

**Course Structure & Syllabus of BCA  
Applicable for Batch: 2021-24**

**DIT UNIVERSITY  
Dehradun**



**Detailed Course Structure & Syllabus  
of  
BCA**

# Course Structure & Syllabus of BCA

## Applicable for Batch: 2021-24

### Course Structure of the BCA Program in School of Computing

Basket/Area	Min Credits To be taken	Credit per course	Courses
<b>Language and Literature (LL)</b> Core: Professional Communication, Corporate communication English Language Teaching	9	3	3
<b>Discipline Core (DC)</b> 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
<b>Discipline Elective (DE)</b> Mobile Applications development using Android Multimedia Tools Artificial Intelligence Advance Web Applications	6	3	2
<b>Free Elective(FE)</b> <b>Choose any one from FE basket</b>	3	3	1
<b>Skill Enhancement Courses (SEC)*</b> Core: Technical Training1, Technical Training2	8	4	2
<b>Ability Enhancement(AEC)</b> Aptitude and Soft Skills training	2	2	1
<b>Minor Project</b>	4	4	1
<b>Capstone Project (TP)</b> 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
<b>Total Credits</b>	116		

\* Credits in SEC courses may vary

# Course Structure & Syllabus of BCA

## Applicable for Batch: 2021-24

A Sample Plan of Study

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

Course Syllabus: BCACORE

Year: 1<sup>ST</sup>

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
		<b>Total</b>				<b>19</b>

Year: 1<sup>ST</sup>

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
SEC	CAF109	Technical Training -1	2	0	4	4
LL	LAF184	Corporate Communication & Soft skill	3	0	0	3
		<b>Total</b>				<b>23</b>

# Course Structure & Syllabus of BCA

## Applicable for Batch: 2021-24

Year: 2<sup>nd</sup>

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
<b>Total</b>						<b>21</b>

Year: 2<sup>nd</sup>

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 *Advance Web Applications	2	0	2	3
DC	CAF207	Advanced Java Programming	3	0	2	4
SEC	CAF208	Technical Training-2	2	0	4	4
PR	CAF209	Minor Project	0	0	8	4
<b>Total</b>						<b>23</b>

## Course Structure & Syllabus of BCA Applicable for Batch: 2021-24

Year: 3<sup>rd</sup>

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
<b>Total</b>						<b>18</b>

Year: 3<sup>rd</sup>

Semester: VI

Course Category	Course Code	Course Title	L	T	P	Credit
PR	CAF304	Capstone Project	0	0	24	12
<b>Total</b>						<b>12</b>

**Total Credit: 116**

# Course Structure & Syllabus of BCA

## Applicable for Batch: 2021-24

### Free Electives

Free Electives					
	Name of Courses	L	T	P	C
ECF481	Analogue Electronics (ECE)	2	0	2	3
ECF482	Cellular Communication Network (ECE)	2	0	2	3
ECF381	Microcontroller (ECE)	2	0	2	3
ECF382	Bio Medical Instrumentation (ECE)	2	0	2	3
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
MEF381	Composites materials	3	0	0	3
MEF481	Total Quality Management	3	0	0	3
MEF482	Renewable Energy Sources	3	0	0	3
PEF381	Carbon Capture and Sequestration	3	0	0	3
PEF491	Polymer Technology	3	0	0	3
PEF492	Health, Safety and Environment in Industry	3	0	0	3
CEF281	Properties of Materials	3	0	0	3
CEF382	Disaster Preparedness Planning & Management	3	0	0	3
CEF481	Environmental Management & Sustainability	3	0	0	3
CEF482	Natural Dynamics	3	0	0	3
CEF483	GIS	3	0	0	3
CEF484	Resource Dynamics and Economic Implications	3	0	0	3
CEF404	Capstone Project	0	0	24	12
CEF405	Industrial Internship	0	0	0	12

# Course Structure & Syllabus of BCA

## Applicable for Batch: 2021-24

### BCA Course Description Document

Department offering the course	Computer Application
Course Code	CAF101
Course Title	Fundamentals of Computer
Credits (L:T:P:C)	3:0:2:4
Contact Hours (L: T:P)	3:0:2
Prerequisites (if any)	
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.
- ✓ Student 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:**

- Understand the fundamental hardware components that make up a computer's hardware and the role of each of these components
- Understand the difference between an operating system and an application program, and what each is used for in a computer

#### Curriculum Content

##### UNIT 1: Computer

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. (6L)

##### UNIT 2: Memory

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. (6L)

##### UNIT 3: Operating System

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. (8L)

##### UNIT 4: Communication System

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. (8L)

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### UNIT-5: MS Office

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.

(8L)

#### Text Books

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

#### Reference Books

1. Computer Today, Suresh Basandra, Galgotia Publication ,1<sup>st</sup>edition,2010
2. Unix Concepts and Application, Sumitabha Das, Tata Mc-Graw Hills, 4<sup>th</sup> edition, 2008.
3. MS-Office 2000(For Windows), Steve Sagman, Peachpit press, 1<sup>st</sup> 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 concept of Operating System
3. Introduction to basics commands of DOS
4. Introduction to basics commands of Linux.
5. Installing Windows XP in Personal Computer.
6. Creation of Resume in Windows MS Office.
7. Creation of MS Excel Table and performing some mathematical function
8. Creation of pie chart, histograms in excel.
9. Creating mail merge in MS Word.
10. Creating macro in excel.
11. Creation of MS PowerPoint depicting about their profile
12. Using animation and effects in power point.



# Course Structure & Syllabus of BCA

## Applicable for Batch: 2021-24

### BCA Course Description Document

Department offering the course	Computer Application
Course Code	CAF102
Course Title	Programming for Problem Solving
Credits (L:T:P:C)	3:0:2:4
Contact Hours (L:T:P)	3:0:2
Prerequisites (if any)	
Course Basket	Discipline Core

#### **COURSE OUTLINE:**

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 to understand the key hardware components in a modern computer system and as to how the software is mapped to the hardware. The student shall also be able to learn make the computer programs using C language by exploring the various features of C.

#### **COURSE OUTCOMES:**

At the end of the course, the student will be able to:

- ✓ To formulate simple algorithms for arithmetic and logical problems.
- ✓ To implement conditional branching, iteration and recursion.
- ✓ To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
- ✓ To use arrays, pointers and structures to formulate algorithms and programs.
- ✓ To apply programming to solve matrix addition and multiplication problems and searching and sorting problems

#### **COURSE PRE/CO- REQUISITE (IF ANY):**

#### **CURRICULUM CONTENT**

##### **UNIT 1: Introduction to Computer, Programming & algorithms**

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. (8L)

##### **UNIT 2: Arithmetic Expression, and Conditional statements, Loops, Expression:**

Arithmetic, Logical, Relational expressions and precedence. Loops & Branching: Writing and evaluation of conditionals and consequent branching, Iteration and loops. (7L)

##### **UNIT 3: Arrays & Functions**

**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.

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**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). (7L)

### UNIT 4: Recursion and Structure

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. (8L)

### UNIT 5: Pointers & File handling

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. (7L)

### 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 Simple computational problems using arithmetic expressions.
3	Programming for Problems involving if-then-else structures.
4	Programming for Iterative problems e.g., sum of series.
5	Programming for 1-D Array manipulation.
6	Programming for Matrix problems, String operations.
7	Programming for Simple functions
8	Programming for Recursive functions.
9	Programming for Pointers and structures.
10	Programming for File operations
11	Programming for solving Numerical methods problems

# Course Structure & Syllabus of BCA

## Applicable for Batch: 2021-24

### BCA Course Description Document

Department offering the course	Computer Application
Course Code	CAF103
Course Title	Discrete Mathematics
Credits (L:T:P:C)	3:1:0:4
Contact Hours (L:T:P)	3:1:0
Prerequisites (if any)	
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

- ✓ To understand the needs, the precision of mathematical notation and techniques.
- ✓ Specify computational problems using mathematical objects such as sets, functions, relations, orders, and sequences.

#### Course Outcomes

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

- Problem solving through computer programming
- Ability to use different memory allocation methods
- Ability to deal with different input/output methods

#### Curriculum Content

##### Unit 1: Sets, Relations and Functions

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.

(8L)

##### Unit 2: Partial Order Relations and Lattices:

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.

(8L)

##### Unit 3: Graphs

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.

(8L)

##### Unit 4: Propositional Logic:

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

(6L)

##### Unit- 5: Groups and Rings:

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

(6L)

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### **Text books:**

1. Discrete Mathematics and its Applications, Rosen K.H, McGraw Hill, 6<sup>th</sup> Edition 2006.
2. Discrete Mathematical Structure, Kolman, Busby and Ross, PHI, 6<sup>th</sup> Edition 2009.

### **Reference Books:**

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

# Course Structure & Syllabus of BCA

## Applicable for Batch: 2021-24

### BCA Course Description Document

Department offering the course	Computer Application
Course Code	CAF104
Course Title	Digital Logic and Computer Design
Credits (L: T:P:C)	3:1:0:4
Contact Hours (L: T:P)	3:1:0
Prerequisites (if any)	
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

- ✓ To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.
- ✓ Prepare 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:**

- ✓ Have a thorough understanding of the fundamental concepts and techniques used in digital electronics.
- ✓ To understand and examine the structure of various number systems and its application in digital design.

### Curriculum Content

#### UNIT 1 Introduction:

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. **(8L)**

#### UNIT 2 Data and Number representation:

Binary-complement representation BCD-ASCII, conversion of numbers from 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 converters), Parity generation and Checking. **(8L)**

#### UNIT 3 Arithmetic Circuits:

Adder, Subtractor, Parallel binary adder/Subtractor, binary multiplier and divider. Combinational Circuits: Multiplexers, De-Multiplexers, decoders, encoders. **(6L)**

#### UNIT 4 Flips-flops:

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. **(8L)**

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## **Applicable for Batch: 2021-24**

### **UNIT 5 Counter:**

Ripple counter, Synchronous Counter, Modulo Counters, Ring Counter, Twisted Ring, Memory Devices  
- RAM, ROM, PAL & PLA. **(6L)**

### **Text books:**

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

### **Reference Books:**

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

### **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: 2021-24

### BCA Course Description Document

Department offering the course	Computer Application
Course Code	CAF105
Course Title	Computer Based Numerical Techniques
Credits (L: T:P:C)	3:0:2:4
Contact Hours (L: T:P)	3:0:2
Prerequisites (if any)	Programming in C (CAF102)
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:**

- ✓ To learn fundamentals and concepts of statistical and optimization methods, in particular, with reference to frequency distribution and measures of central tendency, measures of dispersion, skewness and kurtosis,
- ✓ To solve problems on theory of probability, linear programming problems, transportation, assignment and game problems.

### Curriculum Content

#### UNIT 1 Floating point Arithmetic:

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. **(8L)**

#### UNIT 2 Simultaneous Linear Equations:

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. Lagrange's interpolation. **(8L)**

#### UNIT 3 Numerical Differentiation and Integration:

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. **(8L)**

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### UNIT 4 Curve fitting:

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. (6L)

### UNIT 5 Time series and forecasting:

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. (6L)

### Text books:

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

### Reference Books:

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

### 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. 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 Integrate numerically using Simpson's 3/8 rules.
11. WAP to find numerical solution of ordinary differential equations by Euler's method.
12. WAP to linear Curve fitting by least – square approximations



# Course Structure & Syllabus of BCA

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### BCA Course Description Document

Department offering the course	Computer Application
Course Code	CAF106
Course Title	Data Base Management Systems
Credits (L: T:P:C)	3:0:2:4
Contact Hours (L: T:P)	3:0:2
Prerequisites (if any)	
Course Basket	Discipline Core

### Course Summary

This course introduces the role of databases in organizations. It also introduces the core components of a database environment. This course discusses the entity relationship diagram; how it may be used to model real-life situations, and its symbols and constructs. It also provides an understanding of relational model, normalization, and how to transform an entity-relationship data diagram into a relational model.

### Course Objectives

- ✓ Objective of this course is to introduce the data base management system.
- ✓ To introduce the server query language and designing the database for the system.
- ✓ It enables the students to generate the query and to the transaction of data to perform various task of the different management system.

### Course Outcomes

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

- ✓ Have a broad understanding of database concepts and database management system software.
- ✓ Have a high-level understanding of major DBMS components and their function.
- ✓ Be able to model an application's data requirements using conceptual modelling tools like ER diagrams and design database schemas based on the conceptual model.
- ✓ Be able to write SQL commands to create tables and indexes, insert/update/delete data, and query data in a relational DBMS.

### Curriculum Content

#### UNIT 1 Introduction:

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. **(8L)**

#### UNIT 2 Relational data model concepts:

Relational data model concepts, integrity constraints: entity integrity, Referential integrity, Keys constraints, Domain constraints, relational algebra, relational calculus. **(6L)**

#### UNIT 3 Introduction to SQL:

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. **(8L)**

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### UNIT 4 Data Base Design & Normalization:

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. (6L)

### UNIT 5 Transaction Processing Concepts:

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

(8L)

### Text books:

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

### Reference Book:

1. Introduction to Database Systems, C.J. Date, Pearson Education, India, 8<sup>th</sup> 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:

1. To implement Data Definition language
2. To implement Data Manipulation language
3. To implement Constraints
4. To implement Insert, Select commands, update and delete commands.
5. To implement SET OPERATORS (Union, Intersect, Minus).
6. To implement Nested Queries & Join Queries.
7. To implement GROUP functions (avg, count, max, min, Sum).
8. Write program by the use of PL/SQL
9. To implement Views
10. To implement Triggers
11. To implement Cursors
12. Create FORMS and REPORTS

# Course Structure & Syllabus of BCA

## Applicable for Batch: 2021-24

### BCA Course Description Document

Department offering the course	Computer Application
Course Code	CAF107
Course Title	Computer Organization
Credits (L: T:P:C)	3:1:0:4
Contact Hours (L: T:P)	3:1:0
Prerequisites (if any)	
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:**

- ✓ Understand the basics of computer hardware and how software interacts with computer hardware
- ✓ Analyse and evaluate computer performance
- ✓ Understand how computers represent and manipulate data
- ✓ 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:

Register Transfer Language, Register Transfer, Bus and Memory Transfer, Arithmetic Micro Operations, Logic Micro Operations, Shift Micro Operations. **(6L)**

#### UNIT 2 Basic Computer Organization and Design:

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. **(8L)**

#### UNIT 3 Central Processing Unit:

Introduction, General Register Organization, Stack Organization, Instruction Format, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer. **(8L)**

#### UNIT 4 Computer Arithmetic:

Introduction, Addition and Subtraction, Multiplication Algorithms, Division Algorithm, Floating-Point Arithmetic Operation, Decimal Arithmetic Unit. **(6L)**

# **Course Structure & Syllabus of BCA**

## **Applicable for Batch: 2021-24**

### **UNIT 5 Input-Output and Memory Organization:**

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. **(8L)**

#### **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: 2021-24

### BCA Course Description Document

Department offering the course	Computer Application
Course Code	CAF108
Course Title	Data Structures using C
Credits (L:T:P:C)	3:0:2:4
Contact Hours (L:T:P)	3:0:2
Prerequisites (if any)	CAF102
Course Basket	Discipline Core

### COURSE SUMMARY

The course is a foundation level course and requires the knowledge of the C programming language. 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. Some of the searching methods include Linear Search, Binary Search, and sorting mechanism includes Bubble sort, Insertion sort, Selection sort, Quick sort, Merge sort, and Heap Sort. 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, and how the choice of a data structure impacts the performance of programs. The other objective may include:

- ✓ How to select the appropriate data structure model specific to some application?
- ✓ Solve problems using data structures like Stacks, Queues, Linked Lists, Trees, Graphs, and writing programs for these solutions using C code.
- ✓ Introduce the concept of algorithm writing, analyzing algorithms, converting pseudocode to appropriate C code, 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:

- ✓ The student will develop an ability to read, write, and analyze the time and space complexity of any algorithms.
- ✓ Able to describe the properties, behavior, and implementation of basic data structures like Stacks, Queues, Linked List, Trees, and Graphs.
- ✓ Able to convert pseudocode to its appropriate C code implementation.
- ✓ Able to compare different searching and sorting techniques in terms of their memory usage and time consumption.
- ✓ Able to design and implement different hash functions, analyze the collision effect, and hash table implementations.

### CURRICULUM CONTENT

#### Unit 1: Introduction to Algorithms & Data Structure

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. **(8 L)**

# **Course Structure & Syllabus of BCA**

## **Applicable for Batch: 2021-24**

### **Unit 2: Arrays, Stacks, and Queues**

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. (7 L)

### **Unit 3: Linked Lists and Trees**

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. (8 L)

### **Unit4: Graphs**

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. (7 L)

### **Unit- 5: Sorting & Hashing:**

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. (9 L)

### **TEXTBOOK(S)**

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

### **REFERENCE BOOKS**

1. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publication, 2<sup>nd</sup> 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. 2<sup>nd</sup> Edition. 2006.
4. Willam J. Collins, Data Structure and the Standard Template library –2003, T.M.H. 1<sup>st</sup> Edition.
5. Kyle Loudon, Mastering Algorithms with C, O'Reily Publication, 1<sup>st</sup> 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.

# **Course Structure & Syllabus of BCA**

## **Applicable for Batch: 2021-24**

### **Lab Practical**

<b>S. NO.</b>	<b>EXPERIMENT NAME</b>
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.

# Course Structure & Syllabus of BCA

## Applicable for Batch: 2021-24

### BCA Course Description Document

Department offering the course	Computer Application
Course Code	CAF201
Course Title	Operating Systems
Credits (L: T:P:C)	3:1:0:4
Contact Hours (L: T:P)	3:1:0
Prerequisites (if any)	
Course Basket	Discipline Core

#### Course Summary

An introduction to fundamental concepts in operating systems: their design, implementation, and usage. Topics include process management, main memory management, virtual memory, I/O and device drivers, file systems, secondary storage management, and an introduction to critical sections and deadlocks.

#### Course Objectives

- ✓ Understanding of operating system concepts and the role it plays, An understanding of the structure of operating systems, applications, and the relationship between them.
- ✓ Some knowledge of the services provided by operating systems.
- ✓ Exposure to some details of major OS.

#### Course Outcomes

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

- ✓ Describe the important computer system resources and the role of operating system in their management policies and algorithms.
- ✓ Understand the process management policies and scheduling of processes by CPU
- ✓ Evaluate the requirement for process synchronization and coordination handled by operating system
- ✓ Describe and analyze the memory management and its allocation policies.
- ✓ Identify use and evaluate the storage management policies with respect to different storage management technologies. 6. Identify the need to create the special purpose operating system.

#### Curriculum Content

##### UNIT 1 Basic concepts and terminology:

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. **(8L)**

##### UNIT 2 Processor Management:

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. **(8L)**



# **Course Structure & Syllabus of BCA**

## **Applicable for Batch: 2021-24**

### **UNIT 3 Memory Management:**

Functions, Contiguous: State and Dynamic, Non-contiguous Segmentation and Paging, Virtual memory, Demand paging, Page replacement policies, Working Set principle. **(6L)**

### **UNIT 4 File Management:**

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. **(8L)**

### **UNIT 5 Device Management:**

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. **(6L)**

### **Text books:**

1. Operating System Concepts, Silberschatz and Galvin, John Wiley & Sons, 7th Ed., 2005.
2. Operating System, Haldar, Aravind, Pearson Education, 2<sup>nd</sup> Edition, 2014.

### **Reference Books:**

1. Modern Operating System, Tannenbaum, PHI, 4<sup>th</sup> Edition, 2016.
2. Operating Systems, Nutt, Pearson Education, 3<sup>rd</sup> Edition, 2009

### **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: 2021-24

### BCA Course Description Document

Department offering the course	Computer Application
Course Code	CAF202
Course Title	Introduction to Java Programming
Credits (L:T:P:C)	3:0:2:4
Contact Hours (L:T:P)	3:0:2
Prerequisites (if any)	CAF102
Course Basket	Discipline Core

### COURSE SUMMARY

This course covers Java and fundamental programming 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 how to write recursive methods for solving inherently recursive problems. The next part will introduce object-oriented programming. Java is an object-oriented programming language that uses abstraction, encapsulation, inheritance, and polymorphism to provide great flexibility, modularity, and reusability in developing software. 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:

- ✓ Understand and implement fundamental programming techniques and data types, variables, constants, assignments, expressions, and operators of Java programming language.
- ✓ Understand and implement selection statements, mathematical functions, characters, and strings, loops,
- ✓ Understand and implement methods, arrays and recursion using Java.
- ✓ Understand and implement object-oriented paradigm using abstraction, encapsulation, inheritance, and polymorphism.
- ✓ Understand and implement the objects and classes, exception handling, abstract classes, interfaces, Text I/O and binary I/O.

### CURRICULUM CONTENT

#### UNIT I: Introduction, Fundamental Programming Techniques

*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.*

(6 L)

#### UNIT 2: Selection Statements, Loops, Mathematical Functions, Characters and Strings

*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*

# Course Structure & Syllabus of BCA

## Applicable for Batch: 2021-24

*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.*

(6 L)

### UNIT 3: Methods, Arrays and Recursions

*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.*

(6 L)

### UNIT4: Object Oriented Paradigm

*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 toString() Method, Polymorphism, Dynamic Binding, Casting Objects and the instanceof Operator, The Object's equals Method, The ArrayList Class.*

(12L)

### 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 Cloneable 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.

### Lab Practical

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 and use of super keyword.
4	Program in Java to the concept of polymorphism by designing functions to sum different type of numbers
5	Program to show the concept of method overriding in Java.

## **Course Structure & Syllabus of BCA**

### **Applicable for Batch: 2021-24**

6	Program in Java that import the user define package and access the Member variable of classes that Contained by Package.
7	Program in C for the creation of Binary Search Tree for its various operation implementation.
8	Program in Java to handle the Exception using try and multiple catch block.
9	Program in Java to create a thread that Implement the Runnable interface
10	Program in Java to create Frame that display the student information using awt components
11	Program in Java to create frame for course enquiry using Swings components.

# Course Structure & Syllabus of BCA

## Applicable for Batch: 2021-24

### BCA Course Description Document

Department offering the course	Computer Application
Course Code	CAF203
Course Title	Web Technologies
Credits (L: T:P:C)	3:0:2:4
Contact Hours (L: T:P)	3:0:2
Prerequisites (if any)	
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:**

- Analyze a web page and identify its elements and attributes.
- Create web pages using XHTML and Cascading Style Sheets.
- Build dynamic web pages using JavaScript (Client-side programming).
- Create XML documents and Schemas.

#### Curriculum Content

##### UNIT 1 Internet Basic:

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. (6L)

##### UNIT 2 Introduction to JavaScript:

Advantage of JavaScript, JavaScript Syntax - Datatype - Variable - Array - Operator and Expression - Looping Constructor - Function - Dialog box. (8L)

##### UNIT 3 JavaScript document object model:

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. (8L)

##### UNIT 4: XML

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. (8L)

# Course Structure & Syllabus of BCA

## Applicable for Batch: 2021-24

### UNIT 5:XML Applications and Tools

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

(6L)

#### 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. Write a program to print date using JavaScript.
4. Write a JavaScript program to print the contents of the current window.
5. Write a JavaScript program to find the area of a triangle.
6. Write a program to Sum and Multiply two numbers using JavaScript.
7. Write a program to Show use of alert, confirm and prompt box.
8. Create validation Form in JavaScript.
9. Write a program to change content of web page.
10. Write a program to view XML coursesMenu.
11. Write a program to create XMLHttpRequest .
12. Wite 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: 2021-24

1. Department offering the course	Computer Application
2. Course Code	CAF204
3. Course Title	Design and Analysis of Algorithms
4. Credits (L:T:P:C)	3:0:2:4
5. Contact Hours (L:T:P)	3:0:1
6. Prerequisites (if any)	
7. Course Basket	

### 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 Objectives

Objective of this course is to study and analyse 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:**

- The student will develop an ability to read, write, and analyze the time and space complexity of any algorithms.
- 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.
- To determine the worst time complexity of algorithms
- 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

# Course Structure & Syllabus of BCA

## Applicable for Batch: 2021-24

### 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, 2<sup>nd</sup> edition, 2001.
2. **Fundamentals of Computer Algorithms**, Ellis Horowitz, Satraj Sahni and Rajasekharam, Galgotia publications Pvt. Ltd, New Delhi India, 2<sup>nd</sup> 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: 2021-24

### BCA Course Description Document

Department offering the course	Computer Application
Course Code	CAF205
Course Title	Software Engineering
Credits (L: T:P:C)	3:1:0:4
Contact Hours (L: T:P)	3:1:0
Prerequisites (if any)	
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:**

An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, manufacturability, sustainability, ethical, health and safety;

#### Curriculum Content

##### UNIT 1 Introduction to Software Engineering:

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. **(6L)**

##### UNIT 2 Software Cost Estimation:

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. **(6L)**

##### UNIT 3 Software design:

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. **(8L)**

##### UNIT 4 Implementation issues:

Implementation issues: Structured Coding Techniques - Coding Style - Standards and Guidelines - documentation guidelines -Type Checking - Scoping Rules - Concurrency Mechanisms. **(8L)**

##### UNIT 5 Quality Assurance:

Quality Assurance - Walkthroughs and Inspections - Static Analysis - Symbolic Execution - Unit Testing and Debugging - System Testing - Formal Verification: Enhancing Maintainability during Development -

# **Course Structure & Syllabus of BCA**

## **Applicable for Batch: 2021-24**

Managerial Aspects of Software Maintenance - Source Code Metrics - Other Maintenance Tools and Techniques. (10L)

### **Text books:**

1. Software engineering, K. K. Aggarwal & Yogesh Singh, New Age International, 2<sup>nd</sup> Edition, 2005.
2. Software Engineering, I. Sommerville, Addison Wesley, 10<sup>th</sup> 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: 2021-24

### BCA Course Description Document

Department offering the course	Computer Application
Course Code	CAF206
Course Title	Computer Networks
Credits (L: T:P:C)	3:1:0:4
Contact Hours (L: T:P)	3:1:0
Prerequisites (if any)	
Course Basket	Discipline Core

#### Course Summary

- ✓ Data communications, network architectures, communication protocols, data link control, medium access control
- ✓ Introduction to local area networks metropolitan area networks and wide area networks; Introduction to OSI model, routing algorithms and networking services.

#### 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:**

- Independently understand basic computer network technology.
- Understand and explain Data Communications System and its components.
- Identify the different types of network topologies and protocols.
- Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer

#### Curriculum Content

##### UNIT 1 Introduction:

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. **(6L)**

##### UNIT 2 Packet Transmission:

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. **(8L)**

##### UNIT 3 Routing Algorithms:

Distance-Vector, Link-State, Shortest path computation, Dijkstra's algorithm, Congestion control, WAN technologies including frame relay, X.25, ATM. **(6L)**

##### UNIT 4 Internetworking:

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. **(8L)**

##### UNIT 5 Network Services:

Electronic mail, File transfer, Access and management, Virtual terminals, Remote procedure call. **(6L)**

# **Course Structure & Syllabus of BCA**

## **Applicable for Batch: 2021-24**

### **Text books:**

1. Data communication and Networking, Forouzan, B.A, McGraw Hill, 4<sup>th</sup> Edition, 2006
2. Computer Networks, Tanenbaum, A.S., Prentice Hall, 4<sup>th</sup> Edition, 2003

### **Reference Books:**

1. Internetworking with TCP/IP Vol. 1 Principles, Comer, D.E., Prentice Hall of India, 5<sup>th</sup> 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: 2021-24

### BCA Course Description Document

1. Department offering the course	Computer Application
2. Course Code	CAF207
3. Course Title	Advanced Java Programming
4. Credits (L:T:P:C)	3:0:2:4
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:
- ✓ Understand and implement JavaFX technologies.
- ✓ Understand and implement java collections framework.
- ✓ Understand and implement multithreading in Java.
- ✓ Understand and implement networking and java database programming.
- ✓ Understand and implement enterprise level technologies like beans, servlets and jsp.

### CURRICULUM CONTENT

#### UNIT I: User Interface

*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.* (6L)

#### UNIT 2: Java Collections Framework

*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.*

(7 L)

#### UNIT 3: Multithreading

*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.*

(8 L)

# Course Structure & Syllabus of BCA

## Applicable for Batch: 2021-24

### UNIT4: Networking and Java database programming

Client/Server Computing, Relational Database Systems, SQL, JDBC, Prepared Statement, Callable Statement. (6 L)

### UNIT5: Enterprise programming

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. (11 L)

### 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 implement Runnable Interface.
4	WAP to create 5 thread by extending thread class.
5	WAP to create table Register in database and perform navigation operation using Result Set.
6	WAP in JDBC to perform Transaction Management by using SetAuto Commit(),Commit() & rollback() in the table student.
7	WAP in JDBC to insert Organization details by using PreparedFStatement Interface.

## **Course Structure & Syllabus of BCA**

### **Applicable for Batch: 2021-24**

8	WAP to demonstrate Life Cycle of Servlet.
9	WAP to switch ON and OFF the bulb by using visible bean.
10	Create a java application by implementing Generic Servlet Class.
11	WAP to display the utilization of HttpServlet Class.
12	Create login application in java by using MVC and mysql.
13	WAP using JSP code for describing all types of directive.

# Course Structure & Syllabus of BCA

## Applicable for Batch: 2021-24

### BCA Course Description Document

8. Department offering the course	Computer Science and Engineering
9. Course Code	CAF301
10. Course Title	Introduction to Data Science
11. Credits (L:T:P:C)	3:1:0:4
12. Contact Hours (L:T:P)	3:1:0
13. Prerequisites (if any)	
14. 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

Data Science is the study of the generalizable extraction of knowledge from data. This course serves as an introduction to the data science principles required to tackle real-world, data-rich problems in business and academia, including:

- Data acquisition, cleaning, and aggregation
- Exploratory data analysis and visualization
- Feature engineering
- Model creation and validation
- Basic statistical and mathematical foundations for data science

### Course Outcomes

- An understanding of problems solvable with data science and an ability to attack them from a statistical perspective.
- An understanding of when to use supervised and unsupervised statistical learning methods on labeled and unlabeled data-rich problems.
- The ability to create data analytical pipelines and applications in Python.
- Familiarity with the Python data science ecosystem and the various tools needed to continue developing as a data scientist.

### Curriculum Content

#### **UNIT1:COMPUTER SCIENCE/STATISTICS/LINEAR ALGEBRA SHORT REVIEW**

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. **(8L)**

#### **UNIT2:EXPLORATORY DATA ANALYSIS (EDA) AND VISUALIZATION**

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.) **(8L)**

#### **UNIT3:DATA MODELING: SUPERVISED/UNSUPERVISED LEARNING**

Two basic kinds of statistical models used for prediction. Supervised Learning algorithm: Linear Regression and Logistic Regression. Unsupervised Learning algorithm: K-Means clustering. Advanced



# **Course Structure & Syllabus of BCA**

## **Applicable for Batch: 2021-24**

supervised learning algorithms like linear support vector machines, decision trees, and random forest models for regression and classification. Advanced unsupervised learning algorithm like DBSCAN.

**(8L)**

### **UNIT4:DATA MODELING: FEATURE SELECTION, ENGINEERING, AND DATA PIPELINES**

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.

**(6L)**

### **UNIT5:DATA MODELING: MODEL EVALUATION AND PROJECT PRESENTATIONS**

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.

**(6L)**

#### **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 MieraJr.. 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: 2021-24

### BCA Course Description Document

Department offering the course	Computer Application
Course Code	CAF302
Course Title	Computer Graphics
Credits (L: T:P:C)	3:0:2:4
Contact Hours (L: T:P)	3:0:2
Prerequisites (if any)	
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 subject helps students develop problem-solving, communication and research skills in the context of computer graphics, including computer representation, and 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 visualisation and computer games.

#### Course Outcomes

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

- Describe the major computer graphics applications.
- Explain the operations of graphics hardware systems  
Explain the viewing pipeline of generating a raster-scan image

#### Curriculum Content

##### UNIT 1 Introduction to Active and Passive Graphics:

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. (10L)

##### UNIT 2 Process and need of Scan Conversion:

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. (12L)

# Course Structure & Syllabus of BCA

## Applicable for Batch: 2021-24

### UNIT 3 Translation, Scaling and Rotation:

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.

(10L)

### UNIT 4 3D Graphics:

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

(8L)

### UNIT 5 Illumination and shading:

Illumination models, Ambient light, Diffuse reflection, Specular reflection, Gouraud and Phong shading models, parametric cubic curves, Hermite, Bezier and B-spline curves.

(6L)

#### Text books:

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

#### Reference Books:

1. Computer Graphics (Schaums Outline Series), R.A. Plastock et.al., TMH, 2<sup>nd</sup> edition, 2006
2. Computer Graphics, J.D. Foley, Pearson Education, 2<sup>nd</sup> 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 drawing algorithm
3. Write a program to implement Bresenham circle drawing algorithm
4. Write a program to implement Midpoint circle drawing algorithm
5. Write a program to rotate a triangle (continuous rotation)
6. Write a program to depict movement of a man walking
7. Write a program to depict a rotating cylinder.
8. Write a program to implement Cohen Sutherland line clipping algorithm
9. Write a program to implement Liang Barsky line clipping algorithm
10. Write a program to implement 2D transformation
11. Write a program to implement 3D transformation
12. Write a program to implement Bezier curve.

# Course Structure & Syllabus of BCA

## Applicable for Batch: 2021-24

### BCA Course Description Document

Department offering the course	Computer Application
Course Code	CAF303
Course Title	Python Programming
Credits (L: T:P:C)	3:0:2:4
Contact Hours (L: T:P)	3:0:2
Prerequisites (if any)	
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:**

- To learn how to use lists, tuples, and dictionaries in Python programs
- To define the structure and components of a Python program
- To learn how to read and write files in Python.
- To learn how to use exception handling in Python applications for error handling

#### Curriculum Content

##### UNIT 1 Introduction to python:

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. **(6L)**

##### UNIT 2 Numpy basics:

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. **(8L)**

##### UNIT 3 Classes and Objects:

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. **(6L)**

##### UNIT 4 Pandas:

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. **(8L)**

# Course Structure & Syllabus of BCA

## Applicable for Batch: 2021-24

### UNIT 5 Plotting and visualization:

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. (8L)

#### Text books:

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

#### Reference Books:

1. Trending on Python Vol I, Matt Harrison, 1<sup>st</sup> edition, 2013
2. Trending on Python Vol II, Matt Harrison, 1<sup>st</sup> 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 darrays 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 to import data using pandas read methods like read (), read_csv() etc
10. WAP using pandas to reset index of data frame and use methods like idxmax(), Idxmin() etc.
11. WAP in pandas to import various file formats (csv,excel,txt etc.) and perform various operation on data frame and Series
12. WAP using matplotlib to create histograms, densityplots, scatter plots etc.

# Course Structure & Syllabus of BCA

## Applicable for Batch: 2021-24

### BCA Course Description Document (DE)

Department offering the course	Computer Application
Course Code	CAF251
Course Title	Mobile Application using Android
Credits (L: T:P:C)	2:0:2:3
Contact Hours (L: T:P)	2:0:2
Prerequisites (if any)	
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:**

- Describe those aspects of mobile programming that make it unique from programming for other platforms,
- Critique mobile applications on their design pros and cons,
- Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces,
- Program mobile applications for the Android operating system that use basic and advanced phone features, and
- Deploy applications to the Android marketplace for distribution

### Curriculum Content

#### UNIT 1 Introduction to Android:

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. **(8L)**

#### UNIT 2 Introduction to Android SDK, Application Life Cycle:

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. **(8L)**

#### UNIT 3 Created Files:

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. **(8L)**

#### UNIT 4 Adding the Intent to Your Activity:

Adding the Intent to Your Activity, Modifying the Android Phone Dialer, adding a Button, Implementing an Edit Text View. **(6L)**

# Course Structure & Syllabus of BCA

## Applicable for Batch: 2021-24

### UNIT 5:Lists, Menus, and Other Views

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. (6L)

#### 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. Create an application to read file from the SD card and display that file content to the screen.
9. Create an application to draw line on the screen as user drag his finger.
10. Create an application to send message between two emulators.
11. Create an application to take picture using native application.
12. Create an application to pick up any image from the native application gallery and display it on the screen.

# Course Structure & Syllabus of BCA

## Applicable for Batch: 2021-24

### BCA Course Description Document (DE)

Department offering the course	Computer Application
Course Code	CAF252
Course Title	Advance Web Applications
Credits (L: T:P:C)	2:0:2:3
Contact Hours (L: T:P)	2:0:2
Prerequisites (if any)	
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:**

- Is able to understand and use the basics of the XML based technologies
- Is able to understand and define and utilize the Web Services / Windows Communication Foundations concept
- Is able to describe how Web Services can be used to implement Service Oriented Architecture (SOA)
- Is able to design and implement user interfaces based on the AJAX technology

#### Curriculum Content

##### UNIT 1 PHP

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, StringCreating and accessing, String Searching & Replacing, String Formatting String, String Related Library function. **(6L)**

##### UNIT 2 Function:

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 **(8L)**

##### UNIT 3 PHP Components:

PHP GD Library, PHP Regular expression function, Cookies, Session, Server variable, Database Connectivity with MySQL (Using PhpMyAdmin) **(8L)**

##### UNIT 4: Working with file and Directories:

Understanding file& directory, Opening and closing a file Coping, renaming and deleting a file, Working with directories, Building a text editor, File Uploading & Downloading **(8L)**



# Course Structure & Syllabus of BCA

## Applicable for Batch: 2021-24

### 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, 1<sup>st</sup> edition, 2001
2. **PHP Bible**, Joyce Park and Tim Converse, Wiley, 2<sup>nd</sup> edition, 2002

#### Reference Book:

1. **Beginning XML**, Joe Fawcett, Danny Ayers, Liam R. E. Quin, Wrox, 5<sup>th</sup> Edition, 2012
2. **Professional PHP5**, Stephen Nowicki, Wiley, 2<sup>nd</sup> 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:

Program to print each element of an array using for each().
Program to find number of elements in an array.
Program to sort elements in an array in ascending order.
Program to create a Simple Calculator.
Programs to create simple Login and Logout using sessions.
Program to Upload a file to the Server.
Program to create a New Database.
Program to connect to the server and selecting database.
Program to Insert and Fetch records to the table in Database.
Program to Store and Read an image in Database.
Program to create a simple Registration form.
Contact form using PHP

# Course Structure & Syllabus of BCA

## Applicable for Batch: 2021-24

### BCA Course Description Document (DE)

Department offering the course	Computer Application
Course Code	CAF351
Course Title	Multimedia Tools
Credits (L: T:P:C)	2:0:2:3
Contact Hours (L: T:P)	2:0:2
Prerequisites (if any)	
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:

- Understand the fundamental principles of Multimedia and Animations.
- Understand the working of various Multimedia tools
- Understand various Designing Tools.

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

#### Curriculum Content

##### UNIT 1

**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.

**(6L)**

##### UNIT 2

**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.

**(8L)**

##### UNIT 3

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

**(8L)**

##### UNIT 4:

**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.

**(8L)**

# Course Structure & Syllabus of BCA

## Applicable for Batch: 2021-24

### UNIT 5:

**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.

(6L)

### 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, Kiran Thakrar, 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
2. Create Cover page for any text book
3. Create a Paper add for advertising of any commercial agency
4. Design a Passport photo
5. Create a Pamphlet for any program to be conducted by an organization
6. Create Broacher for you college
7. Create Titles for any forthcoming film
8. Custom shapes creation
9. Create a Web template for your college
10. Convert color photo to black and white photo
11. Enhance and reduce the given Image size
12. Background changes
13. Design Box package cover
14. Design Texture and patterns
15. Filter effects & Eraser effects
16. WordPress Introduction Installation & Configuration
17. WordPress Theme, Widget, Plugin
18. WordPress Theme development
19. WordPress Advanced development.
20. 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: 2021-24

### BCA Course Description Document (DE)

1. Department offering the course	Computer Application
2. Course Code	CAF352
3. Course Title	Artificial Intelligence
4. Credits (L:T:P:C)	2:0:2:3
5. Contact Hours (L:T:P)	2:0:2
6. Prerequisites (if any)	
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 important part of the content. Knowledge Representation, Reasoning Planning and Learning being requirement for development of 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.

#### Course Outcomes

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

1. Ability to identify and formulate appropriate AI methods for solving a problem.
2. Ability to implement AI algorithms.
3. Ability to compare different AI algorithms in terms of design issues, computational complexity, and assumptions.
4. Student will be able to use the concepts of AI for real world problem solving.
5. 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.

# Course Structure & Syllabus of BCA

## Applicable for Batch: 2021-24

### 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.

### Text Books:

1. Stuart J. Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education Asia, Third Edition, Latest Edition.
2. Elaine Rich, Kevin Knight and Shivashankar B. Nair, "Artificial Intelligence", Tata McGraw-Hill, Latest Edition.
3. Nils J. Nilsson, "Artificial Intelligence - A New Synthesis", Harcourt Asia Pvt. Ltd., Morgan Kaufmann, Latest Edition.

### Reference Books:

1. Ivan Bratko, "Prolog Programming for Artificial Intelligence", Pearson Education Asia, Latest Edition.
2. Dan W. Patterson, "Introduction to Artificial Intelligence and Expert Systems", PHI Learning, Latest Edition.

### 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.
11	Implementation of an Expert System for a particular domain.