Course Structure & Syllabus of BCA
Applicable for Batch: 2023-26

DIT UNIVERSITY
Dehradun

Detailed Course Structure & Syllabus
of
Bachelor of Computer Application

Approved by the Academic Council in its 22nd Meeting held on 06.03.2023

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Course Structure of the BCA Program in School of Computing

Basket/Area	Min Credits To be taken	Credit per course	Courses
Language and Literature (LL) Core: Professional Communication, Corporate communication English Language Teaching	9	3	3
Discipline Core (DC) Core: FOC, Programming for Problem Solving, DS, DM,CO, OS, DE, WT, CN, CG, CBNST, SE, DAA, Python, Data science, DBMS, IJP, AJP	72	4	18
Discipline Elective (DE) Mobile Applications development using Android Multimedia Tools Artificial Intelligence Advance Web Applications	6	3	2
Free Elective(FE) **Choose any one from FE basket**	3	3	1
Skill Enhancement Courses (SEC)* Core: Technical Training1, Technical Training2	8	4	2
Ability Enhancement(AEC) Aptitude and Soft Skills training	2	2	1
Minor Project	4	4	1
Capstone Project (TP) Mode A: Project with a department faculty Mode B: Project as part of Industry Internship Mode C: Project in an academic institute/lab of National Importance. All Modes must be semester long	12	12	1
Total Credits	116		

** Credits in SEC courses may vary*

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A Sample Plan of Study

A Sample BCA Plan of Study for 3 Years is mentioned below

Course Syllabus: BCA

Year: 1ST **Semester: I**

Course Category	Course Code	Course Title	L	T	P	Credit
DC	CAF101	Fundamentals of Computer	3	0	2	4
DC	CAF102	Programming for Problem Solving	3	0	2	4
DC	CAF103	Discrete Mathematics	3	1	0	4
DC	CAF104	Digital Logic & Computer Design	3	1	0	4
LL	LAF181	Professional Communication	2	0	2	3
		Total				**19**

Year: 1st **Semester: II**

Course Category	Course Code	Course Title	L	T	P	Credit
DC	CAF105	Computer Based Numerical Techniques	3	0	2	4
DC	CAF106	Data Base Management System	3	0	2	4
DC	CAF107	Computer Organization	3	1	0	4
DC	CAF108	Data Structures in C	3	0	2	4
LL	LAF184	Corporate Communication & Soft skill	3	0	0	3
		Total				**19**

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Year: 2nd **Semester: III**

Course Category	Course Code	Course Title	L	T	P	Credit
DC	CAF201	Operating Systems	3	1	0	4
DC	CAF202	Introduction to Java Programming	3	0	2	4
DC	CAF203	Web Technologies	3	0	2	4
DC	CAF204	Design and Analysis of Algorithms	3	0	2	4
LL	LAF183	English Language Teaching	3	0	0	3
AEC	UCF201	Aptitude and Soft Skills Training	2	0	0	2
Total						**21**

Year: 2nd **Semester: IV**

Course Category	Course Code	Course Title	L	T	P	Credit
DC	CAF205	Software Engineering	3	1	0	4
DC	CAF206	Computer Networks	3	1	0	4
DE	CAF251/ CAF252	*Mobile Applications development using Android *Advanced Web Applications	2	0	2	3
DC	CAF207	Advanced Java Programming	3	0	2	4
SEC	CAF109	Technical Training -1	2	0	4	4
PRJ	CAF209	Minor Project	0	0	8	4
Total						**23**

Summer	Course Code	Course	Name of Course	L	T	P	Credits
1	CAF208	SEC	Technical Training 2	2	0	4	4

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Year: 3rd **Semester: V**

Course Category	Course Code	Course Title	L	T	P	Credit
DC	CAF301	Introduction to Data Science	3	0	2	4
DC	CAF302	Computer Graphics	3	0	2	4
DC	CAF303	Python Programming	3	0	2	4
DE	CAF351/CAF352	Multimedia Tools/ Artificial Intelligence	2	0	2	3
FE		Free Elective	3	0	0	3
TOTAL						18

Year: 3RD **Semester: VI**

Course Category	Course Code	Course Title	L	T	P	Credit
PRJ	CAF304	Capstone Project	0	0	24	12
TOTAL						**12**

Total Credit: 116

Free Electives

	Free Electives				
	Name of Courses	**L**	**T**	**P**	**C**
ECF483	Digital Image processing (ECE)	2	0	2	3
CSF381	Software Project Management	3	0	0	3
CSF345	Introduction to Data Science	3	0	0	3
CSF482	Introduction to Cyber security	3	0	0	3
CEF481	Environmental Management & Sustainability	3	0	0	3
ECF481	Analog Electronics	3	0	0	3
CEF348	Air & Water Pollution	3	0	0	3
MEF481	Total Quality Management	3	0	0	3

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Course Structure & Syllabus of BCA
Applicable for Batch: 2023-26

BCA Course Description Document

1. School offering the course	SOC
2. Course Code	**CAF101**
3. Course Title	**Fundamentals of Computer**
4. Credits (L:T:P:C)	3:0:1:4
5. Contact Hours (L: T:P)	3:0:2
6. Prerequisites (if any)	None
7. Course Basket	Discipline Core

Course Summary

This course will introduce students with the basics of computer- Hardware, Software, Operating System, Communication Systems. This course will also make students to be familiar with Office Tools – MS-Word, MS-Excel and MS- Power Point.

Course Objectives

The main objective of this course is to aware the student with the basics of computer- Hardware, Software, Operating System, Communication Systems. Students need to be familiar with Office Tools – MS-Word, MS-Excel, and MS- Power Point.

Course Outcomes

On successful completion of the course, students will be able to achieve the following:

CO1: Demonstrate the knowledge of the basic structure, components, features, and generations of computers
CO2: Compare and contrast features, functioning & types of operating system and computer network
CO3: Describe the concept of Communication Systems and transmission mode.
CO4: Demonstrate the application of the office tools - MS-Word, MS-Excel and MS- Power Point

Curriculum Content

UNIT 1: Computer (6L)

Introduction, characteristics of computer; History of computers; classification of computers on size, architecture and chronology; Applications of computers; Commonly used terms–Hardware, Software, Firmware; Computer Architecture and organization; Input, Process and Output; Representation of information; BIT, BYTE.

UNIT 2: Memory (6L)

Memory, Memory size; Units of measurement of storage; Input/output devices; Secondary storage devices; Networking concepts - LAN, WAN and Topologies: Types of software; system and application software.

UNIT 3: Operating System (8L)

Operating system concepts, Different types of operating systems, structure of operating system/UNIX/LINUX commands, Data Processing, File systems and Database Management Systems, Different types of Database Management System.

UNIT 4: Communication System (8L)

Basic elements of a Communication System, Data transmission modes, Data Transmission speed, Data transmission media, Digital and Analog Transmission, Network topologies, Network Types (LAN, WAN and MAN), Communication protocols, Internetworking tools, Distributed Computing Systems.

UNIT-5: MS Office (8L)

Introduction to open office/MS office. Word Processing: Formatting Text, Pages, Lists, Tables. Spreadsheets: Worksheets, formatting data, creating charts and graphs, using formulas and functions, macros, Pivot Table). Presentation Tools: Adding and formatting text, pictures, graphic objects, including charts, objects, formatting slides, notes, hand-outs, slide shows, using transitions, animations.

Text Books

1. Fundamental of Computers, V. Rajaraman, B.P.B. Publications, 3rd Edition, 2011
2. Fundamental of Computers, P.K. Sinha, B.P.B Publication, 6th Edition, 2008

Reference Books

1. Computer Today, Suresh Basandra, Galgotia Publication ,1stedition,2010
2. Unix Concepts and Application, Sumitabha Das, Tata Mc-Graw Hills, 4th edition, 2008.
3. MS-Office 2000(For Windows), Steve Sagman, Peachpit press, 1st Edition, 1999.

TEACHING AND LEARNING STRATEGY

All materials (ppts, assignments, labs, etc.) will be uploaded in Moodle. Refer to your course in Moodle for details

List of practical:

1. Introduction to Personal Computer: Hardware, Software
2. Introduction to basic commands of DOS and Linux
3. Installing Windows XP in Personal Computer
4. Creation of Resume in Windows MS Office
5. Creation of MS Excel Table and performing some mathematical function
6. Creation of pie chart, histograms in excel
7. Creating mail merge in MS Word.
8. Creating macro in excel.
9. Creation of MS PowerPoint using different animation and effects in the power point.
10. Introduction to basic commands of Linux

Course Structure & Syllabus of BCA
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BCA Course Description Document

1. School offering the course	SOC
2. Course Code	**CAF102**
3. Course Title	**Programming for Problem Solving**
4. Credits (L:T:P:C)	3:0:1:4
5. Contact Hours (L:T:P)	3:0:2
6. Prerequisites (if any)	None
7. Course Basket	Discipline Core

Course Summary

This course contains the fundamental concepts about the computer hardware and intends to provide to students about the knowledge of C language

Course Objective

The objective of the course is to make the students understand the key hardware components in a modern computer system. The student shall also be able to learn the computer programs using C language by exploring the various features of C.

Course outcomes

On successful completion of the course, students will be able to achieve the following:

CO1: Implement conditional branching, iteration and recursion to formulate algorithms and programs.
CO2: Decompose a problem into functions and synthesize a complete program using divide and conquer approach.
CO3: Use arrays (1-D, 2-D), pointers and structures to formulate algorithms and programs.
CO4: Apply programming to solve matrix addition and multiplication problems and searching and sorting problems

Curriculum Content

UNIT 1: Introduction to Computer, Programming & algorithms (8L)

Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.).

Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples, From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code.

UNIT 2: Arithmetic Expression, and Conditional statements, Loops, Expression: (7L)

Arithmetic, Logical, Relational expressions and precedence. Loops & Branching: Writing and evaluation of conditionals and consequent branching, Iteration and loops.

UNIT 3: Arrays & Functions (7L)

Arrays: Arrays (1-D, 2-D), Character arrays and Strings. Functions: functions (including using built in libraries), Parameter passing in functions, call by value, passing arrays to functions: idea of call by reference.

Searching & Sorting: Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required).

UNIT 4: Recursion and Structure **(8L)**

Recursion: Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Structure: Structures, Defining structures and Array of Structures.

UNIT 5: Pointers & File handling **(7L)**

Pointers: Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list. File handling: different modes of opening a file in C, reading, writing from files.

Text Books

1. Byron Gottfried, "Schaum's Outline of Programming with C", 2nd edition 2006 McGraw-Hill.
2. E. Balaguruswamy, "Programming in ANSI C", 6th Edition 2010, Tata McGraw-Hill.

References

1. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", 2nd edition 1988, Prentice Hall of India.

TEACHING AND LEARNING STRATEGY

All materials (PPT, assignments, labs, etc.) will be uploaded in Moodle. Refer to your course in Moodle for details.

Lab Practical:

S.NO.	EXPERIMENT NAME
1	Familiarization with programming environment.
2	Programming for Problems involving if-then-else structures.
3	Programming for Iterative problems e.g., sum of series.
4	Programming for 1-D Array manipulation.
5	Programming for Matrix problems, String operations.
6	Programming for Simple functions
7	Programming for Recursive functions.
8	Programming for Pointers and structures.
9	Programming for File operations
10	Programming for solving Numerical methods problems

Course Structure & Syllabus of BCA
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BCA Course Description Document

1. School offering the course	SOC
2. Course Code	**CAF103**
3. Course Title	**Discrete Mathematics**
4. Credits (L:T:P:C)	3:1:0:4
5. Contact Hours (L:T:P)	3:1:0
6. Prerequisites (if any)	None
7. Course Basket	Discipline Core

Course Summary

This course provides the knowledge of sets, relations and functions, it also explains partial order relations and lattices, graphs, propositional logic, groups and rings.

Course Objectives

The course objective is to provide students with an overview of discrete mathematics. Students will learn about topics such as sets, relations, functions, graph theory, propositional logic, group and ring theory and other important discrete math concepts.

Course Outcomes

On successful completion of the course, students will be able to achieve the following:

CO1: Understand the basic principles of sets theory, relations and functions.
CO2: Ability to define the basic concepts of graphs, directed graphs, and weighted graphs.
CO3: Write an argument using logical notation and determine if the argument is or is not valid.
CO4: Ability to use group theory and ring theory.

Curriculum Content

Unit 1: Sets, Relations and Functions (8L)

Sets, Subsets, Equal Sets Universal Sets, Finite and Infinite Sets, Operation on Sets, Union, Intersection and Complements of Sets, Cartesian Product, Cardinality of Set, Simple Applications. Properties of Relations, Equivalence Relation, Partial Order Relation Function: Domain and Range, Onto, Into and One to One Functions, Composite and Inverse Functions, Hashing functions, Recursive function.

Unit 2: Partial Order Relations and Lattices (8L)

Partial Order Sets, Representation of POSETS using Hasse diagram, Chains, Maximal and Minimal Point, Glb, lub, Lattices & Algebraic Systems, Principle of Duality, Basic Properties, Sublattices, Distributed &Complemented Lattices.

Unit 3: Graphs (8L)

Types and operations (bipartite graph. Subgraph, distance of a graph, cut-edges & cut vertices, isomorphic and homomorphic graphs), degree of graphs, adjacent and incidence matrices, path circuit (Floyd's and Warshall algorithms), Hamiltonian graph, graph colouring.

Unit 4: Propositional Logic (6L)

Proposition, First order logic, Basic logical operation, truth tables, tautologies, contradictions, Algebra of Proposition, logical implications, logical equivalence, predicates, Universal and existential quantifiers.

Unit- 5: Groups and Rings **(6L)**

Groups -Subgroups, Generation and evaluation of process- Rings, Integral domains and fields (definitions and simple properties only).

Text books

1. Discrete Mathematics and its Applications, Rosen K.H, McGraw Hill, 8thEdition 2021.

2. Discrete Mathematical Structure, Kolman, Busby and Ross, PHI, 6th Edition 2009.

Reference Books

1. Discrete Math, S.K. Sarkar, S. Chand & Co, 9thEdition, 2016.
2. Discrete Mathematical Structures with Applications to Computer Science, Tremblay, J.P. and Manohar, Tata McGraw Hill, 5th Edition2007.

TEACHING AND LEARNING STRATEGY

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Course Structure & Syllabus of BCA
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BCA Course Description Document

1. School offering the course	SOC
2. Course Code	**CAF104**
3. Course Title	**Digital Logic and Computer Design**
4. Credits (L: T:P:C)	3:1:0:4
5. Contact Hours (L: T:P)	3:1:0
6. Prerequisites (if any)	None
7. Course Basket	Discipline Core

Course Summary

Foundation in design and analysis of the operation of digital gates. Design and implementation of combinational and sequential logic circuits. Concepts of Boolean algebra, Karnaugh maps, flip-flops, registers, and counters along with various logic families and comparison of their behavior and characteristics.

Course Objectives

The course objectives are to acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits. This course prepares students to perform the analysis and design of various digital electronic circuits.

Course Outcomes

On successful completion of the course, students will be able to achieve the following:

CO1: Understand the working knowledge of Boolean algebra and its application to combinational logic circuits.
CO2: Illustrate reduction of logical expressions using Boolean algebra, k-map and tabulation method and implement the functions using logic gates.
CO3: Design and analyses synchronous and asynchronous sequential circuits using flip-flops.
CO4: Design combination of operators to form higher level functions (multiplexer, counter) and memory element (flip-flop)

Curriculum Content

UNIT 1 Introduction (8L)

Logic gates NOT, AND, OR, Universal gates- NAND, NOR. EX-OR and EX-NOR gates. Diode and Transistor as a switch Logic Families-RTL, DTL, TTL, ECL, CMOS – (Main features only - without details of circuit connections and working). Definition of- current and voltage parameters, noise margin, Concepts of Fan -in, Fan-out, Boolean algebra: Basics Laws of Boolean Algebra, Logic Gates, Simplifications of Boolean equations using K-maps.

UNIT 2 Data and Number representation (8L)

Binary-complement representation BCD-ASCII, conversion of numbers forms one system to the other, 2's complement representation, binary arithmetic Review of various number systems (Binary, Octal, Hexadecimal), Definition of BCD, Gray codes and Excess – 3 codes and their application (without design of code convertors), Parity generation and Checking.

UNIT 3 Arithmetic Circuits (6L)

Adder, Subtractor, Parallel binary adder/Subtractor, binary multiplier and divider. Combinational Circuits: Multiplexers, De-Multiplexers, decoders, encoders.

UNIT 4 Flips-flops **(8L)**

S-R, D, J-K, T, Clocked Flip-flop, Race around condition, Master slave Flip-Flop, Realization of one flip-flop using another flip-flop. Shift Registers: Serial-in-serial-out, serial-in-parallel-out, parallel-in-serial-out and parallel-in-parallel-out, Bi-directional shift register.

UNIT 5 Counter **(6L)**

Ripple counter, Synchronous Counter, Modulo Counters, Ring Counter, Twisted Ring, Memory Devices - RAM, ROM, PAL & PLA.

Text books

1. Digital Logic and Computer Design, M.M. Mano, PHI, 5th Edition, 2008
2. Digital fundamentals, Floyd, L, Thomas, Universal Book Stall, 10th Edition, 1998

Reference Books

1. Computer Architecture, M.M. Mano, PHI, 3rd Edition, 1998
2. Computer Organization, Hamcher, Vranesic and Zaky, McGraw-Hill, Singapore, 5th Edition,2000

TEACHING AND LEARNING STRATEGY

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Course Structure & Syllabus of BCA
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BCA Course Description Document

1. School offering the course	SOC
2. Course Code	**CAF105**
3. Course Title	**Computer Based Numerical Techniques**
4. Credits (L: T:P:C)	3:0:1:4
5. Contact Hours (L: T:P)	3:0:2
6. Prerequisites (if any)	Programming in C (CAF102)
7. Course Basket	Discipline Core

Course Summary

This course will introduce students to Bisection Method, Iteration Method, Method of False Position, Newton-Raphson Method, Methods of Finding Complex Roots, Gauss Seidel iterative methods, Interpolation and approximation, Curve fitting, Time series and forecasting.

Course Objectives

The objective of this course is to provide conceptual understanding of various numerical methods, in particular, with reference to numerical solution of non-linear equations and system of linear equations, interpolation, numerical differentiation and integration and numerical solution of ordinary differential equations.

Course Outcomes

On successful completion of the course, students will be able to achieve the following:

CO1: Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to otherwise intractable mathematical problems.
CO2: Apply numerical methods to obtain approximate solutions to mathematical problems.
CO3: Apply numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.
CO4: Analyse and evaluate the accuracy of common numerical method.

Curriculum Content

UNIT 1 Floating point Arithmetic (8L)

Representation of floating-point numbers, Operations, Normalization, Pitfalls of floating-point representation, Errors in numerical computation. Iterative Methods: Zeros of a single transcendental equation and zeros of polynomial using Bisection Method, Iteration Method, Regula-Falsi method, Newton Raphson method, Secant method.

UNIT 2 Simultaneous Linear Equations (8L)

Solutions of system of Linear equations, Gauss Elimination and Gauss Jordan. Gauss Seidel iterative methods Interpolation and approximation: Finite Differences, Difference tables. Polynomial Interpolation: Newton's forward and backward formula. Langrange's interpolation.

UNIT 3 Numerical Differentiation and Integration (8L)

Introduction, Numerical Differentiation, Numerical Integration, Trapezoidal rule, Simpson's rules, Gaussian Quadrature Formula. Solution of differential equations: Picard's Method, Euler's Method, Taylor's Method, Runge-Kutta methods, Predictor-corrector method.

UNIT 4 Curve fitting **(6L)**

Curve fitting, Method of least squares, fitting of straight lines, polynomials, exponential curves etc Frequency Chart: Different frequency chart like Histogram, Frequency curve, Pi-chart. Regression analysis, Multiple regression.

UNIT 5 Time series and forecasting **(6L)**

Moving averages, smoothening of curves, forecasting models and methods. Statistical Quality Controls methods. Testing of Hypothesis: Test of significance, Chi-square test, t-test, ANOVA, F-Test. Application to medicine, agriculture etc.

Text books

1. Applied Numerical Analyses, C.F Gerald& Wheatley, Addison Wesley, 7th Edison, 2011.
2. Computer Oriented Numerical Methods, Rajaraman V., PHI, 3rd Edition, 2013.

Reference Books

1. Numerical Methods for Scientific and Engineering Computations, Jain, Iyengar and Jain, New Age Int, 6th Edition, 2012.

TEACHING AND LEARNING STRATEGY

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List of practical:

1.	WAP to find the roots of non-linear equation using Bisection method.
2.	WAP to find the roots of non-linear equation using False position method.
3.	WAP to find the roots of non-linear equation using Newton's Raphson method.
4.	WAP to find the roots of non-linear equation using Iteration method.
5.	WAP to interpolate numerically using Newton's forward difference method.
6.	WAP to interpolate numerically using Newton's backward difference method.
7.	WAP to interpolate numerically using Lagrange's method.
8.	WAP to Integrate numerically using Trapezoidal rule.
9.	WAP to Integrate numerically using Simpson's 1/3 rules.
10.	WAP to find numerical solution of ordinary differential equations by Euler's method.

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BCA Course Description Document

1. School offering the course	SOC
2. Course Code	**CAF106**
3. Course Title	**Data Base Management Systems**
4. Credits (L: T:P:C)	3:0:1:4
5. Contact Hours (L: T:P)	3:0:2
6. Prerequisites (if any)	None
7. Course Basket	Discipline Core

Course Summary

The students will learn the basic theory of databases. They will be able to design and develop a database using conceptual schema, logical schema, and physical schema and are expected to learn how to write database management system software. They will also learn about some of the specialized databases.

Course Objectives

This course aims to educate students on the role of a well-structured relational database management system (RDBMS) in the efficient functioning of an organization. This course covers theory and practice in designing a relational database management system with an example of a current database product of MYSQL. Students also learn about the important concepts of database integrity, security, and availability with techniques like normalization, concurrency control, and recoverability control.

Course Outcomes

On successful completion of the course, students will be able to achieve the following:

CO1: Demonstrate the basic elements of a relational database management system.
CO2: Identify the data models for relevant problems.
CO3: Design entity-relationship and convert entity-relationship diagrams into RDBMS and formulate SQL queries.
CO4: Apply and create relational database design process with Normalization and De-normalization of data so that data redundancy, data inconsistency, and data loss problems may be resolved.

Curriculum Content

UNIT 1 Introduction (8L)

History of Data Base Systems, Database System Vs File System, Database System concepts and architecture, data models schema and instances, data independence, interfaces, Database Languages, DDL, DML, Overall Database Structure, data base Users and Administrator.ER model concepts, notation for ER diagram, Mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation.

UNIT 2 Relational data model concepts (6L)

Relational data model concepts, integrity constraints: entity integrity, Referential integrity, Keys constraints, Domain constraints, relational algebra, relational calculus.

UNIT 3 Introduction to SQL (8L)

Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL Commands, SQL operators and their procedure, Tables, views and indexes, Queries and sub queries, Aggregate Functions, Insert, update and delete operations, Joins, Unions, Intersection, Minus, Cursors in SQL.PL/SQL, Triggers and cursors.

UNIT 4 Data Base Design & Normalization (6L)

Role of Normalization, Schema refinement, Problems Caused by redundancy, Functional dependencies, normal forms, first, second, third normal Forms, BCNF, inclusion dependencies, loss less join decompositions, normalization using FD, MVD, and JDs.

UNIT 5 Transaction Processing Concepts (8L)

Transaction execution and Problems, Transaction execution and control with SQL, Transaction properties, Transaction log, Concurrency control, locking Techniques for concurrency control.

Text books

1. Data base System Concepts, Silberschatz, Korth, McGraw hill, USA, 6th edition, 2011.
2. Fundamentals of Database Systems, ElmasriNavate, Pearson Education, India, 6th edition, 2010.

Reference Book

1. Introduction to Database Systems, C.J. Date, Pearson Education, India, 8th edition, 2003.

TEACHING AND LEARNING STRATEGY

All materials (ppts, assignments, labs, etc.) will be uploaded in Moodle. Refer to your course in Moodle for details

List of practical

S.NO.	EXPERIMENT NAME
1	Implementation of Data Definition language in Query Language.
2	Implementation of Data Manipulation in Query Language.
3	Insertion & Updation of records in the database table
4	Implementation of GROUP functions (avg, count, max, min, Sum).
5	Execution of the various type of SET OPERATORS (Union, Intersect, Minus).
6	Apply the various types of Integrity Constraints on the table.
7	Creation of various types of JOINS.
8	Implementation of Views and Indices in database.
9	Implementation of the foreign key on the database.
10	Modify the database structure and drop the record with structure.

Course Structure & Syllabus of BCA
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CA Course Description Document

1. School offering the course	SOC
2. Course Code	**CAF107**
3. Course Title	**Computer Organization**
4. Credits (L: T:P:C)	3:1:0:4
5. Contact Hours (L: T:P)	3:1:0
6. Prerequisites (if any)	None
7. Course Basket	Discipline Core

Course Summary

This course provides the knowledge of basic building blocks for computations, understanding and exploiting structure in computational problems, design space, costs, and trade-offs in computer organization, register transfer and Micro operations, I-O, and memory organization.

Course Objectives

This course will introduce students to the fundamental concepts underlying modern computer organization and architecture. Main objective of the course is to familiarize students about hardware design including logic design.

Course Outcomes

On successful completion of the course, students will be able to achieve the following:

CO1: Understand the basics of computer hardware and how software interacts with computer hardware
CO2: Analyse and evaluate computer performance
CO3: Understand how computers represent and manipulate data
CO4: Use Boolean algebra as related to designing computer logic, through simple combinational and sequential logic circuits

Curriculum Content

UNIT 1 Register Transfer and Micro Operations (6L)

Register Transfer Language, Register Transfer, Bus and Memory Transfer, Arithmetic Micro Operations, Logic Micro Operations, Shift Micro Operations.

UNIT 2 Basic Computer Organization and Design (8L)

Instruction Codes, Computer Registers, Computer Instruction, Timing and Control, Instruction Cycle, Memory Reference Instruction, Input-Output Interrupt, Design of Basic Computer, Design of Accumulator Logic.

UNIT 3 Central Processing Unit (8L)

Introduction, General Register Organization, Stack Organization, Instruction Format, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer.

UNIT 4 Computer Arithmetic (6L)

Introduction, Addition and Subtraction, Multiplication Algorithms, Division Algorithm, Floating-Point Arithmetic Operation, Decimal Arithmetic Unit.

UNIT 5 Input-Output and Memory Organization (8L)

Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Direct Memory Access, Input-Output Processor, Memory Hierarchy, Associative Memory, Cache Memory, Virtual Memory.

Text books

1. M.Morris Mano-Computer System Architecture, 3rd Edition, Pearson Education, New Delhi, 2006.

Reference Books

1. Stallings- Computer Organization & Architecture, 7th Edition, Pearson Education, New Delhi, 2006
2. N. Carter- Computer Architecture, Schaums Outline Series, TMH, New Delhi, 2006, Pearson Higher

TEACHING AND LEARNING STRATEGY

All materials (ppts, assignments, labs, etc.) will be uploaded in Moodle. Refer to your course in Moodle for details

Course Structure & Syllabus of BCA
Applicable for Batch: 2023-26

BCA Course Description Document

1. School offering the course	SOC
2. Course Code	**CAF108**
3. Course Title	**Data Structures using C**
4. Credits (L:T:P:C)	3:0:1:4
5. Contact Hours (L:T:P)	3:0:2
6. Prerequisites (if any)	CAF102
7. Course Basket	Discipline Core

Course Summary

The course outlines the detailed architecture and implementation of basic data structures such as Stacks, Queues, Linked Lists, Trees, and Graphs. It also covers the time and space complexity analysis of different searching and sorting techniques. The course also incorporates different hashing techniques, designing hash functions, hash table implementation, and collision resolution technique.

Course Objectives

The main objective of this course is to introduce the concept of data structure, how to choose a particular data structure. The objective may include solving problems using data structures like Stacks, Queues, Linked Lists, Trees, Graph and analyzing algorithms and showing how one solution is better than others by analyzing their computational complexities.

Course Outcomes

On successful completion of the course, students will be able to achieve the following:

CO1: Develop an ability to read, write, and analyze the time and space complexity of any algorithm.
CO2: Describe the properties, behavior, and implementation of basic data structures like Stacks, Queues, Linked List, Trees, and Graphs and its appropriate C code implementation.
CO3: Compare different searching and sorting techniques in terms of their memory usage and time consumption.
CO4: Design and implement different hash functions, analyze the collision effect, and hash table implementations.

Curriculum Content

Unit 1: Introduction to Algorithms & Data Structure (8L)

Introduction: Data types, Abstraction, Abstract Data Type (ADT), Concept of data structure, Types of data structures, Operations on Data Structures, Introduction to Algorithms, Writing Pseudocodes, Algorithm analysis, Complexity of algorithms and Time space trade-off, Searching: Linear and Binary Search Techniques and their complexity analysis.

Unit 2: Arrays, Stacks, and Queues (7L)

Arrays: Introduction to Array, Applications of Array, Operations on Arrays: Traverse, Insert, Delete etc. Stacks: Introduction to Stacks, Array representation of Stack, Operations on Stack: Push, Pop, etc. Applications of Stacks: Infix and Postfix Conversion, Evaluations of Infix and Postfix expressions. Queue: Introduction to Queue, Array representation and implementation of queues, Operations of Queue, Applications of Queue, Types of Queue: Circular Queue, Priority Queue, Double ended Queue. Operations on each type of Queue and their Applications.

Unit 3: Linked Lists and Trees **(8L)**

Linked Lists: Introduction to Dynamic Memory Allocation, Representation and Implementation of Single, Double, and Circular Linked Lists, Operations on Linked List: Insert, Delete, Traverse etc. Applications of Linked List, Linked List representation of Stack and Queue. Trees: Basic Tree terminologies, Types of Trees: Binary Tree, Binary Search Tree (BST), AVL Tree, B-Tree, and Heap. Representation and Implementations of different types of trees, Tree Traversal algorithms, Operation on trees: Insert, Delete, etc., Applications of Tress.

Unit4: Graphs **(7L)**

Graphs: Introduction to Graph and their Terminologies, Types of Graph, Representations of Graph, Graph traversal algorithms, Topological Sorting, Minimum Spanning Tree, Shortest Path Algorithms: Single Source Shortest Path like Bellman-Ford, Dijkstra and All Pair Shortest Path like Floyd-Warshall.

Unit- 5: Sorting &Hashing **(9L)**

Sorting Algorithms and their Analysis: Selection Sort, Bubble sort, Insertion sort, Quick sort, Merge sort, Heap Sort. Performance Analysis and Comparison of all sorting techniques. Hashing: Hash Functions and its type, Hash Table construction, Collision Resolution, Universal Addressing, Open Hashing.

Text Books

1. A. M. Tenenbaum, Langsam, Moshe J. Augentem, Data Structures using C PHI Pub.1st Edition.1998
2. Schaum'soutline series "Data structures" TMH. 1st Edition Indian Reprint 2014.

Reference Books

1. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publication,2nd Edition. 2008.
2. Mark Allen Weiss, Data Structures and Algorithm Analysis in C, Addison-Wesley,Second Edition
3. Robert Kruse, Data Structures and Program Design in C PHI.2nd Edition.2006.
4. Willam J. Collins, Data Structure and the Standard Template library –2003, T.M.H.1st Edition.
5. Kyle Loudon, Mastering Algorithms with C, O'Reily Publication, 1st Edition, 1999

TEACHING AND LEARNING STRATEGY

All materials (ppts, assignments, labs, etc.) will be uploaded in Moodle. Refer to your course in Moodle for details.

List of experiments:

S.NO.	EXPERIMENT NAME
1	Program in C for the implementation of Array for various operations.
2	Program in C for the creation of Stack for its various operation implementation.
3	Program in C for the creation of Queue for its various operation implementation.
4	Program in C for the creation of Link list for its various operation implementation.
5	Program in C for the creation of Circular Link list for its various operation implementation.
6	Program in C for the creation of Doubly Link list for its various operation implementation.
7	Program in C for the creation of Binary Search Tree for its various operation implementation.
8	Program in C for the Implementation of sorting Algorithms.
9	Program in C for the Implementation of basic Graph Algorithms.
10	Program in C for the Implementation of linear Search Algorithms

Course Structure & Syllabus of BCA
Applicable for Batch: 2023-26

BCA Course Description Document

1. School offering the course	SOC
2. Course Code	**CAF201**
3. Course Title	**Operating Systems**
4. Credits (L: T:P:C)	3:1:0:4
5. Contact Hours (L: T:P)	3:1:0
6. Prerequisites (if any)	None
7. Course Basket	Discipline Core

Course Summary

This course will introduce the core concepts of operating systems, such as processes and threads, scheduling, synchronization, memory management, file systems, input and output device management and security.

Course Objectives

This course is classified into two sections: a theory section that educates to students about the theories and principles that underlie modern operating systems, and a practical section that relates theoretical principles to operating system implementation. Theory section basically includes: Process and processor management, concurrency and synchronization, memory management schemes, file system and secondary storage management, etc.

Course Outcomes

On successful completion of the course, students will be able to achieve the following:

CO1: Describe the basic concepts of operating systems, including development and achievements, functionalities and objectives, structure and components.
CO2: Understand the general architecture & functioning of operating system such as processes, threads, files, Concurrency, IPC abstractions, shared memory regions, etc.
CO3: Analyze various algorithms eg. Process scheduling and memory management algorithms.
CO4: Categorize the operating system's resource management techniques, deadlock management techniques, memory management techniques.

Curriculum Content

UNIT 1 Basic concepts and terminology (8L)

Importance of OS, Basic concepts and terminology, types of OS, what is an OS, Functions, Structure, Types: Batch, Multiprogramming, Timesharing, Real time, Multiprocessor system, distributed system, OS as Resource manager, Booting process.

UNIT 2 Processor Management (8L)

Functions, Process, Process states, State transition, PCB, Events related to process, Process scheduling, Scheduling objectives , Scheduling levels , Pre-emptive and non-pre-emptive scheduling algorithms , Concurrent processes , Process synchronization , Mutual exclusion and critical section , Solution to mutual exclusion problem : Software , Hardware & Semaphore Solutions , Classical problems of mutual exclusion , Deadlock :Handling deadlock , Prevention , Avoidance , Detection and Recovery.

UNIT 3 Memory Management **(6L)**

Functions, Contiguous: State and Dynamic, Non-contiguous Segmentation and Paging, Virtual memory, Demand paging, Page replacement policies, Working Set principle.

UNIT 4 File Management **(8L)**

Information management: File system, Functions, File directory, File system structure, File system design: Symbolic, Basic, Logical and Physical file system layers, File organization, File allocation, free space management, File protection and security.

UNIT 5 Device Management **(6L)**

Disk scheduling, Disk scheduling policies, Device management: Functions, Techniques for device management: Dedicated, Shared, Virtual, Spooling, Channels and Control unit.
Case Study: Introduction to Linux/UNIX.

Text books

1. Silberschatz, Galvin and Gagne, —Operating Systems Concepts‖, Wiley, 9th Edition 2018.
2. Operating System, Haldar, Aravind, Pearson Education, 2nd Edition, 2014.

Reference Books

1. Modern Operating System, Tannenbaum, PHI, 4th Edition, 2016.

2. D M Dhamdhere, —Operating Systems: A Concept based Approach‖, PHI. 3rd Edition.2017

TEACHING AND LEARNING STRATEGY

All materials (ppts, assignments, labs, etc.) will be uploaded in Moodle. Refer to your course in Moodle for details

Course Structure & Syllabus of BCA
Applicable for Batch: 2023-26

BCA Course Description Document

1. School offering the course	SOC
2. Course Code	**CAF202**
3. Course Title	**Introduction to Java Programming**
4. Credits (L:T:P:C)	3:0:1:4
5. Contact Hours (L:T:P)	3:0:2
6. Prerequisites (if any)	CAF102
7. Course Basket	Discipline Core

Course Summary

This course covers Java programming fundamentals techniques with primitive data types, variables, constants, assignments, expressions, and operators, selection statements, mathematical functions, characters, and strings, loops, methods, and arrays. Students will learn programming with objects and classes, class inheritance, polymorphism, exception handling, abstract classes, interfaces, Text I/O and binary I/O.

Course Objectives

The objectives of this course are to learn object oriented programming paradigm using Java as programming language. Students will be exposed to fundamental concepts in java programming language, followed by object oriented paradigm and its building blocks.

Course Outcomes

On successful completion of the course, students will be able to achieve the following:

CO1: Apply object-oriented principles in software design process.

CO2: Develop Java programs for real applications using java constructs and libraries.

CO3: Understand and apply various object-oriented features like inheritance, data abstraction, encapsulation, and polymorphism to solve various computing problems using Java language.

CO4: Implement Exception Handling in java

Curriculum Content

UNIT I: Introduction, Fundamental Programming Techniques (6L)

Introduction, the Java Language Specification, API, JDK, and IDE, Creating, Compiling, and Executing a Java Program, Developing Java Programs Using Net Beans.

Identifiers, Variables, Assignment Statements and Assignment Expressions, Named Constants, Naming Conventions, Numeric Data Types and Operations, Numeric Literals, Evaluating Expressions and Operator Precedence, Increment and Decrement Operators, Numeric Type Conversions.

UNIT 2: **Selection Statements, Loops, Mathematical Functions, Characters and Strings (6 L)**

Boolean Data Type, if Statements, Two-Way if-else Statements, Nested if and Multi-Way if-else Statements, Logical Operators, switch Statements, Conditional Expressions, Operator Precedence and Associativity. Common Mathematical Functions, Character Data Type and Operations, the String Type. The while Loop, the do-while Loop, The for Loop, Nested Loops, Keywords break and continue.

UNIT 3: Methods, Arrays and Recursions **(6L)**

Defining a Method, Calling a Method, Passing Arguments by Values, Modularizing Code, Overloading Methods, The Scope of Variables, Method Abstraction and Stepwise Refinement. Array Basics, Copying Arrays, Passing Arrays to Methods, Returning an Array from a Method, Searching Arrays, Sorting Arrays, The Arrays Class. Two-Dimensional Array Basics, Passing Two-Dimensional Arrays to Methods, Multidimensional Arrays. Recursion, writing recursive codes in Java.

UNIT4: Object Oriented Paradigm **(12L)**

Defining Classes for Objects, Constructing Objects Using Constructors, Accessing Objects via Reference Variables, Using Classes from the Java Library, Static Variables, Constants, and Methods, Visibility Modifiers, Data Field Encapsulation, Passing Objects to Methods, Array of Objects, Immutable Objects and Classes, The this Reference. Class Abstraction and Encapsulation, Thinking in Objects, Processing Primitive Data Type Values as Objects, Types and, The Big Integer and Big Decimal Classes, The String Class, The String Builder and String Buffer Classes. Superclass and Subclasses, Using the super Keyword, Overriding Methods, Overriding vs. Overloading, The Object Class and Its to String() Method, Polymorphism, Dynamic Binding, Casting Objects and the instance of Operator, The Object's equals Method, The Array List Class.

UNIT5: Exception handling, Abstract Classes and Interfaces, Binary I/O.

Generics Exception-Handling Overview, Exception Types, the finally Clause, When to Use Exceptions, Defining Custom Exception Classes. Abstract Classes, Interfaces, The Comparable Interface, The Clone able Interface, Interfaces vs. Abstract Classes. Introduction, How Is Text I/O Handled in Java?, Text I/O vs. Binary I/O, Binary I/O Classes Motivations and Benefits, Defining Generic Classes and Interfaces, Generic Methods.

(6L)

TEXTBOOK(S)

1. Intro to Java Programming (Comprehensive Version), by Y. Daniel Liang. Publisher: Pearson Education; Tenth edition (2018), ISBN-10: 935306578X, ISBN-13: 978-9353065782

REFERENCE BOOKS

1. Java - The Complete Reference, by Herbert Schildt, Publisher: McGraw Hill Education; Tenth edition (2017), ISBN-10: 9789387432291, ISBN-13: 978-9387432291

TEACHING AND LEARNING STRATEGY

All materials (ppts, assignments, labs, etc.) will be uploaded in Moodle. Refer to your course in Moodle for details.

List of Experiments:

S.NO.	EXPERIMENT NAME
1	Program in Java to design simple calculator for (+, -, *, and /) using switch case
2	Program in Java to design accounts class and two functions withdraw() and deposit().
3	Program in Java to show the inheritance in java .
4	Program in Java to implement the concept of polymorphism by implementing method overloading and overriding
5	Program in Java that import the user define package and access the Member variable of classes that Contained by Package.
6	Program in Java to handle the Exception using try and multiple catch block.
7	Program in Java to create a thread that Implement the Runnable interface
8	Program in Java to create Frame that display the student information using awt components
9	Program in Java to create frame for course enquiry using Swings components
10	Program to implement the concept of super/this/static keywords

Course Structure & Syllabus of BCA
Applicable for Batch: 2023-26

BCA Course Description Document

1. School offering the course	SOC
2. Course Code	**CAF203**
3. Course Title	**Web Technologies**
4. Credits (L: T:P:C)	3:0:1:4
5. Contact Hours (L: T:P)	3:0:2
6. Prerequisites (if any)	None
7. Course Basket	Discipline Core

Course Summary

This course is intended to teach the basics involved in publishing content on the World Wide Web. This includes the 'language of the Web' – HTML, the fundamentals of how the Internet and the Web function, a basic understanding of graphic production with a specific stress on creating graphics for the Web

Course Objectives

This course is intended to teach the basics involved in publishing content on the World Wide Web. This includes the 'language of the Web' – HTML, the fundamentals of how the Internet and the Web function, a basic understanding of graphic production with a specific stress on creating graphics for the Web

Course Outcomes

On successful completion of the course, students will be able to achieve the following:

CO1: Analyse a web page and identify its elements and attributes.

CO2: Create web pages using XHTML and Cascading Style Sheets.

CO3: Build dynamic web pages using JavaScript (Client-side programming).

CO4: Create XML documents and Schemas.

Curriculum Content

UNIT 1 Internet Basic: **(6L)**

Introduction to HTML - List - Creating Table - Linking Document Frames - Graphics to HTML Doc - Style sheet - Style sheet basic - Add style to document - Creating Style sheet rules - Style sheet properties - Font - Text - List - Color and background color - Box - Display properties.

UNIT 2 Introduction to JavaScript: **(8L)**

Advantage of JavaScript, JavaScript Syntax - Datatype - Variable - Arra y - Operator and Expression - Looping Constructor - Function - Dialog box.

UNIT 3 JavaScript document object model: **(8L)**

Introduction - Object in HTML - Event Handling - Window Object - Document object - Browser Object - Form Object - Navigator object Screen object - Build in Object - User defined object - Cookies.

UNIT 4: XML **(8L)**

XML: Introduction, The Need for XML, Structured Data and Formatting, Advantages of XML, SGML, XML, and HTML, World Wide Web Consortium (W3C) Specifications and Grammars.

Approved by the Academic Council in its 22nd Meeting held on 06.03.2023

UNIT 5:**XML Applications and Tools** **(6L)**

XML Applications and Tools: Creating and Viewing XML Documents, Transforming XML Documents, XML Document Syntax, Validating XML Documents with DTDs, XML Namespaces

Text books:

1. Web Enable Commercial Application Development Using HTML, DHTML, JavaScript, Perl CGI, I. Bayross, BPB Publications, 2000
2. Mastering JavaScript. Jaworski, BPB Publications, 1999

Reference Books:

1. Complete Reference HTMLT. A. Powell, Third Edition, TMH, 2002
2. ASP.NET Developers Guide, G.Buczek, TMH, 2002

TEACHING AND LEARNING STRATEGY

All materials (ppts, assignments, labs, etc.) will be uploaded in Moodle. Refer to your course in Moodle for details

List of practical:

1. Write a program to create student registration form in html.
2. Write a program to create menu using HTML and CSS.
3. Create validation Form in JavaScript.
4. Write a JavaScript program to find the area of a triangle.
5. Write a program to Sum and Multiply two numbers using JavaScript
6. Write a program to Show use of alert, confirm and prompt box.
7. Write a program to change content of web page.
8. Write a program to view XML courses Menu.
9. Write a program to create XMLHttpRequest
10. Write a XML documents form a tree structure that starts at "the root" as book store and branches to "the leaves".

Course Structure & Syllabus of BCA
Applicable for Batch: 2023-26

BCA Course Description Document

1. School offering the course	SOC
2. Course Code	**CAF204**
3. Course Title	**Design and Analysis of Algorithms**
4. Credits (L:T:P:C)	3:0:1:4
5. Contact Hours (L:T:P)	3:0:2
6. Prerequisites (if any)	None
7. Course Basket	Discipline core

COURSE SUMMARY

This course covers the time and space complexity analysis of different searching and sorting techniques. Some of the searching methods include Linear Search, Binary Search, and sorting mechanism includes Bubble sort, Insertion sort, Selection sort, Quick sort, and Merge sort. The course also incorporates the study of various techniques (Divide & Conquer, Greedy, Dynamic Programming, Backtracking, and Branch & Bound) to design an algorithm.

COURSE OBJECTIVE

Objective of this course is to study and analyze the algorithms. It provides us with the mathematical and technical approaches of solving problems in various ways. This course enables the students to design the algorithm to solve the problems and to find out the complexity of the program. It enables the students to check how the worst-case complexity of an algorithm is defined.

Course Outcomes

On successful completion of the course, students will be able to achieve the following:
CO1: The student will develop an ability to read, write, and analyze the time and space complexity of any algorithms.
CO2: To Know about the big O, omega, and theta notations and their usage to give asymptotic upper, lower, and tight bounds on time and space complexity of algorithms.
CO3: To determine the worst time complexity of algorithms
CO4: To Know how to design algorithms using the divide-and-conquer strategy, and recite algorithms that employ this strategy.

Curriculum Content

Unit 1: Introduction

Algorithms, Pseudo code for expressing algorithms, Space complexity, Time complexity, Asymptotic Notation- Big oh notation, Omega notation, Theta notation and Little oh notation. Sorting: bubble

Unit 2: Recurrences

substitution, iteration and master methods Sorting: bubble sort, selection sort. Divide-and-conquer: general approach, binary search, merge sort, quick sort, Strassen's matrix multiplication

Unit 3: Greedy algorithms

general approach, activity selection, knapsack problem, minimum-spanning tree, Diskstra's algorithm, Huffman code

Unit- 4: Dynamic Programming

General approach, matrix-chain multiplication, all-pairs shortest paths, binary search tree, traveling salesperson, 0/1 knapsack problem

Unit- 5: Branch and Bound and Backtracking:

Traveling sales man problem, Linear programming, General method, applications-n-queen problem, sum of subset problem.

Textbook(s)

1. Introduction to Algorithms, T.H. Cormen, C.E. Leiserson, R.L. Rivest, and C. Stein, PHI Pvt. Ltd./ Pearson Education, India, 2nd edition, 2001.
2. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharam, Galgotia publications Pvt. Ltd, New Delhi India, 2nd edition, 2007

Reference Books

1. Introduction to Design and Analysis of Algorithms A strategic approach, C.T. Lee, S.S. Tseng, Chang and T. Tsai, McGraw Hill, USA, 2/e, 2007.
2. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson education, India, 4/e, 2009
3. Algorithms, Richard Johnson Baugh and Marcus Schaefer, Pearson Education, India, 3/e, 2006

TEACHING AND LEARNING STRATEGY
All materials (ppts, assignments, labs, etc.) will be uploaded in Moodle.

LIST OF EXPERIMENTS:

S.NO	EXPERIMENT NAME
1	Program in C to Implement Linear search and Binary Search algorithms
2	Program in C to Implement Bubble Sort algorithm
3	Program in C to Implement Selection Sort algorithm
4	Program in C to Implement Merge Sort algorithm
5	Program in C to Implement Quick Sort algorithm
6	Program in C for Breadth-First Search in a graph
7	Program in C for Depth-First Search in a graph
8	Program in C to determine the minimum spanning tree of a graph
9	Program in C for finding maximum and minimum number using Divide and conquer
10	Program in C for Knapsack problem

Course Structure & Syllabus of BCA
Applicable for Batch: 2023-26

BCA Course Description Document

1. School offering the course	SOC
2. Course Code	**CAF205**
3. Course Title	**Software Engineering**
4. Credits (L: T:P:C)	3:1:0:4
5. Contact Hours (L: T:P)	3:1:0
6. Prerequisites (if any)	None
7. Course Basket	Discipline Core

Course Summary

This course will introduce to software life cycle models. Software requirements engineering, formal specification and validation. Techniques for software design and testing. Cost estimation models. Issues in software quality assurance and software maintenance.

Course Objectives

The program's goal is to provide a professionally guided education in software engineering that prepares graduates to transition into a broad range of career options: industry, government, computing graduate program, and professional education.

Course Outcomes

On successful completion of the course, students will be able to achieve the following:

CO1: Apply the various design models of software engineering
CO2: Implement the Software Life Cycle Model.
CO3: Demonstrate the complexities of software projects at the beginning of design phases.
CO4: Estimate the cost and budget of projects, and Removing the errors and bugs so that re-design of models can be done.

Curriculum Content

UNIT 1 Introduction to Software Engineering: (6L)

Definitions - Size Factors - Quality and Productivity Factors - Managerial Issues - Planning a software project: Defining the problem - Developing a Solution Strategy - Planning the Development Process - Planning an Organization structure - Other Planning Activities.

UNIT 2 Software Cost Estimation: (6L)

Software cost factors - Software Cost Estimation Techniques - Staffing-level Estimation - Estimating Software Maintenance Costs - The Software Requirements Specification - Formal Specification Techniques - Languages and Processors for Requirements Specification.

UNIT 3 Software design: (8L)

Fundamental Design Concepts - Modules and Modularization Criteria - Design Notations - Design Techniques - Detailed Design Considerations - Real-Time and Distributed System Design - Test Plans - Milestones, walkthroughs, and Inspections.

UNIT 4 Implementation issues: (8L)

Implementation issues: Structured Coding Techniques - Coding Style - Standards and Guidelines - documentation guidelines -Type Checking - Scoping Rules - Concurrency Mechanisms.

UNIT 5 Quality Assurance: (10L)

Quality Assurance - Walkthroughs and Inspections - Static Analysis - Symbolic Execution - Unit Testing and Debugging - System Testing - Formal Verification: Enhancing Maintainability during Development - Managerial Aspects of Software Maintenance - Source Code Metrics - Other Maintenance Tools and Techniques.

Text books:

1. Software engineering, K. K. Aggarwal& Yogesh Singh, New Age International,2nd Edition,2005.
2. Software Engineering, I. Sommerville, Addison Wesley,10th Edition, 2006.

Reference Books:

1. Software Engineering – A Practitioner's Approach, Roger S Pressman, McGraw Hills Publication, 8th Edition, 2012.
2. Software Architecture in Practice, Len Bass, SEI Series, 3rd Edition, 2010.

TEACHING AND LEARNING STRATEGY

All materials (ppts, assignments, labs, etc.) will be uploaded in Moodle. Refer to your course in Moodle for details

Course Structure & Syllabus of BCA
Applicable for Batch: 2023-26

BCA Course Description Document

1. School offering the course	SOC
2. Course Code	**CAF206**
3. Course Title	**Computer Networks**
4. Credits (L: T:P:C)	3:1:0:4
5. Contact Hours (L: T:P)	3:1:0
6. Prerequisites (if any)	None
7. Course Basket	Discipline Core

Course Summary

This course covers the fundamentals of computer networks, with an emphasis on the Internet architecture and protocols. Layered network topologies, addressing, name, forwarding, routing, communication dependability, the client-server model, and web and email protocols are only a few of the subjects covered.

Course Objectives

Objective of this course is to build an understanding of the fundamental concepts of computer networking and to familiarize the student with the basic taxonomy and terminology of the computer networking area.

Course Outcomes

On successful completion of the course, students will be able to achieve the following:

CO1: Understand basic computer network technology and explain Data Communications System and its **components.**

CO2: Describe, analyse and evaluate number of datalink, network, and transport layer protocols.

CO3: Identify the different types of network topologies and protocols.

CO4: Analyse the layers of the OSI model and TCP/IP

Curriculum Content

UNIT 1 Introduction: (6L

Motivation, OSI model, Signals and media, Bits over signals, Synchronous communication, Modulation and modems, Bandwidth, Throughput, and noise, Time division and Frequency division multiplexing, Standards, Switching methods, ISDN.

UNIT 2 Packet Transmission: (8L)

Multiplexing, Frames, Error correction techniques, LAN/WAN/MAN, Topology, CSMA/CD, LAN protocol, Elementary Data link protocol- Sliding window protocols, Token passing rings, FDDI, IEEE 802.3, 802.5.

UNIT 3 Routing Algorithms: (6L)

Distance-Vector, Link-State, Shortest path computation, Dijkstra's algorithm, Congestion control, WAN technologies including frame relay, X.25, ATM.

UNIT 4 Internetworking: (8L)

Motivation, Concept, Goals, TCP/IP model, IP addressing with sub netting, Address binding with ARP, IP Datagram, Encapsulation IP fragmentation and reassembly, ICMP, IGMP, TCP.

Approved by the Academic Council in its 22nd Meeting held on 06.03.2023

UNIT 5 Network Services: **(6L)**

Electronic mail, File transfer, Access and management, Virtual terminals, Remote procedure call.

1. **Text books:** Data communication and Networking, Forouzan, B.A, McGraw Hill, 5th Edition, 2017.
2. Computer Networks, Tanenbaum, A.S., Prentice Hall,5th Edition, 2013

Reference Books:

1. Internetworking with TCP/IP Vol. 1 Principles, Comer, D.E., Prentice Hall of India,5th Edition, 2005
2. Computer Networking with Internet Protocols and Tech, Stallings, W., Prentice Hall of India, 2007.

Course Structure & Syllabus of BCA
Applicable for Batch: 2023-26

BCA Course Description Document

1. School offering the course	SOC
2. Course Code	**CAF207**
3. Course Title	**Advanced Java Programming**
4. Credits (L:T:P:C)	3:0:1:4
5. Contact Hours (L:T:P)	3:0:2
6. Prerequisites (if any)	CAF202
7. Course Basket	Discipline Core

COURSE SUMMARY

This course covers advanced Java programming concepts that includes Java user interface programming and design, collections framework, multithreading, networking, java database programming. Students will also be introduced to technologies like Java beans, Servlets and JSP.

COURSE OBJECTIVES

The objectives of this course are to learn advanced java programming techniques and technologies required to build applications at enterprise level with good user interface.

COURSE OUTCOMES

On successful completion of the course, students will be able to achieve the following:

CO1: Understand and implement JavaFX technologies and java collections framework.

CO2: Understand and implement multithreading in Java.

CO3: Understand and implement networking and java database programming.

CO4: Understand and implement enterprise level technologies like beans, servlets and jsp.

CURRICULUM CONTENT

UNIT I: User Interface (6L)

Java FX vs Swing and AWT, The Basic Structure of a Java FX Program, Panes, UI Controls, and Shapes, The Color Class, The Font Class, The Image and Image View Classes, Layout Panes, Shapes. Events and Event Sources, Registering Handlers and Handling Events, Inner Classes, Anonymous Inner Class Handlers, Simplifying Event Handling Using Lambda Expressions, Mouse Events, Key Events, Listeners for Observable Objects. Labeled and Label, Button, Check Box, Radio Button, Text Field, Text Area, Combo Box, List View, Scrollbar, Slider.

UNIT 2: Java Collections Framework (7 L)

Collections, Iterators, Lists, the Comparator Interface, Static Methods for Lists and Collections, Queues and Priority Queues, Binary Search Trees, Array Lists, Linked Lists, Queues, Maps.

UNIT 3: Multithreading (8 L)

Thread Concepts, Creating Tasks and Threads, The Thread Class, Thread Pools, Thread Synchronization, Synchronization Using Locks, Cooperation among Threads, Case Study: Producer/Consumer, Blocking Queues, Semaphores, Avoiding Deadlocks, Thread States, Synchronized Collections.

UNIT4: Networking and Java database programming (6 L)

Client/Server Computing, Relational Database Systems, SQL, JDBC, Prepared Statement, Callable Statement.

UNIT5: Enterprise programming (11 L)

Java Beans: The software component assembly model- The java beans development kit- developing beans JAR Files-Introspection-Bound Properties-Persistence-customizers - java beans API. EJB: EJB architecture- EJB requirements –EJB session beans- EJB entity beans-EJB Clients.

Java Servlet: Servlet overview, Brief origin and advantages over CGI, Writing small Servlet Programs, Deployment Descriptor, Servlet Life Cycle, Sharing Information, Initializing a Servlet, Writing Service Methods, Filtering Requests and Responses, Invoking Other Web Resources, Accessing the Web Context, Maintaining Client State, Finalizing a Servlet, Session: Definition, Different ways to track sessions.

JSP: Introduction to JSP, JSP processing, JSP Application Design, Tomcat Server, Implicit JSP objects, Conditional Processing, declaring variables and methods, Error Handling and Debugging, Sharing data between JSP pages-Sharing Session and Application Data. Accessing a database from a JSP page, Application-specific Database Action, Developing Java Beans in a JSP page, introduction to Struts framework.

TEXTBOOK(S)

1. Intro to Java Programming (Comprehensive Version), by Y. Daniel Liang. Publisher: Pearson Education; Tenth edition (2018), ISBN-10: 935306578X, ISBN-13: 978-9353065782

REFERENCE BOOKS

1. Java - The Complete Reference, by Herbert Schildt, Publisher: McGraw Hill Education; Tenth edition (2017), ISBN-10: 9789387432291, ISBN-13: 978-9387432291

TEACHING AND LEARNING STRATEGY

All materials (ppts, assignments, labs, etc.) will be uploaded in Moodle. Refer to your course in Moodle for details.

List of Experiments

S.NO	EXPERIMENT NAME
1	WAP in java to perform basic arithmetic operations.
2	WAP in java to create database connectivity with organization database & display the record of employee table.
3	WAP to create 5 thread by implement Runnable Interface and extending thread class
4	WAP to create table Register in database and perform navigation operation using ResultSet.
5	WAP in JDBC to perform Transaction Management by using SetAutoCommit(),Commit() & rollback() in the table student and insert Organization details by using PreparedFStatement Interface
6	WAP to switch ON and OFF the bulb by using visible bean.
7	Create a java application by implementing Generic Servlet Class.
8	WAP to display the utilization of HttpServlet Class.
9	Create login application in java by using MVC and mysql.
10	WAP using JSP code for describing all types of directive.

Course Structure & Syllabus of BCA
Applicable for Batch: 2023-26

BCA Course Description Document

1. School offering the course	SOC
2. Course Code	**CAF209**
3. Course Title	**Minor Project**
4. Credits (L:T:P:C)	0:0:4:4
5. Contact Hours (L:T:P)	0:0:8
6. Prerequisites (if any)	None
7. Course Basket	Discipline Core

Evaluation Scheme The evaluation scheme, as discussed above, will be as follows:

Total Marks: 100
Component wise Marks
Project Advisor: 40 Marks
Mid Term Presentation: 20 Marks
End Term Presentation: 40 Marks

Approved by the Academic Council in its 22nd Meeting held on 06.03.2023

Course Structure & Syllabus of BCA
Applicable for Batch: 2023-26

BCA Course Description Document

1. School offering the course	SOC
2. Course Code	**CAF301**
3. Course Title	**Introduction to Data Science**
4. Credits (L:T:P:C)	3:0:1:4
5. Contact Hours (L:T:P)	3:0:2
6. Prerequisites (if any)	None
7. Course Basket	Discipline Core

Course Summary This course aims to provide a basic understanding of Data Science concepts. This course introduces students to the data science principles required to tackle real-world, data-rich problems in business

Course Objectives

The objective of this course is to define and explain key concepts in the data science pipeline and analyze real-world data. It also helps students to gain fluency in basic programming skills in Python with a focus on statistical modeling and machine learning.

Course Outcomes

On successful completion of the course, students will be able to achieve the following:

CO1: Understanding the basics of data science approaches and techniques.
CO2: Demonstrate knowledge of data collection, organization, exploration, and analysis methodologies and approaches.
CO3: Determine how data analysis, inferential statistics, modelling, machine learning, and statistical computing can all be used together.
CO4: Apply customizable data analysis and visualization techniques based on an assessment of the data's properties and the nature of the investigation.

Curriculum Content

UNIT1: COMPUTER SCIENCE/STATISTICS/LINEAR ALGEBRA SHORT REVIEW (8L)

What is data science? Brief review of prerequisite knowledge for studying data science. Basics of computer science; data structures/types, program control flow, and syntax in Python. Basics of statistics; probability and probability distributions. Basics of linear algebra; matrices, vectors using Python programming language.

UNIT2: EXPLORATORY DATA ANALYSIS (EDA) AND VISUALIZATION (8L)

Exploration of dataset using Pandas Python package. Compute Stem and Leaf plot, Box plot, Histogram, Scatter plot of a data set. At this point, students decide on a course project that would benefit from the data-scientific approach. The project involves exploration of freely-accessible and usable data that answer some interesting questions about the data (Several resources of free data will be provided.)

UNIT3:DATA MODELING: SUPERVISED/UNSUPERVISED LEARNING (8L)

Two basic kinds of statistical models used for prediction. Supervised Learning algorithm: Linear Regression and Logistic Regression. Unsupervised Learning algorithm: K-Means clustering. Advanced supervised learning algorithms like linear support vector machines, decision trees, and random forest models for regression and classification. Advanced unsupervised learning algorithm like DBSCAN.

UNIT4: DATA MODELING: FEATURE SELECTION, ENGINEERING, AND DATA PIPELINES (6L)

Curse of dimensionality and Dimensionality reduction. Feature selection and feature extraction. Principal Component Analysis/Independent Component Analysis and regularization. Construct complete data pipelines, going from data ingestion, preprocessing to model construction and evaluation.

Approved by the Academic Council in its 22nd Meeting held on 06.03.2023

UNIT5: DATA MODELING: MODEL EVALUATION AND PROJECT PRESENTATIONS (6L)

Exploration of more sophisticated model evaluation approaches like cross-validation and bootstrapping with the goal of making the model as generalizable as possible. Presentation of students' project and sharing learning experience**.**

Text Books:

1. "Doing Data Science, Straight Talk from the Frontline", Cathy O'Neil and Rachel Schutt, O'Reilly. 2014.
2."Data Mining: Concepts and Techniques", Jiawei Han, MichelineKamber and Jian Pei., Third Edition. ISBN 0123814790. 2011.

Reference Books:

1. "**Data Mining and Analysis: Fundamental Concepts and Algorithms",** Mohammed J. Zaki and Wagner Miera Jr.. Cambridge University Press. 2014.

Teaching and Learning Strategy

All materials (ppts, assignments, labs, etc.) will be uploaded in Moodle. Teaching of students will be conducted through power point lectures, tutorials, short classroom exercises.

Course Structure & Syllabus of BCA
Applicable for Batch: 2023-26

S. No.	Title of experiment
1	Environment Set-up • Download set-up files • Installation • Environment Set-up • Demo Program
2.	Print Alphabet Pattern in Python Output: A A B A B C A B C D A B C D E
3.	Write a Python program to get the largest number from a list.
4.	Data Handling • Downloading Dataset • Import/Export Dataset Files • Summarization of dataset
5.	Data Pre-processing • Missing Value • Outlier Handling • Formatting data
6.	Descriptive Statistics a. variance, standard deviation, shape – skewness, kurtosis, percentiles, five point summary b. boxplots, histograms, bar plot, pie chart, scatter plot, two way tables, c. covariance, correlation analysis, Chi-Square test for two way tables
7.	a. Supervised Learning- Regressions • Linear Regression with one variable • Linear Regression with multiple variable • Polynomial regression b. Supervised Learning- Classifications • Logistic Regression • Decision Tree • k-Nearest Neighbours
8.	a. Supervised Learning- Classifications • Support Vector Machine • Random Forest b. Unsupervised Learning- Clustering • K-means clustering • Hierarchical clustering
9.	Feature reduction and feature extraction a. Principal Component Analysis (PCA) b. Linear Discriminant Analysis (LDA) c. Kernel PCA
10.	Model Selection a. grid search b. k fold cross validation

Course Structure & Syllabus of BCA
Applicable for Batch: 2023-26

BCA Course Description Document

1. School offering the course	SOC
2. Course Code	**CAF302**
3. Course Title	**Computer Graphics**
4. Credits (L: T:P:C)	3:0:1:4
5. Contact Hours (L: T:P)	3:0:2
6. Prerequisites (if any)	None
7. Course Basket	Discipline Core

Course Summary

Computer Graphics is a study of the hardware and software principles of interactive raster graphics. Topics include an introduction to the basic concepts, 2-D and 3-D modelling and transformations, viewing transformations, projections, rendering techniques, graphical software packages and graphics systems. Students will use a standard computer graphics API to reinforce concepts and study fundamental computer graphics algorithms.

Course Objectives

These subjects help students develop problem-solving skills in the context of computer graphics, including computer representation, manipulation, and display of pictorial information. It also helps students enhance their skills to design and implement three-dimensional (3D) computer images, such as those used in animated films, virtual reality (VR), data visualization and computer games.

Course Outcomes

On successful completion of the course, students will be able to achieve the following:

CO1: Understand the graphics hardware used in the field of computer graphics.
CO2: Understand the concept of graphics primitives such as lines and circle based on different algorithms
CO3: Apply the 2D graphics transformations, composite transformation, and Clipping concepts.
CO4: Apply the concepts of and techniques used in 3D computer graphics, including viewing transformations, projections, curves, and hidden surfaces in real life.

Curriculum Content

UNIT 1 Introduction to Active and Passive Graphics: (10L)

Introduction to Active and Passive Graphics, Applications of Computer Graphics, concept of pixels, resolution, aspect ratio, frame buffer. Pointing and Selection: the use of selection points defining a boundary rectangle, multiple selections, Menu selection, Keyboard, Trackball, Joystick, Mouse, Light Pen, Tablet, Scanner and Digitizing Camera etc.

Refresh Cathode Ray Tube, Raster Scan displays, Random Scan displays, Architecture of Raster and Random Scan Monitors, Color CRT-monitors and Color generating techniques (Shadow Mask, Beam Penetration), Direct View Storage Tube, Flat-Panel Displays; 3-D Viewing Devices, Raster Scan Systems, Random Scan Systems, Graphics monitors and workstations, Color Models (RGB and CMY), Lookup Table.

UNIT 2 Process and need of Scan Conversion: (12L)

Process and need of Scan Conversion, effect of scan conversion, image representation. Line- Straight Line, DDA algorithm, Bresenham's Line Algorithm. Circle- Mid Point Circle Algorithm, Bresenham's Circle drawing Algorithm, Ellipse-Mid Point Algorithm. Polygon filling algorithms- boundary fill, scan-line algorithm, Aliasing and Anti-aliasing, flood fill techniques, character generation.

UNIT 3 Translation, Scaling and Rotation: (10L)

Translation, scaling, fixed point scaling, rotation, reflection, transformation with respect to arbitrary points. Application of homogeneous coordinates for uniform matrix operations, composite transformations. Window to viewport transformation, Clipping- Point clipping, Line Clipping, Cohen-Sutherland Line Clipping algorithms, Polygon Clipping-Sutherland-Hodgeman algorithm.

UNIT 4 3D Graphics: (8L)

3DDisplay Methods, 3D transformations (Translation, Scaling, Rotation, Reflection, and Shearing), Projection-parallel projections, perspective projection, Hidden Surface removal Algorithms-scan line method, Z-buffer method.

UNIT 5 Illumination and shading: (6L)

Illumination models, ambient light, diffuse reflection, specular reflection, Gouraud and Phong shading models, parametric cubic curves, Hermite, Bezier and Bspline curves.

Text books:

1. Computer Graphics C Version, Donald Hearn and M Pauline Baker, Pearson Education, 2nd edition, 2006
2. Introduction to Computer Graphics, J.D. Foley, A.V. Dam, Addison-Wesley Publishing Company, 2nd edition, 1994.

Reference Books:

1. Computer Graphics (Schaums Outline Series), R.A. Plastock et.al., TMH, 2nd edition, 2006
2. Computer Graphics, J.D. Foley, Pearson Education, 2nd edition, 2004

TEACHING AND LEARNING STRATEGY

All materials (ppts, assignments, labs, etc.) will be uploaded in Moodle. Refer to your course in Moodle for details.

List of practical:

1. Write a program to implement DDA line drawing algorithm
2. Write a program to implement the Bresenham line/circle drawing algorithm
3. Write a program to implement Midpoint circle drawing algorithm
4. Write a program to rotate a triangle (continuous rotation)
5. Write a program to depict movement of a man walking
6. Write a program to depict a rotating cylinder.
7. Write a program to implement Cohen Sutherland line clipping algorithm
8. Write a program to implement Liang Barsky line clipping algorithm
9. Write a program to implement 2D/3D transformation
10. Write a program to implement Bezier curve.

Course Structure & Syllabus of BCA
Applicable for Batch: 2023-26

BCA Course Description Document

1. School offering the course	SOC
2. Course Code	**CAF303**
3. Course Title	**Python Programming**
4. Credits (L: T:P:C)	3:0:1:4
5. Contact Hours (L: T:P)	3:0:2
6. Prerequisites (if any)	None
7. Course Basket	Discipline Core

Course Summary

This course is intended for students with little or no programming experience. This course provides knowledge of installation and Working with Python Understanding Python Variables Python Basic Operators Understanding python block, 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.

Course Objectives

To understand why Python is a useful scripting language for developers

Course Outcomes

On successful completion of the course, students will be able to achieve the following:

CO1: Demonstrate programs using simple Python statements and expressions.

CO2: Explain control flow and functions concept in Python for solving problems.

CO3: Use Python data structures – lists, tuples & dictionaries for representing compound data.

CO4: Explain files, exceptions, modules, and packages in Python for solving problems.

Curriculum Content

UNIT 1 Introduction to python: (6L)

Introduction to python, Installation and versions of python, variables, expression and data types, conditional statements, Loops and iterations, functions, strings, strings functions, Sequences: List, tuples, Sets and Dictionaries, indexing and slicing lists, Functions, Functions parameters, closures, decorators, lambda functions, map, reduce and filters.

UNIT 2 Numpy basics: (8L)

List comprehensions, dictionary comprehensions, set comprehensions, Numpy basics: ndarrays, data types for ndarrays, operations between array and scalar, indexing, slicing, transposing, swapping axes, conditional logics, mathematical and statistical methods, linear algebra, random number generation.

UNIT 3 Classes and Objects: (6L)

Classes and objects: string representation of instances, making objects, encapsulating name in a class, managed attributes, inheritance, constructors, modules and packages: import everything, import submodule, splitting a module into multiple files, reloading modules.

UNIT 4 Pandas: **(8L)**

Pandas: series, data frame, index object, indexing, dropping, selection, filtering, reindexing, data alignment, function application and mapping, sorting, ranking, summarizing, missing data, hierarchical indexing, data loading, file formats, combining, merging, reshaping, pivoting.

UNIT 5 Plotting and visualization: **(8L)**

Plotting and visualization: figures, subplot, colours markers, line style, tick, label, legends, annotation, drawing, line plots, bar plots, histogram and density plots, scatter plots, Chaco, mayavi and other packages.

Text books:

1. Python Cook Book, david Beazley et al, 3rd edition, O'reilly media, 2013,
2. Python for Data Analysis, Wes Mckinney,1stedition, O'reilly media,2012

Reference Books:

1. Trending on Python Vol I, Matt Harrison, 1st edition, 2013
2. Trending on Python Vol II, Matt Harrison, 1st edition, 2013

TEACHING AND LEARNING STRATEGY

All materials (ppts, assignments, labs, etc.) will be uploaded in Moodle. Refer to your course in Moodle for details.

List of Practical:

1. Programs demonstrating data types, variable and expression
2. Programs demonstrating the use of conditional statements, loops and arrays.
3. WAP to demonstrate list, tuples and dictionary (indexing and iloc function)
4. Create functions that perform arithmetic operation. Also create lambda function for the same
5. WAP of list comprehensions, dictionary comprehensions, set comprehensions
6. WAP of n x d arrays and perform slicing and other operations
7. WAP of various mathematical and statistical functions
8. WAP to demonstrate classes and object, inheritance, constructor, managed attributes
9. WAP in pandas to import various file formats (csv,excel ,txt etc.) and perform various operations on data frame and Series
10. WAP using matplotlib to create histograms, densityplots, scatter plots etc.

Course Structure & Syllabus of BCA
Applicable for Batch: 2023-26

BCA Course Description Document (DE)

1. School offering the course	SOC
2. Course Code	**CAF251**
3. Course Title	**Mobile Application using Android**
4. Credits (L: T:P:C)	2:0:1:3
5. Contact Hours (L: T:P)	2:0:2
6. Prerequisites (if any)	None
7. Course Basket	Discipline Elective

Course Summary

This examines the principles of mobile application design and development. Students will learn application development on the Android platform. Topics will include user interface design; user interface building; input methods; data handling; network techniques.

Course Objectives

Demonstrate knowledge of different software engineering techniques for mobile applications and apply this knowledge to develop an application for a mobile device.

Course Outcomes

On successful completion of the course, students will be able to achieve the following:

CO1: Describe those aspects of mobile programming that make it unique from programming for other platforms,

CO2: Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces

CO3: Develop mobile applications for the Android operating system that use basic and advanced phone features

CO4: Deploy applications to the Android marketplace for distribution.

Curriculum Content

UNIT 1 Introduction to Android: (8L)

Introduction to Android, Brief History of Android, Downloading and Installing Eclipse, Downloading and Installing the Android Studio, Downloading and Installing the Android SDK, Introduction to layout, Buttons, Views.

UNIT 2 Introduction to Android SDK, Application Life Cycle: (8L)

Introduction to Android SDK, Application Life Cycle: Standard ASP Application Life Cycle, Introduction to Activity, Android activity Life Cycle, Creating Android Project in Android, Examining the Android applications.

UNIT 3 Created Files: (8L)

Created Files: AndroidManifest.xml, Referenced Libraries, Directories, Hello World! XML-Based UI, Hello World! CODE-Based UI, Using Intents and the Phone Dialer, Intents, Using the Dialer, Placing a Call from Your Activity.

UNIT 4 Adding the Intent to Your Activity: (6L)

Adding the Intent to Your Activity, Modifying the Android Phone Dialer, adding a Button, Implementing an Edit Text View.

Approved by the Academic Council in its 22nd Meeting held on 06.03.2023

UNIT 5: Lists, Menus, and Other Views **(6L)**

Lists, Menus, and Other Views, Building the Activities, Intent Code for the .xml File, Intent Code for the .java File, Using the Menu, Creating the Activity for AutoComplete, Button, CheckBox, EditText, RadioGroup.

Text books:

1. Head First Android Development, Dawn Griffiths, O'reilly Media,1/e, June 2015
2. Programming Android, ZigurdMednieks, O'reilly Media,2/e,2012

Reference Books:

1. Professional Android, Retro Meier, Wiley,4/e,2017

TEACHING AND LEARNING STRATEGY

All materials (ppts, assignments, labs, etc.) will be uploaded in Moodle. Refer to your course in Moodle for details

List of practical:

1. Create "Hello World" application. That will display "Hello World" in the middle of the screen in the red color with white background.
2. To understand Activity, Intent a) Create sample application with login module. (Check username and password) b) On successful login, go to next screen. And on failing login, alert user using Toast. c) Also pass username to next screen.
3. Create login application where you will have to validate Email-ID (Username). Till the username and password is not validated, login button should remain disabled.
4. Create and Login application as above. On successful login, open browser with any URL.
5. Create an application that will pass some number to the next screen, and on the next screen that number of items should be display in the list.
6. Create an application that will play a media file from the memory card.
7. Create an application to make Insert, update, Delete and retrieve operation on the database.
8. (a) Create an application to read file from the SD card and display that file content to the screen. (b) Create an application to draw a line on the screen as user drag his finger.
9. Create an application to send message between two emulators.
10. Create an application to take picture using native application.

Course Structure & Syllabus of BCA
Applicable for Batch: 2023-26

BCA Course Description Document (DE)

1. School offering the course	SOC
2. Course Code	**CAF252**
3. Course Title	**Advance Web Applications**
4. Credits (L: T:P:C)	2:0:1:3
5. Contact Hours (L: T:P)	2:0:2
6. Prerequisites (if any)	None
7. Course Basket	Discipline Elective

Course Summary

This course gives detailed description of World Wide Web Consortium (W3C) standard markup language and services of the Internet.

Course Objectives

This course introduces World Wide Web Consortium (W3C) standard markup language and services of the Internet. This includes the creating web pages, search engines, FTP, and other related topics. Upon completion, students should be able to deploy a hand-coded web site created with mark-up language, and effectively use and understand the function of search engines.

Course Outcomes

On successful completion of the course, students will be able to achieve the following:

CO1: Understand and use the basics of the XML based technologies

CO2: Understand and define and utilize the Web Services / Windows Communication Foundations concept

CO3: Describe the use of the Web Services to implement Service Oriented Architecture (SOA)

CO4: Design and implement user interfaces based on the AJAX technology

Curriculum Content

UNIT 1 PHP **(6L)**

Introduction to PHP Evaluation of PHP Basic Syntax Defining variable and constant PhP Data Type Operator and Expression, GET & POST method PHP, Conditional Structure & Looping Structure, Array, String Creating and accessing, String Searching & Replacing, String Formatting String, String Related Library function.

UNIT 2 Function: **(8L)**

Call by value and Call by reference, Recursive function. Handling Html Form withPhP: Capturing Form, Data Dealing with Multi-value filed, Generating File uploaded form, Redirecting a form after submission

UNIT 3 PHP Components: **(8L)**

PHP GD Library, PHP Regular expression function, Cookies, Session, Server variable, Database Connectivity with MySQL (Using PhpMyAdmin)

UNIT 4: Working with file and Directories: **(8L)**

Understanding file& directory, Opening and closing a file Coping, renaming and deleting a file, working with directories, Building a text editor, File Uploading & Downloading

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UNIT 5: PHP with OOPS

PHP with OOPS: Class, constructor, inheritance, serialize objects PHP with XML **(6L)**

Text Book:

1. **XML How to Program**, Deitel, Nieto, Pearson, 1st edition, 2001
2. **PHP Bible**, Joyce Park and Tim Converse, Wiley, 2nd edition, 2002

Reference Book:

1. **Beginning XML**, Joe Fawcett, Danny Ayers, Liam R. E. Quin, Wrox, 5th Edition, 2012
2. **Professional PHP5**, Stephen Nowicki, Wiley, 2nd edition, 2007

TEACHING AND LEARNING STRATEGY

All materials (ppts, assignments, labs, etc.) will be uploaded in Moodle. Refer to your course in Moodle for details.

List of practical:

1. Program to find a number of elements in an array.
2. Program to sort elements in an array in ascending order.
3. Program to Program to create a Simple Calculator.
4. Programs to create simple Login and Logout using sessions.
5. Program to Upload a file to the Server.
6. Program to create a New Database.
7. Program to connect to the server and select database.
8. a. Program to Insert and Fetch records to the table in Database. b. Program to Store and Read an image in Database.
9. Program to create a simple Registration form.
10. Contact form using PHP

Course Structure & Syllabus of BCA
Applicable for Batch: 2023-26

BCA Course Description Document (DE)

1. School offering the course	SOC
2. Course Code	**CAF351**
3. Course Title	**Multimedia Tools**
4. Credits (L: T:P:C)	2:0:1:3
5. Contact Hours (L: T:P)	2:0:2
6. Prerequisites (if any)	None
7. Course Basket	Discipline Elective

Course Summary

This course aims to provide understanding of Multimedia tools. This course introduces students to the Multimedia tools required to tackle real-world.

Course Objectives

Aware the student with the basics of Multimedia and Graphics. Students need to be familiar with various types and formats of animations, video and audio formats and learn Multimedia and animation Tools.

Course Outcomes

After studying this course, you should be able to:

CO1: Understand the fundamental principles of Multimedia and Animations.
CO2: Understand the working of various Multimedia tools
CO3: Understand various Designing Tools.
CO4: Understand about various latest interactive multimedia devices, the basic concepts about Presentation

Curriculum Content

UNIT 1 **(6L)**

Introduction and Features of Photoshop: History of Photoshop, advertisement creation, wallpapers, websites, animations& 3d effects, software development, and designs, Photo modification purpose, Editing Photo in camera raw : photo lightings, temperature and color options for background shades.

UNIT 2 **(8L)**

Creating Web Galleries, PDF converts PDF Presentation, slide show presentation, Opening and Importing images, Creating Documents with different sizes, New document properties, inserting of images, Marquee Tool, selections on your image, Move tool, Working with layers & layer styles.

UNIT 3 **(8L)**

Introduction to WordPress: Creating WordPress Blog, Installing WordPress Themes, WordPress Plug-ins, Widgets •, Using the WordPress Dashboard, Creating pages' / page title & body text, Draft vs. Publishing Blogs.

UNIT 4: **(8L)**

Fundamentals of CAD/CAM: Automation, design process, Application of computers for design, Benefits of CAD, Computer configuration for CAD applications, Computer peripherals for CAD, Design workstation, Graphic terminal, CAD software- definition of system software and application software, CAD database and structure.

UNIT 5: **(6L)**

Geometric Modeling: 3-D wire frame modeling, wire frame entities and their definitions, Interpolation and approximation of curves, Concept of parametric and non-parametric representation of curves, Curve fitting techniques, and definitions of cubic spline, Bezier, and B-spline.

Text book [TB]:

1. **Multimedia, Making IT Work**, Tay Vaughan, Tata McGraw Hill,9th edition,2014
2. Fundamentals of Multimedia, Ze-Nian Li and Mark S.Drew, Pearson Education,1st edition,2003

Reference Books

1. **Multimedia systems design**, Prabhat K Andleigh, KiranThakrar, PHI Learning Private Limited, Delhi India.,1st Edition,1995

TEACHING AND LEARNING STRATEGY

All materials (ppts, assignments, labs, etc.) will be uploaded in Moodle. Refer to your course in Moodle for details

List of practical:

1. Create your Visiting card and Cover page for any text book
2. Create a Paper add for advertising of any commercial agency
3. Create a Pamphlet for any program to be conducted by an organization
4. Design a Passport photo and Create Broacher for you college
5. Create a Web template for your college
6. Convert color photo to black and white photo
7. Enhance and reduce the given Image size and Custom shapes creation
8. WordPress Introduction Installation & Configuration and Theme development
9. WordPress Advanced development.
10.System architecture- Computer graphics – co-ordinate systems- 2D and 3D transformations- homogeneous coordinates – Line drawing -Clipping- viewing transformation

Course Structure & Syllabus of BCA
Applicable for Batch: 2023-26

BCA Course Description Document (DE)

1. School offering the course	SOC
2. Course Code	**CAF352**
3. Course Title	**Artificial Intelligence**
4. Credits (L:T:P:C)	2:0:1:3
5. Contact Hours (L:T:P)	2:0:2
6. Prerequisites (if any)	None
7. Course Basket	Discipline Elective

Course Summary

The course will start with a brief introduction to artificial Intelligence. This course includes basic AI search techniques like A*, BFS, DFS. Introduction to Prolog is also an important part of the content. Knowledge Representation, Reasoning-Planning and Learning being requirements for the development of an expert system is also part of this course.

Course Objectives

The course is proposed to teach concepts of Artificial Intelligence. The subject will provide the foundations for AI problem solving techniques and knowledge representation formalisms.

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Course Outcomes

On successful completion of the course, students will be able to achieve the following:

CO1: Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations.

CO2: Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.

CO3: Compare different AI algorithms in terms of design issues, computational complexity, and assumptions.

CO4: Visualize the basic use of AI algorithms and their implementations in laboratory.

Curriculum Content

Unit I- Introduction- Definitions, Intelligent Agents, Problem solving and Search- Uninformed Search, Informed Search, MiniMax Search, Constraint Satisfaction Problem, A*, Best Search, DFS, BFS.

Unit II - Prolog- Introduction to Prolog, Syntax and Meanings of Prolog Programs, Operators and Arithmetic, Prolog for Artificial Intelligence.

Unit III- Knowledge Representation- Introduction, Approaches and Issues in Knowledge Representation, Propositional Logic and Inference, First-Order Logic and Inference, Unification and Resolution, Expert Systems.

Unit IV- Reasoning-

Introduction, Types of Reasoning, Probabilistic Reasoning, Probabilistic Graphical Models, Certainty factors and Rule Based Systems, Introduction to Fuzzy Reasoning.

Unit V- Planning and Learning- Introduction to Planning, Types-Conditional, Continuous, Multi-Agent. Introduction to Learning, Categories of Learning, Inductive Learning, Supervised and Unsupervised & Reinforcement Learning, Basic Introduction to Neural Net Learning.

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Text Books:

1. Stuart J. Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education Asia, 4th Edition, 2021.
2. Elaine Rich, Kevin Knight and ShivashankarB.Nair, “Artificial Intelligence”, Tata McGraw-Hill, 3rd Edition, 2008.

Reference Books:

1. Ivan Bratko, “Prolog Programming for Artificial Intelligence”, Pearson Education Asia, 4th Edition, 2011.
2. Dan W. Patterson, “Introduction to Artificial Intelligence and Expert Systems”, PHI Learning, 1st Edition, 2015.

Teaching and Learning Strategy

The teaching of students will be conducted through power point lectures, tutorials, short classroom exercises aimed at solving real life problems. The lecture material (pdf/ppts, assignments, labs, etc.) will be availed to the students in Moodle (lms.dituniversitu.edu.in) to enable them have appropriate reading.

List of practical:

Experiment No.	Title of Experiment
1	Introduction to PROLOG programming, PROLOG platform. “Hello World” program.
2	Defining Clauses and Predicates, Variables, Anonymous Variables.
3	Arithmetic Operators, Arithmetic Functions and Logical Operators (NOT, conjunction disjunction).
4	Binding Variables and Backtracking & Concept of Unification.
5	Implementation of Recursion in PROLOG.
6	Implementation of LIST and built-in predicates of LIST in PROLOG.
7	Implementation of State-Space Searching Problem using PROLOG (Water-Jug or 8 Queens problem).
8	Universal and Existential Quantifier Variables in PROLOG.
9	Knowledge Base and Rule Base Creation for a specific domain in PROLOG.
10	Implementation of Resolution process in PROLOG.