub.
3. Ralph Kimball, "The Data Warehouse Lifecycle toolkit", John Wiley.
4. Jiawei Han, Micheline Kamber, "Data Mining: Concepts and Techniques", 2nd edition, Morgan Kaufmann, ISBN 1558609016, 2006.
5. A B M Shaikat Ali, Saleh A Wasimi, "Data Mining: Methods and Techniques", Cengage Learning Pub.

Branch: BCA	Semester-VI
Subject Code: 6103	Lecture: 02 Credit: 02
Course Opted	Skill Enhancement Course - 3
Subject Title	INTERNET OF THINGS (IOT)

Course Objectives:

- To learn about IOT concepts and its Applications
- To learn various domains in IOT

Course Outcomes:

- Enable learners to understand System On Chip Architectures.
- Enable to learn ArduinoOpen Source Platform with hardware and installation.
- To develop physical interfaces and electronics of Raspberry Pi and program them using hand- on-training.

Modules	Sr. No.	Topic and Details	No of Lectures Assigned	Marks Weight age %
UNIT - I	1	Introduction to IOT , Features, IOT Applications, Advantages and Disadvantages, IOT Architecture & Domains, Components of IOT.	4	8
	2	IOT Devices, Technology, Protocols, Hardware and Software, Applications and its Usages	4	8
	3	IOT Testing, Analytics, IOT Ecosystem, IOT Platforms, IOT Communications: Data Link, Network Layer, Session Layer,	4	8
UNIT - II	4	Open – Source Prototyping Platforms for IoT: Basic Arduino Programming Extended Arduino Libraries, Arduino – Based Internet Communication, Raspberry PI, Sensors and Interfacing. IoT Technology: RFID + NFC, Wireless Networks + WSN, RTLS + GPS, Agents + Multi – Agent Systems, Composition Models for the Web of Things and resources on the Web, Discovery, Search, IoT Mashups and Others. Wireless Sensor Networks: History and Context, The Node, Connecting Nodes, Networking Nodes, Secured Communication for IoT.	6	12
	5	Data Management, Business Process and Analytics: Data Management, Business Process in IoT, IoT Analytics, Creative Thinking Techniques, Modification, Combination Scenarios, Decentralized and Interoperable Approaches, Object – Information Distribution Architecture, Object Naming Service (ONS), Service Oriented Architecture, Network of Information, Etc.	7	14

		Application and Use Cases: Concrete Applications and Use – Cases of Web Enabled Things: Energy Management and Smart Homes, Ambient Assisted Living, Intelligent Transport, Etc. M2M, Industrial IoT Applications.		
TOTAL			25	50

Text Books:

1. The Internet of Things (MIT Press) by Samuel Greengard.
2. The Internet of Things (Connecting objects to the web) by Hakima Chaouchi ,Wiley .
3. Internet of Things (A Hands-on-Approach) by Arshdeep Bhaga and Vijay Madiseti.

Reference Books:

1. The Internet of Things Key applications and Protocols, 2nd Edition, (Wiley Publication) by Olivier Hersent, David Boswarthick and Omar Elloumi.
2. IoT –From Research and Innovation to Market development, River Publication by Ovidiu Vermesan and Peter Friess.
3. Building Internet of Things with Arduino by Charalampos Doukas.

Branch: BCA	Semester-VI
Subject Code:6104	Lecture: 04 Credit: 04
Course Opted	Discipline Specific Elective – 4
Subject Title	MACHINE LEARNING

Course Objectives:

- To introduce students to the basic concepts and techniques of Machine Learning.
- To become familiar with regression methods, supervised and unsupervised learning
- To become familiar with the Applications of Machine Learning Algorithms

Course Outcomes:

- Gain knowledge about basic concepts of Machine Learning
- Identify machine learning techniques suitable for a given problem
- Solve the problems using various machine learning techniques
- Apply Dimensionality reduction techniques.
- Design application using machine learning techniques

Modules	Sr. No.	Topic and Details	No. of Lectures Assigned	Marks Weightage %
UNIT -I	1	Introduction to Machine Learning: History of Machine Learning, Introduction and installation of Python, NumPy and SciPy.	4	8
	2	Introduction and installation of Matplotlib, SymPy, Mathematical Foundations: L1 and L2 form, Type of Matrixes, Eigenvector and eigenvalues, Singular-Value Decomposition.	6	12
	3	Formation of Mean, Median, Mode, Confusion Matrix, Bias and Variance	5	10
UNIT -II	4	Linear regression: Meaning, Ordinary Least Squares Regression (OLSR), over fitting, Multivariate Adaptive Regression Splines (MARS).	5	10
	5	Logistic Regression: Meaning, Regularization, Regularized Linear Regression, Regularized Logistic Regression.	5	10
UNIT -III	6	Supervised Learning: Decision tree, Support Vector Machine (SVM).	5	10
	7	Random forest, Naive Bayes, and k-nearest neighbor, Neural Network.	5	10
UNIT -IV	8	Unsupervised Learning: k-means Clustering, Hidden Markov Model, DBSCAN Clustering.	5	10

	9	Unsupervised Learning: PCA, t-SNE, SVD, Association rule.	5	10
	10	Applications of Machine Learning Algorithms: Virtual Personal Assistants, Siri, Alexa, Google Home, Face Recognition, Email Spam and Malware Filtering etc.	5	10
TOTAL			50	100

Text Books:

1. Dr. Nilesh Shelke, Dr. Narendra Chudhari, Dr. Gopal Sakarkar "Introduction to Machine Learning ", DAS GANU PRAKASHAN
2. Dr. A Krishna Mohan, Dr. T Murali Mohan, Karunakar," Pyhton with Machine Learning", S. Chand Prakashan

Reference Books:

1. Introduction to machine learning, Ethem Alpaydin. —2nd ed., The MIT Press, Cambridge, Massachusetts, London, England.
2. Introduction to artificial neural systems, J. Zurada, St. Paul: West.
3. Machine Learning, Tom M Mitchell.

Branch: BCA	Semester-VI
Subject Code:6104	Lecture: 04 Credit: 04
Course Opted	Discipline Specific Elective - 5
Subject Title	BLOCKCHAIN TECHNOLOGY

Course Objectives:

- To understand what Blockchain is and why it is used
- To be able to explain the different components involved within Blockchain
- To know when and why to use Blockchain within an environment
- To understand cryptocurrency and hashing algorithms
- To apply blockchain optimization and enhancements technique to improve security and applications.

Course Outcomes:

- Explain cryptographic building blocks and reason about their security.
- Define Bitcoin's consensus mechanism. The immutable blockchain and appreciate how security comes from a combination of technical methods and clever incentive engineering.
- Learn how the individual components of the Bitcoin protocol make the whole system works: transactions, script, blocks, and the peer-to-peer network.
- Exploit applications of Blockchain in real world sceneries.

Modules	Sr. No.	Topic and Details	No of Lectures Assigned	Marks Weightage %
UNIT-I	1	Introduction: Definition and concepts, History, How blockchain is different from databases, nodes, cryptocurrency, Tokens, Motivation behind blockchain, characteristics of blockchain.	3	5
	2	Overview: Background of DLT, Types of Blockchain: (public (permissionless), private (permissioned) and consortium), Overview of Blocks: (Block attributes, Structure of block, block header, Linking block) Influence of Moore's Law on Blockchain technology.	4	10
UNIT-II	3	Cryptography: Concepts, Classical Cryptography, Cryptographic Primitives, Symmetric key cryptography: (Stream, Cipher, Block cipher, Data Encryption Standard (DES), Advanced Encryption Standard (AES), An example implementation of AES)	8	10

		Asymmetric key cryptography: (Prime Factorization, Discrete logarithm, Elliptic – curve, RSA algorithm).		
	4	Hashing: Hashing Algorithms: (Message Digest, SHA, Hashing example using an SHA -256 algorithm) Merkle Hash Trees, Encoding Schemes.	5	10
	5	Digital Signatures: Working, Signing Process, Verification Process, Creating an identity, Signature in transaction, asset ownership in blockchain – (Transferring an asset, Transmitting the transaction, claiming the asset), Blockchain Wallet.	5	5
UNIT-III	6	Networking in Blockchain: Peer – to – Peer (P2P) networking: (History of P2P network, P2P networking architecture), Network Discovery, Block Synchronization Cryptocurrency: (Basics, Key and address, Transactions, Mining and Consensus, Block Structure and Merkle Trees, Blockchain Networks viz. Testnet, Regtest and Bitcoin hard forks and altcoins).	5	10
	7	Blockchain Optimization and Enhancements: Blockchain Optimization: Transaction Exchange, Off-chain Transactions, Block size improvements Blockchain Enhancements: Sharding – (Components, Design and Cross – shard Communication), Evolution of consensus algorithm – (Proof of Stack (PoS), Proof of Activity (PoA)) Byzantine Fault Tolerance (BFT) consensus models – (Practical Byzantine Fault Tolerance (PBFT), Federated Byzantine Fault Tolerance (FBFT)).	8	15
UNIT-IV	8	Blockchain Security: Transaction Security Model: (Risks of the Security model) Decentralized Security Model: (Centralization due to cryptocurrency exchange, Centralization in mining pool) Attacks on the Blockchain: (Double-spend attacks, 51% attack, Eclipse attacks) Threats of Quantum Computing,	7	15

	9	Limitations and Use cases of Blockchain: Limitations: (Slower Process, Scalability, High Energy Consumption, Immutability, Inefficient, Self - Maintenance, High Cost, Maturity, Interoperability and Integration). Use Cases of Blockchain: (Tracking provenance in the supply chain, Financial System, Crow funding, Non – Profit autonomous organizations)	5	10
TOTAL			50	100

Text Books:

1. Koshik Raj, Foundations of Blockchain, Packt, Birmingham, Mumbai
2. Atul Kahate, Cryptography and Network Security, McGraw Hill

Reference Books:

1. Kaufman, C., Perlman, R., & Speciner, M., .Network Security, Private Communication in a Public world, 2nd ed., Prentice Hall PTR, 2002
2. Stallings, W., Cryptography and Network Security: Principles and Practice, 3rd ed., Prentice Hall PTR., 2003
3. Stallings, W., Network Security Essentials: Applications and Standards, Prentice Hall, 2000
4. Van Haren, Introduction to Blockchain Technology, Van Haren Publishing, 20 October 2019 by Melanie Swan, Blockchain, O'Reilly; 1 edition, 6 February 2015
5. Clarke, A.C., "Hazards of Prophecy: The Failure of Imagination," from *Profiles of the Future: An Inquiry into the Limits of the Possible*, 1962.
6. Satoshi Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System", <https://bitcoin.org/bitcoin.pdf>
7. Gautam N. Ramamoorthy, Samiha Z. Khan, "BITCOIN: BLOCKCHAIN BASED PEER TO PEER PAYMENT SYSTEM", 2020 IJRAR March 2020, Volume 7, Issue 1, <http://www.ijrar.org/papers/IJRAR2001834.pdf>

Branch: BCA	Semester-VI
Subject Code:6104	Lecture: 04 Credit: 04
Course Opted	Discipline Specific Elective - 6
Subject Title	BIG DATA AND CLOUD COMPUTING

Course Objectives:

- To provide learners with the comprehensive and in-depth knowledge of Cloud Computing concepts, technologies, architecture, implantations and applications.
- To provide sufficient foundations of cloud computing.

Course Outcomes:

- Learners will be able to articulate the main concepts, key technologies, strengths, and limitations of cloud computing.
- Learners will be able to apply form state-of-the-art cloud computing using open source technology.
- Learner will be able to identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc.
- Learner will be able to explain the core issues of cloud computing such as security, privacy, and interoperability.

Modules	Sr. No.	Topic and Details	No of Lectures Assigned	Marks Weightage %
UNIT-I	1	Introduction to Big Data: Characteristics of Data, Evolution of Big Data, Definition of Big Data, Challenges with Big Data, What is Big Data?, Other Characteristics of Data, Why Big Data?, Information?, Traditional Business Intelligence (BI) versus Big Data.	7	14
	2	Introduction of Hadoop and its Installation: Modules, history, Ecosystem, Architecture, advantages and disadvantages, Analytics Tools, Components and Domain. MapReduce	6	12
UNIT-II	3	Introduction to Cloud Computing: Characteristics and benefits of Cloud Computing, Advantages and disadvantages, History, Architecture: The cloud reference model. Infrastructure as a service. Platform as a service. Software as a service. Types of clouds. Technologies and the processes required when deploying web services; Deploying a web service from inside and outside a cloud architecture, advantages and disadvantages.	7	14
	4	Virtualized Environments: Taxonomy of Virtualization Techniques. Virtualization and Cloud Computing. Pros and Cons of Virtualization. Cloud service Providers. - CLOUD APPLICATIONS Technologies and the processes required when deploying web services; Deploying a	6	12

		web service from inside and outside a cloud architecture, advantages and disadvantages.		
UNIT-III	5	Cloud IT Model: Analysis of Case Studies when deciding to adopt cloud computing architecture. How to decide if the cloud is right for your requirements. Cloud based service, applications and development platform deployment so as to improve the total cost of ownership (TCO).	6	12
	6	Introduction to OpenStack: OpenStack test-drive, Basic OpenStack operations, OpenStack CLI and APIs, Tenant model operations, Quotas, Private cloud building blocks.	6	12
UNIT-IV	7	Deployment: Controller deployment, Networking deployment, Block Storage deployment, Compute deployment, deploying and utilizing OpenStack in production environments, building a production environment, Application orchestration using OpenStack Heat.	6	12
	8	Apache Spark: Introduction, Architecture, Components, Spark RDD, in-built Functions. AWS Web services, Services: Computer, Network, Storage, Database, Analytics, Applications SSH using putty and filezilla.	6	12
TOTAL			50	100

Text Books:

1. Mastering Cloud Computing, Rajkumar Buyya, Christian Vecchiola, S ThamaraiSelvi, Tata McGraw Hill Education Private Limited, 2013.
2. OpenStack in Action, V. K. CODY BUMGARDNER, Manning Publications Co, 2016

Reference Books:

1. OpenStack Essentials, Dan Radez, PACKT Publishing, 2015.
2. OpenStack Operations Guide, Tom Fifield, Diane Fleming, Anne Gentle, Lorin Hochstein, Jonathan Proulx, Everett Toews, and Joe Topjian, O'Reilly Media, Inc., 2014<https://www.openstack.org>

Branch: BCA	Semester-VI
Subject Code:6105	Lecture: 12 Credit: 06
Course Opted	Core Course - 20
Subject Title	PROJECT

Objective:

The Project work enables students to involve themselves completely to develop their project for solving problems of software industry or any research organization. Doing this will give more exposure to students to handle real life problems of project development. The project covers study of existing system & System Requirements, Analysis, Design and Coding and presentation of result to demonstrate proficiency in the design of research.

Guidelines:

1. Project Topic:

1. To proceed with the project work it is very important to select a right topic. Project can be undertaken on any subject addressing IT programme. Research and development projects on problems of practical and theoretical interest should be encouraged.
2. Project work must be carried out by the group of maximum four students and minimum two and must be original.
3. Students can certainly take ideas from anywhere, but be sure that they should evolve them in the unique way to suit their project requirements.
4. The project work can be undertaken in a research institute or organization/company/any business establishment and work professionally and independently to continue to be an entrepreneur. Student must consult internal guide along with external guide (if any) in selection of topic.
5. Head of department and senior staff in the department will take decision regarding selection of projects.

2. Project Proposal:

A proposal as per the format given should be prepared once the topic is selected. It should not be more than 3-4 pages and need not be sent separately. The format for the same is:

1. Title of Project
2. Objectives
3. Need for topic and Modules
4. Tools and Technology to be used in Project.
5. Methodology and Procedure of work.
6. Detailed information of Guide (Name, Address, qualification and Experience)

3. No Objection Certificate:

If the project is carried out in a company or organization, then a certificate for no objection of same needs to be presented. It should mention that the organization has no objection in publishing the findings of the project study.

The certificate should contain the name of the authority with signature and company stamp and should be given on company's letterhead and duly signed by authorized signatory.

4. Project Report Format:

At the end of semester a student need to prepare a project report (Black book) should be prepared as per the guidelines given by the University and College. Along with project report a

CD containing: project documentation, Implementation code, required utilities, Software's and user Manuals need to be attached.

1. Abstract
2. Introduction
3. Literature Survey
 1. Survey Existing system
 2. Limitation existing system or research gap
 3. Problem Statement and Objectives
 4. Scope
4. Proposed System
 1. Analysis/Framework/ Algorithm
 2. Details of Hardware & Software
 3. Design details (ER Diagram, Data Dictionary, Table Design etc.)
 4. Methodology (your approach to solve the problem)
5. Screenshots
6. Coding
7. Conclusion
8. References

5. Term Work:

Student has to submit weekly progress report to the internal guide and where as internal guide has to keep track on the progress of the project and also has to maintain attendance report. This progress report can be used for awarding term work marks. Distribution of marks for term work will be as follows

1. Weekly Attendance on Project Day
2. Project work contribution as per objective
3. Project Report (Hard Bound)
4. Term End Presentation (Internal)

The final certification and acceptance of team work ensures the satisfactory performance on the above aspects.

6. Oral & Practical:

Oral & Practical examination of Project should be conducted by Internal and External examiners at College Level. Students have to give presentation and demonstration on the Project.