Course Outcome - B.C.A

Course Outcomes: I Year – Problem solving techniques
CO1.1: Introduction to software, programming concepts such as structured programming and modular programming, skill to develop logic for problems using algorithms and flowcharts and overview of C programming language.
CO1.2: Managing input output operations, decision making structures, branching and looping structures with examples being implemented in C programming.
CO1.3: Ability to define data types and use them in simple data processing applications using the concept of arrays, strings and storage classes.
CO1.4: Gain knowledge on various types of functions, recursive functions, their implementation using various examples, concept of pointers, dynamic memory allocation, Ability to define function, analyzes, and interprets the concept of pointers, dynamic memory allocation, defining and using macros.
CO1.5: Ability to define structures and union and understand the differences, user defined data types and text and binary files and their implementation using suitable examples.
Course Outcomes: I Year – Computer Organization and Architecture
CO2.1: Gain knowledge on basics of computer architecture and organization, logic gates and digital gates.
CO2.2: Understand Boolean Algebra, De Morganâ€™s Theorem, SOP and POS simplification and Karnaugh Map, and to design Combinational Circuit and Sequential Circuits.
CO2.3: Gain knowledge on various computer instructions, processor structure and function and types of parallel processor systems.
CO2.4: Understand the memory organization, memory systems, mapping process and external memory.
CO2.5: Gain knowledge on Input / output organization, external devices and external Interconnection Standards.
Course Outcomes: I Year – Mathematical Foundations for Computer Applications

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CO3.1: Gain knowledge on sets, set operations, relations, functions, mathematical logic and switching systems.
CO3.2: Understand matrices and determinants, types of matrices, minors, cofactors, inverse of matrix, eigen values and eigen vectors.
CO3.3: Understand permutations and combinations, application in problems, vectors- dot and cross product.
CO3.4: Gain knowledge on Groups, Graph terminologies, types of graphs, operations on graphs, incidence matrix and adjacency matrix representation of graphs.
CO3.5: Gain knowledge on Analytical Geometry in 2 dimensions and problems based on the concept of equation of straight line, distance of point from a line.
Course Outcomes: I Year – Data Structures
CO4.1: Gain knowledge on Data organization, Data structures, design and analyze the time and space efficiency of the data structure, representation of linear arrays in memory, and operations on linear array with implementation in C programming language.
CO4.2: Design and analysis of various sorting techniques, comparison, tracing of algorithms with examples, searching techniques like linear search and binary search, their comparison and various string processing techniques and pattern matching algorithm.
CO4.3: Gain knowledge on linked list creation, operations on linked lists like insertion, deletion, types of linked lists -singly linked list, doubly linked list, circular linked list and their implementation using arrays and pointers and the concept of Garbage collection, implementation using C language.
CO4.4: Understanding stacks and queues, operations on stacks and queues, applications of stacks and queues â€“ Recursion, Towers of Hanoi problem, Polish notation, implementation of stacks and queues.
CO4.5: Ability to gain knowledge in practical applications of data structures like trees and graphs, their representation in memory, and operations like insertion and deletion, implementation using C language.
Course Outcomes: I Year – Data Base Management Systems
CO5.1: Understanding Database Management System, Database concepts, architecture, classification of DBMS.
CO5.2: Gain knowledge on Data modelling using ER model, data model, Record storage and primary file organization, Hashing techniques.
CO5.3: Relational Data Model and Relational Algebra, Examples of Relational Algebra queries, Functional Dependencies, Transitive Dependency and Normalization for Relational Database.

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CO5.4: Relational Database Language, Data types, DDL and DML queries, Nested Queries, PL/SQL, Applications of various types of SQL queries and their implementation.
CO5.5: Understand Transaction Processing Concepts, Concurrency Control techniques, Distributed Databases and Client Server Architecture and ACID properties
Course Outcomes: B.C.A: Numerical and Statistical Methods
CO6.1: Floating point representation of numbers, types of errors- Round-off errors, Truncation, Absolute, Relative errors; finding roots of algebraic and transcendental equations â€“ Bisection, Regula Falsi and Second method and their comparison.
CO6.2: Interpolation and systems of linear equations -Newton Gregory interpolation formula, Lagrangeâ€™s interpolation formula; numerical solution of systems of linear equations- Gauss Elimination, Gauss Jordan, Jacobi methods, Gauss Seidel Iterative method.
CO6.3: Gain knowledge on fundamentals of statistics, correlation, regression and their applications.
CO6.4: Gain knowledge on Probability and random variables, Bayes theorem, probability mass function and applications based on these concepts.
CO6.5: Joint probability, marginal probability distribution, conditional probability distribution, Theoretical distributions like Bernoulli, Binomial, Poisson and Normal.
Course Outcomes: Practicals – C Programming Lab
COP1.1: Ability to gain problem solving skills and implementation using C programming control structures such as decision making, looping, functions and pointers.
COP1.2: Ability to gain problem solving and coding skills using C programming String manipulation, macros, command line arguments, structures and files.
Course Outcomes: Practicals – Computer Architecture and Organization Lab
COP2.1: Study of logic gates and flip flops, implementation of shift registers.
COP2.2: Design of combinational logic circuits, multiplexer, demultiplexer, parity generator and checker circuits.
Course Outcomes: Practicals – Data Structures Lab
COP4.1: Implementation of searching techniques, sorting techniques, string manipulation using pointers, stacks, linear and circular queues, creation of binary search tree.

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COP4.2: Implementation of data structure operations on linked lists, applications of stack like recursion and Towers of Hanoi problem, evaluation of postfix expression.
Course Outcomes: Practicals – DBMS LAB
COP5.1: Design of queries for creation of database, tables with primary key and foreign key constraints, data manipulation operations like insertion, deletion, modification, creation of views and displaying of records.
COP5.2: Creation of multiple tables in database, establishing relationship between them and designing complex queries, nested queries, Entity Relationship diagram for case studies of Bank Database and College Database.
Course Outcomes: II Year – Object Oriented Programming using JAVA
CO7.1: Understanding the concepts of Object-oriented, event driven and concurrent programming paradigm using JAVA.
CO7.2: Understanding classes and objects, arrays, strings, vector, the concept of constructors, inheritance, real life objects can be implemented by creating classes as blueprint and introducing methods for actions.
CO7.3: Gain knowledge on Packages and Interfaces which provides code reusability and naming collision which is very useful in real time projects in companies and also multithreading programming and synchronization methods.
CO7.4: Handling of Exceptions mainly used to manage problems ranging from hard disk crash to simple programming errors and also creation of applets, understanding difference between applets and applications, Event handling mechanism, Abstract Windowing Toolkit AWT classes and controls.
CO7.5: Ability to handle files, input and output streams in Java
Course Outcomes: II Year – Operating System and Linux
CO8.1: Gain knowledge on basic operating system concepts, ad processes relevant to operating system such as process creation, management and scheduling algorithms.
CO8.2: Gain knowledge on Process synchronization, process state transitions, Classical Problems of synchronization, Deadlock recovery, avoidance and prevention.
CO8.3: Understand the concepts of Memory management, page management, file management, disk management in operating systems.
CO8.4: Gain knowledge on Linux, Files and file organization, wild card, system permissions, file handling.

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CO8.5: Gain programming skills using shell scripting in Linux.
Course Outcomes: II Year – Design and Analysis of Algorithms
CO9.1: Gain knowledge on algorithms, Design and Analysis Framework, Asymptotic notations, Analysis of Non-recursive and Recursive algorithms and various algorithm design paradigms, solving problems using Brute force technique.
CO9.2: Ability to derive and solve the time complexities of algorithms using divide and conquer, decrease and conquer, transform and conquer strategies.
CO9.3: Ability to solve problems using graph algorithms and analyse using Greedy method, Dijkstraâ€™s shortest path algorithm.
CO9.4: Devise optimal solution for recursive problems using Dynamic programming paradigm.
CO9.5: Solution for problems on Backtracking and Branch and Bound techniques, finding a feasible solution for decision problems, P and NP problems.
Course Outcomes: II Year – Microprocessor and Assembly Language
CO10.1: Understand the architecture of 8085 microprocessor and memory and Input/Output Interfacing.
CO10.2: Gain knowledge on instruction formats, classification of instructions, addressing modes and to write the basic assembly language programs.
CO10.3: Apply 8085 programming techniques such as looping, counting, indexing, stacks and subroutines to various assembly language programs.
CO10.4: Understand the memory and I/O mapping and interfacing along with vectored and non-vectored interrupts.
CO10.5: Understand the interfacing of peripherals and its applications, such as 8279 programmable keyboard /display interface, 8255 PPI, 8259 PIC, DMA and 8257 DMA controller, RS232 interface.
Course Outcomes: II Year – Web Programming
CO11.1: Understand the basics of Internet, web, web pages, www, and Web Server, tools for designing web pages HTML, XHTML, identify elements and attributes in web page, Lists and Tables.
CO11.2: Usage of Forms, Frames in HTML, CSS style sheets and creation of web pages using XHTML and Cascading Style Sheets.

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CO11.3: Ability to use Javascript for solving simple problems.
CO11.4: Understand Javascript execution environment, Document object model, Event handling and embedding objects in web page.
CO11.5: Build dynamic web pages using JavaScript (Client-side programming), XML document structure and web services.
Course Outcomes: II Year – Software Engineering
CO12.1: Gain knowledge on software process models, professional responsibility, computer-based system engineering, requirements and specifications.
CO12.2: Understand software prototyping, user interface prototyping, and software design and domain specific architecture.
CO12.3: Gain knowledge on object oriented and function-oriented design, user interface design.
CO12.4: Gain knowledge on software reliability metrics, statistical testing, fault avoidance and tolerance, exception handling, defensive programming, software reusability.
CO12.5: Gain knowledge on software testing and its importance, test planning and strategies, project management, quality management, cost estimation and software maintenance.
Course Outcomes: Practicals – II year- JAVA Lab
COP7.1: Ability to gain programming skills by implementing the concepts of string operations, method overloading, method overriding, constructor overloading, multi-threading and file handling in Java.
COP7.2: Implementation of Exception handling, Applet programming, AWT concepts, Event handling and Animation in Java.
Course Outcomes: Practicals – II year- OPERATING SYSTEM AND LINUX LAB
COP8.1: Ability to write Linux shell script for simple problems, test UNIX file commands, creating of files, file types and permissions.
COP8.2: Ability to write Linux shell script using control structures, file compression and decompression, usage of regular expressions -grep command, to execute command at scheduled time.
Course Outcomes: Practicals – II year- ASSEMBLY LANGUAGE PROGRAMMING LAB

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COP10.1: Usage of simulator software to execute assembly language programs in 8085, for addition, subtraction, exchange, transfer of block of data, multiplication, sorting of numbers.
COP10.2: Ability to write assembly language programs to find ones and twos complements, largest of numbers, counting number of 1s and 0s, division and generation of Fibonacci numbers.
Course Outcomes: Practicals – II year- WEB PROGRAMMING LAB
COP11.1: Creation of HTML form with various elements and writing JavaScript code for various operations, creating dynamic effects and including layers and basic animation and event handling.
COP11.2: Ability to apply the knowledge gained in creating small websites using HTML, CSS, JavaScript and XML.
Course Outcomes: III Year B.C.A- DATA COMMUNICATION AND NETWORKS
CO13.1: Ability to understand Data communication concepts, Computer Networks, protocols and standard model of communication (OSI and TCP/IP).
CO13.2: Ability to understand the process of data transmission, switching, multiplexing by taking telephone networks and cable TV as real time example.
CO13.3: Ability to understand the concept of error detection and correction, framing, flow and error control along with IEEE standards and its types, reservation, polling, token passing, channelization.
CO13.4: Understand the concept of wireless networks, connecting devices, SONET, IP Addressing, mapping and delivery, forwarding and routing concepts.
CO13.5: Knowledge on transport layer, UDP, TCP and application layer protocols like Domain Name System; Telnet, E-maill, FTP, WWW and HTTP.
Course Outcomes: III Year - COMPUTER ARCHITECTURE
CO14.1: Knowledge on computer organization and architecture, digital logic circuits, combinational and sequential circuits and integrated circuits.
CO14.2: Gain knowledge on registers, shift registers, Decoders, Encoders, Multiplexers, Binary counters, and to understand the structure of RAM and ROM ICs.
CO14.3: Gain knowledge on CPU organization, Bus structure, micro-operations, instruction formats, addressing modes, RISC and CISC computers.
CO14.4: Understanding Input output organization, Direct Memory Access, modes of data transfer, Programmed I/O and Interrupt driven I/O, Memory Hierarchy, Associative memory, Cache memory, Virtual memory.

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CO14.5: Knowledge on parallel processing systems, multiprocessors, clusters, multi core, GPGPUs, Performance issues, Amdahlâ€™s law, Mooreâ€™s law, Littleâ€™s law.
Course Outcomes: III Year- Python Programming
CO15.1: Understand Python programming basics and control structures.
CO15.2: Gain knowledge on use of Python functions, anonymous functions, recursive functions and modules for code reusability, command line arguments and to be able to write simple Python programs for solving problems.
CO15.3: Ability to use data structures in Python such as arrays, lists, tuples, dictionaries and sets.
CO15.4: Ability to develop programmes on files, Binary data interchange formats, Exception handling, defining and using regular expressions in Python.
CO15.5: Ability to develop small applications on GUI, Data Visualization, Database connectivity in Python.
Course Outcomes: III Year- Data Warehousing and Data Mining
CO16.1: Knowledge on functionalities of Data Mining, Data Warehouse Architecture and Online Analytical Processing systems.
CO16.2: Knowledge on importance of Data pre-processing and its techniques and algorithms for Association Analysis.
CO16.3: Ability to implement various Classification algorithms, linear and non-linear prediction techniques.
CO16.4: Knowledge on various clustering techniques and its implementation and Outlier analysis.
CO16.5: Understanding mining complex types of data in various domains and various application areas of Data Mining.
Course Outcomes: III Year- Project
CO22.1: Ability to do literature survey, select suitable problem, understand system requirements, and prepare the Software Requirement Specification document for minor project.
CO22.2: Ability to design the system â€“ form design, database design, report design.

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CO22.3: Implementation of the system using latest trends in technologies.
CO22.4: Verification and validation of Software developed, using Software Testing methods.
CO22.5: Documentation of the whole process and generation of project report.
CO23.1: Ability to do literature survey, select suitable problem, understand system requirements, and prepare the Software Requirement Specification document for major project.
CO23.2: Ability to design the system â€“ form design, database design, report design.
CO23.3: Implementation of the system by coding using suitable software tools.
CO23.4: Verification and validation using Software Testing methods.
CO23.5: Documentation of the whole process and generation of project report.
Course Outcomes: III Year- System Programming
CO18.1: Gain knowledge on various system software components and IBM 360/370 instruction set.
CO18.2: Ability to design assemblers and also gain knowledge about the databases involved, table processing processes, various techniques of searching and sorting.
CO18.3: Usage of macro processor programs for language expansion and standalone programs to process any kind of text.
CO18.4: Gain knowledge about various loader schemes, activities such as allocation, linking, relocation and loading, binders, overlays, data structures and algorithms.
CO18.5: Gain knowledge about compilers needed to implement a programming language, the different phases of compiler design, data structures, storage classes, and optimization techniques are learnt.
Course Outcomes: III Year- Design and Analysis of Algorithms
CO19.1: Gain knowledge on algorithms, Design and Analysis Framework, Asymptotic notations, Analysis of Non-recursive and Recursive algorithms and various algorithm design paradigms, solving problems using Brute force technique.

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CO19.2: Ability to derive and solve the time complexities of algorithms using divide and conquer, decrease and conquer, transform and conquer strategies.
CO19.3: Ability to solve problems using graph algorithms and analyse using Greedy method, Dijkstraâ€™s shortest path algorithm.
CO19.4: Devise optimal solution for recursive problems using Dynamic programming paradigm.
CO19.5: Solution for problems on Backtracking and Branch and Bound techniques, finding a feasible solution for decision problems, P and NP problems.
Course Outcomes: III Year- Data Analytics
CO20.1: Gain knowledge on types of data, types of analytics and the process of data analytics and introduction to R programming.
CO20.2: Knowledge about Descriptive analytics, data collection methods, graphical data description, inferential statistics, measures of central tendency, probability distributions, Hypothesis testing and implementation using R programming.
CO20.3: Gain knowledge on Predictive analytics, regression types, KNN, Analysis of Variance ANOVA and implementation of algorithms using R programming.
CO20.4: Gain knowledge about various supervised and unsupervised machine learning algorithms and implementation using R using datasets.
CO20.5: Understand the concepts of Big Data, Hadoop Ecosystem, Hadoop streaming, HDFS and Mapreduce.
Course Outcomes: Practicals – PYTHON PROGRAMMING LAB
COP15.1: Gain programming skills in Python to solve simple problems using looping structures, decision structures, functions, modules strings, lists, tuples, dictionaries, sets.
COP15.2: Implement concepts of objects, inheritance, exception handling, file handling, data visualization using Python programming.
Course Outcomes: Practicals – DATA WAREHOUSING AND DATA MINING LAB
COP16.1: Implementation of Data mining operations such as Data cleaning, Data pre-processing, and association analysis.
COP16.2: Creation of data sets and implementation of Data classification, prediction and clustering algorithms on various data sets.

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Course Outcomes: Practicals – DATA ANALYTICS LAB
COP20.1: Implementation of the concepts of select, split, transform using R, hypothesis testing, data visualization, time series analysis, machine learning algorithms-Linear regression, logistic regression, Classification algorithm -NaÃ¯ve Bayes classifier, decision tree and clustering algorithms-K means clustering.
COP20.2: Implementation of Big Data and Hadoop concepts such as file management tasks, execution of Mapreduce applications, matrix multiplication, Hadoop streaming.

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