Scheme for BCA

Session –w.e.f. 2022-2023
### BCA First Year

#### Semester-I

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Paper</th>
<th>(L:T:P)</th>
<th>Credits</th>
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<th>Internal Assessment</th>
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<tbody>
<tr>
<td>BCA-2101</td>
<td>Computer Fundamentals &amp; C Programming</td>
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Practical Examination of BCA-2105 & 2106 may be conducted on the same day in 2 sittings each maximum of 4 hours.

#### Semester-II

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Practical Examination of BCA-2205 & 2206 may be conducted on the same day in 2 sittings each maximum of 4 hours.
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*Practical Examination of BCA-2305 & 2306 may be conducted on the same day in 2 sittings each maximum of 4 hours.*

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<th>Course No.</th>
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*Practical Examination of BCA-2405 & 2406 may be conducted on the same day in 2 sittings each maximum of 4 hours.*
# BCA Third Year

## Semester-V

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<th>Course No.</th>
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Practical Examination of BCA-2505 & 2506 may be conducted on the same day in 2 sittings each maximum of 4 hours.

*Industrial Visit may also be conducted.*

## Semester-VI

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Practical Examination of BCA-2605 & 2606 may be conducted on the same day in 2 sittings each maximum of 4 hours.
BCA-2101: COMPUTER FUNDAMENTALS & C PROGRAMMING

External Marks: 80
Internal Marks: 20
Time: 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

UNIT-I

UNIT-II

UNIT-III
Overview of C: History of C, identifiers and keywords, Data types, Constants and Variables, Assignment statement, Structure of a C Program, printf(), scanf() Functions, Operators & Expression, Type casting and conversion, operator hierarchy & associativity.

UNIT-IV
Decision making & branching: Decision making with IF statement, IF-ELSE statement, Nested IF statement, switch statement, goto statement. Looping: For, while, and do-while loop, jumps in loops, break, continue statement, Nested loops. Introduction to array, functions, pointer.

SUGGESTED READINGS
1) Let Us C by Yashwant Kanetkar
5) Rajaraman, V., Fundamentals of Computers, PHI
6) Ram, B., Computer Fundamentals, Architecture & Organization, New Age International (P) Ltd.
Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of a total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

UNIT I

SETS: Sets, Subsets, Equal Sets Universal Sets, Finite and Infinite Sets, Operation on Sets, Union, Intersection and Complements of Sets, Cartesian Product, Cardinality of Set. DETERMINANTS: Definition, Minors, Cofactors, Properties of Determinants, Applications of determinants in finding area of triangle. MATRICES: Definition, Types of Matrices, Addition, Subtraction, Scalar Multiplication and Multiplication of Matrices, Adjoint, Inverse.

UNIT II

RELATIONS AND FUNCTIONS: Properties of Relations, Equivalence Relation, Partial Order Relation Function: Domain and Range, Onto, Into and One to One Functions, Composite and Inverse Functions. LIMITS & CONTINUITY: Limit at a Point, Properties of Limit, Computation of Limits of Various Types of Functions, and Continuity of a function at a Point, Continuity over an Interval, Sum, product and quotient of continuous functions.

UNIT III

Algebraic Structures: Definitions and examples with one Binary Operation:Semi Groups, Monoids, Groups; Congruence Relation and Quotient Structures, Permutation Groups, Cyclic groups, Normal Subgroups, Definitions and examples of Algebraic Structures with two Binary Operation: Rings, Integral Domain, Fields; Boolean Algebra and Boolean Ring.

UNIT IV

Basic Statistics: Measure of Central Tendency, Preparing frequency distribution table, Mean, Mode, Median, Measure of Dispersion: Range, Variance and Standard Deviations, Correlation and Regression.

SUGGESTED READINGS
1) Trembley, J.P & R. Manohar: Discrete Mathematical Structure with Application to Computer Science, TMH.
3) Lipschutz, Seymour: Discrete Mathematics, Schaum’s Series
4) Satinder Bal Gupta: Discrete Mathematics and Structures, University Science Press, Delhi.
5) Kenneth H. Rosen: Discrete Mathematics and its applications, TMH.
BCA-2103: SYSTEMS ANALYSIS AND DESIGN

External Marks: 80
Internal Marks: 20
Time: 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of a total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

UNIT-I
Introduction to system, Definition and characteristics of a system, Elements of system, Types of system, System development life cycle, Role of system analyst, Analyst/user interface, System planning and initial investigation: Introduction, Bases for planning in system analysis, Sources of project requests, Initial investigation, Fact finding, Information gathering, information gathering tools, Fact analysis, Determination of feasibility.

UNIT-II
Structured analysis, Tools of structured analysis: DFD, Data dictionary, Flow charts, Gantt charts, decision tree, decision table, structured English, Pros and cons of each tool, Feasibility study: Introduction, Objective, Types, Steps in feasibility analysis, Feasibility report, Oral presentation, Cost and benefit analysis: Identification of costs and benefits, classification of costs and benefits, Methods of determining costs and benefits, Interpret results of analysis and take final action.

UNIT-III
System Design: System design objective, Logical and physical design, Design Methodologies, structured design, Form-Driven methodology(IPO charts), structured walkthrough, Input/Output and form design: Input design, Objectives of input design, Output design, Objectives of output design, Form design, Classification of forms, requirements of form design, Types of forms, Layout considerations, Form control.

UNIT-IV
System testing: Introduction, Objectives of testing, Test plan, testing techniques/Types of system tests, Quality assurance goals in system life cycle, System implementation, Process of implementation, System evaluation, System maintenance and its types, System documentation, Forms of documentation.

SUGGESTED READINGS
1) Systems Analysis and design, E.M. AWAD Galgotia Pub.(P) Ltd. 2) Data Management and Data Structures, Loomis (PHI)
4) Introductory System analysis and Design, Lee Vol. I & II
BCA-2104: PC SOFTWARE

External Marks: 80
Internal Marks: 20
Time: 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of a total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

UNIT - I
MS-Windows: Operating system-Definition & functions, basics of Windows. Basic components of windows, icons, types of icons, taskbar, activating windows, using desktop, title bar, running applications, exploring computer, managing files and folders, copying and moving files and folders.

UNIT - II

UNIT - III
Electronic SpreadSheet using MS-Excel - Introduction to MS-Excel, Cell, cell address, Creating & Editing Worksheet, Formatting and Essential Operations, Moving and copying data in excel, Header and footer, Formulas and Functions, Charts, Cell referencing, Page setup, Macros.

UNIT - IV
Presentation using MS-PowerPoint: Presentations, Creating, Manipulating & Enhancing Slides, Organizational Charts, Excel Charts, Word Art, Layering art Objects, Animations and Sounds, Inserting Animated Pictures or Accessing through Object, Inserting Recorded Sound Effect or In-Built Sound Effect.

SUGGESTED READINGS
1) Microsoft Office – Complete Reference – BPB Publication
2) Satinder Bal Gupta, Introductory Concepts of Information Technology, Shree Mahavir Book(Publishers), Delhi
3) Learn Microsoft Office – Russell A. Stultz – BPB Publication
BCA-2201: COMPUTER ORGANIZATION ARCHITECTURE

External Marks: 80
Internal Marks: 20
Time: 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

UNIT - I
Information Representation: Number Systems, Binary Arithmetic, Fixed-point and Floating Point representation of numbers, BCD Codes, Error detecting and correcting codes, Character Representation – ASCII, EBCDIC, Unicode

UNIT - II
Binary Logic: Boolean Algebra, Boolean Theorems, Boolean Functions and Truth Tables, Canonical and Standard forms of Boolean functions, Simplification of Boolean Functions – Venn Diagram, Karnaugh Maps.

UNIT - III

UNIT - IV

SUGGESTED READINGS
5) Nicholas Carter, Schaum’s Outlines Computer Architecture, Tata McGraw-Hill
BCA-2202: DATA STRUCTURE

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

UNIT - I
Introduction: Elementary data organization, Data Structure definition, Data structure operations, Applications of data structures, Algorithms complexity and time-space, Sorting: Internal & external sorting, Quick sort, Heap sort, Merge sort, Searching: Linear search, binary search, merging, Comparison of various sorting and searching algorithms on the basis of their complexity.

UNIT – II
Arrays: Introduction, Linear arrays, Representation of linear array in memory, address calculations, Traversal, Insertions, Deletion in an array, Multidimensional arrays, Parallel arrays, sparse arrays. Linked List: Introduction, Array vs. linked list, Representation of linked lists in memory, Traversal, Insertion, Deletion, Searching in a linked list, Header linked list, Circular linked list, Two-way linked list, Applications of linked lists.

UNIT – III

UNIT – IV
Tree: Introduction, Definition, Representing Binary tree in memory, Traversing binary trees, Traversal algorithms using stacks. AVL Tree, Threaded Tree. Graph: Introduction, Graph theory terminology, Sequential and linked representation of graphs.

SUGGESTED READINGS
BCA-2203: INTERNET & WEB DESIGNING

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

UNIT - I

UNIT - II

UNIT - III

UNIT - IV

References:
1. Dick Oliver: Tech Yourself HTML 4 in 24 Hours, Techmedia.
2. Satish Jain: "O" – Level Information Technology,
3. Craig Zacker: 10 minutes Guide to HTML Style Sheets, PHI.
6. Margaret Levine Young: Internet – The Complete Reference
7. Harley Hahn: The Internet – Complete Reference, TMH.
BCA-2204: MANAGEMENT INFORMATION SYSTEM

External Marks: 80
Internal Marks: 20
Time: 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

UNIT – I

UNIT – II

UNIT – III

UNIT – IV

SUGGESTED READINGS
BCA-2301: OPERATING SYSTEM

External Marks: 80
Internal Marks: 20
Time: 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

UNIT – I
**Fundamentals of Operating system:** Introduction to Operating System, its need and operating System services, Types of operating systems: Batch, Multi programming, timeshared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, Multitasking.
**Process Management:** Process concept, Operation on processes, Cooperating Processes, Threads, and Inter-process Communication.

UNIT-II
**CPU Scheduling:** Basic concepts, scheduling criteria, scheduling algorithms: FCFS, SJF, Round Robin & Queue Algorithms.
**Deadlocks:** Deadlock characterization, Methods for handling deadlocks, Banker’s Algorithm.

UNIT-III
**Memory Management:** Logical versus Physical address space, Swapping, Contiguous allocation, Paging, Segmentation, Fragmentation.
**Virtual Memory:** Demand paging, Performance of demand paging, Page replacement, Page replacement algorithms, Thrashing.

UNIT-IV
**File management:** File system Structure, Allocation methods: Contiguous allocation, Linked allocation, Indexed allocation, Free space management: Bit vector, Linked list, Grouping, Counting.
**Device Management:** Disk structure, Disk scheduling: FCFS, SSTF, SCAN, C-SCAN, LOOK, C-LOOK.

SUGGESTED READINGS
BCA -2302: INTRODUCTION TO DATABASE DESIGN

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

UNIT – I

UNIT – II

UNIT – III
Relational algebra, Relational calculus, Relational database design: Functional dependencies, Modification anomalies, 1st to 3rd NFs, BCNF, 4th and 5th NFs, computing closures of set FDs, Keys, Relational Constraints.

UNIT – IV
SQL: Data types, Basic Queries in SQL, Insert, Delete and Update Statements, Views, Query processing: General strategies of query processing, query optimization, query processor, concept of security, concurrency and recovery.

SUGGESTED READINGS
Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

UNIT-I

Object Oriented Programming Concepts: Procedural Language and Object Oriented approach, Characteristics of OOP, user defined types, polymorphism and encapsulation. Getting started with C++: syntax, data types, variables, string, function, namespace and exception, operators, flow control, recursion, array and pointer, structure.

UNIT-II

Abstracting Mechanism: classes, private and public, Constructor and Destructor, member function, static members, references.
Memory Management: new, delete, object copying, copy constructor, assignment operator, this input/output.

UNIT-III

Inheritance and Polymorphism: Derived Class and Base Class, Different types of Inheritance, Overriding member function, Abstract Class, Public and Private Inheritance, Ambiguity in Multiple inheritance, Virtual function, Friend function, Static function.

UNIT-IV

Exception Handling: Exception and derived class, function exception declaration, unexpected exception, exception when handling exception, resource capture and release.

Template and Standard Template Library: Template classes, declaration, template functions, namespace, string, iterators, hashes, iostreams and other types.

SUGGESTED READINGS
4. Shah & Thakker : Programming in C++, ISTE/EXCEL.
5. Johnston : C++ Programming Today, PHI.
7. Samanta : Object Oriented Programming with C++ & JAVA, PHI.
BCA-2304: ARTIFICIAL INTELLIGENCE

External Marks: 80  
Internal Marks: 20  
Time: 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

UNIT – I

Overview of A.I: Introduction to AI, Importance of AI and its related field, AI techniques, Criteria for success.
Problems, problem space and search: Defining the problem as a state space search, Production system and its characteristics, Issues in the design of the search problem. Heuristic search techniques: Generate and test, hill climbing, best first search technique, problem reduction, constraint satisfaction

UNIT - II

Knowledge Representation: Definition and importance of knowledge, Knowledge representation, various approaches used in knowledge representation, Issues in knowledge representation.
Using Predicate Logic: Representing Simple Facts in logic, Representing instances and is_a relationship, Computable function and predicate.

UNIT - III

Natural language processing: Introduction syntactic processing, Semantic processing, Discourse and pragmatic processing.
Learning: Introduction learning, Rote learning, learning by taking advice, learning in problem solving, learning from example-induction, Explanation based learning.

UNIT - IV


SUGGESTED READINGS:


Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

UNIT-I


Software Requirements Analysis & Specifications: Requirement engineering, requirement elicitation techniques like FAST, QFD, requirements analysis using DFD, Data dictionaries & ER Diagrams, Requirements documentation, Nature of SRS, Characteristics & organization of SRS.

UNIT – II


UNIT - III


Software Implementation: Relationship between design and implementation, Implementation issues and programming support environment, coding the procedural design, Good coding style.

UNIT - IV


Suggested Readings
3. Pressman : Software Engineering, TMH.
BCA-2402: COMPUTER GRAPHICS & MULTIMEDIA

External Marks: 80
Internal Marks: 20
Time: 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

UNIT-I


Output Primitives: Points and lines, line drawing algorithms, mid-point circle and ellipse algorithms. Filled area primitives: Scan line polygon fill algorithm, boundary fill and flood fill algorithms.

UNIT-II

2-D Geometrical Transforms: Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems.

2-D Viewing: The viewing pipeline, viewing coordinate reference frame, window to viewport coordinate transformation, viewing functions.

UNIT-III

3-D Geometric Transformations: Translation, rotation, scaling, reflection and shear transformations, composite transformations.

3-D Viewing: Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping.

UNIT-IV


SUGGESTED READINGS
BCA – 2403: ANALYSIS AND DESIGN OF ALGORITHMS

External Marks: 80
Internal Marks: 20
Time: 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

UNIT – I

UNIT – II
Disjoint set operations, union and find algorithms, AND/OR graphs, Connected Components and Spanning trees, Bi-connected components Backtracking-General method, applications, the 8-queen problem, sum of subsets problem, graph coloring, Hamiltonian cycles.

UNIT – III

UNIT – IV
NP Hard and NP Complete Problems: Basic concepts, NP hard graph and NP scheduling problems some simplified NP hard problems.

SUGGESTED READINGS

2. Design and Analysis of Algorithms, S. Sridhar, Oxford Univ. Press
3. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson Education.
BCA-2404: PYTHON PROGRAMMING

External Marks: 80
Internal Marks: 20
Time: 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

Learning Objectives:
1. Understanding the importance of Python in Machine Learning and Data analysis. 2. Getting knowledge of Machine learning algorithms in Python.
3. Develop the Python programming skills to solve computational problems. 4. Make the students aware about the usefulness of various python packages as per the application requirements.

UNIT – I
Introduction to Python Programming, History of Python, its features, Scope of Python, Downloading and installing Python, Python code execution process, run a simple program on Python interpreter and IDLE. The concept of data types; variables, assignments; numerical types; arithmetic operators and expressions; comments in the program.

UNIT-II
Conditions, Boolean logic, logical operators; ranges; Control statements: if-else, loops (for, while); short-circuit (lazy) evaluation, Lists, tuples, and dictionaries; basic list operators, replacing, inserting, removing an element; searching and sorting lists; dictionary literals, adding and removing keys, accessing and replacing values; traversing dictionaries.

UNIT-III
Classes and OOP: classes, objects, attributes and methods; defining classes; design with classes, data modeling, inheritance, polymorphism, operator overloading; exception handling, try block.

UNIT-IV
Installing and exploring different python libraries used in Graphical User Interface design, Basics of File handling in python, Introduction to Matplotlib.

Learning Outcomes
1. Exploring the different ways of running Python.
2. Teach the students to deal with real world data by importing data and performing various data analysis operations.
3. Plotting the data for data visualization.

SUGGESTED READINGS
BCA-2501: DATA MINING AND E-COMMERCE

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

UNIT-I
Business View of Information Technology applications: Business Enterprise Organization, Its functions, and core business process, Types of digital data, structured data, unstructured data, Semi-structured data. Introduction to OLTP and OLAP, Difference between OLAP and OLTP.

UNIT-II
Types of Data Model: Data Modelling techniques, Fact table, Dimension table, Basics of Enterprise Reporting: Reporting perspectives common to all levels of Enterprise, Report Standardization and Presentation practices, Enterprise Reporting characteristics in OLAP World, Balanced scorecard, Dashboards.

UNIT-III
Basics of data integration, Need for data Warehouse, Definition of data Warehouse, ODS, Goals of data warehouse, Constituents of data Warehouse, Data integration, Data integration technologies, Data Quality, Data Profiling.

UNIT-IV

SUGGESTED READING:
BCA-2502: JAVA PROGRAMMING
External Marks: 80
Internal Marks: 20
Time: 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of a total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

UNIT-I
Object Oriented Methodology-1: Paradigms of Programming Languages, Evolution of OO Methodology, Basic Concepts of OO Approach, Comparison of Object Oriented and Procedure Oriented Approaches, Benefits of OOPs, Introduction to Common OO Language, Applications of OOPs.
Object Oriented Methodology-2: Classes and Objects, Abstraction and Encapsulation, Inheritance, Method Overriding and Polymorphism.

UNIT-II
Object Oriented Concepts: Class and Objects-- Class Fundamentals, Creating objects, Assigning object reference variables; Introducing Methods, Static methods, Constructors, Overloading constructors; This Keyword; Using Objects as Parameters, Argument passing, Returning objects, Method overloading, Garbage Collection, The Finalize ( ) Method.

UNIT-III
Packages: Defining Package, CLASSPATH, Package naming, Accessibility of Packages, using Package Members.
Interfaces: Implementing Interfaces, Interface and Abstract Classes, Extends and Implements together.
Exceptions Handling: Exception, Handling of Exception, Using try-catch, Catching Multiple Exceptions, Using finally clause, Types of Exceptions, Throwing Exceptions, Writing Exception Subclasses.

UNIT-IV
I/O in Java: I/O Basics, Streams and Stream Classes, The Predefined Streams, Reading from, and Writing to, Console, Reading and Writing Files, The Transient and Volatile Modifiers, Using Instance of Native Methods.

SUGGESTED READINGS
1. Programming in Java, E Balagurusamy.
2. The Complete Reference JAVA, TMH Publication.
4. JAVA 2 UNLEASHED, Tech Media Publications.
BCA-2503: C#.NET FRAMEWORK

External Marks: 80
Internal Marks: 20
Time: 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

UNIT-I

UNIT – II

UNIT – III
Operators and expressions: Arithmetic, relational, logical, bitwise, special operators, evolution of expressions, operator precedence & associativity, Control constructs in C#: Decision making, loops, Classes & methods: Class, methods, constructors, destructors, overloading of operators & functions.

UNIT – IV
Inheritance & polymorphism: visibility control, overriding, abstract class & methods, sealed classes & methods, interfaces. Advanced features of C#: Exception handling & error handling, automatic memory management, Input and output (Directories, Files, and streams).

SUGGESTED READINGS

1. Introduction to C# using .NET By Robert J. Oberg, PHI, 2002.
BCA-2504: INTRODUCTION TO CLOUD COMPUTING

External Marks: 80
Internal Marks: 20
Time: 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

UNIT - I
Cloud Computing introduction: Basic structure of cloud computing, working model for cloud computing- deployment and service model, benefits, risks, limitations, components, Types of cloud Environment, characteristics, architecture from front end and back end, Evolution. Applications (Business, Data storage & backup, Management, Social etc.)

UNIT - II
Public, Private, Hybrid, Community cloud model introduction with advantages and, (SaaS IaaS-PaaS) application, characteristics, Benefits, issues, GRID Computing- advantages, disadvantages, Cloud Computing infrastructure: Hypervisor, Technologies- virtualization, SOA Hardware virtualization with Characteristics, Types of Hardware Virtualization.

UNIT - III
Security concerns threats in cloud computing security, security mechanism- IAM (Identify and access management), PKI (Public key infrastructure), Encryption (Symmetric vs asymmetric), SSO (Single sign on), specialized cloud architecture- Direct I/O access architecture, mLoad-balanced virtual switches, multiple resource access architecture, Federated cloud.

UNIT - IV
Mobile Cloud Computing, cloud based ERP, CRM software, supply chain management (SCM), its Benefits, CC architecture, advantages, issues and applications, Introduction of various applications offered by AWS, Microsoft AZURE, GCP, Fog Computing.

SUGGESTED READINGS
2. Cloud Computing-web Based applications that change the way you work and collaborate online, Michael Miller, Pearson Education,2009 Edition.
BCA-2601: DATA SCIENCE

External Marks: 80
Internal Marks: 20
Time: 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

UNIT-I

Introduction to Data Science: Concept of Data Science, Traits of Big data, Web Scraping, Analysis vs Reporting, Collection, storing, processing, describing and modeling, statistical modeling and algorithm modeling, AI and data science, Myths of Data science.

UNIT-II


UNIT-III

Data Science Methodology: Business Understanding, Analytic Approach, Data, Requirements, Data Collection, Data Understanding, data Preparation, Modeling, Evaluation, Deployment, feedback.

UNIT-IV

Data Science Application: Prediction and elections, Recommendations and business analytics, clustering and text analytics.

SUGGESTED READINGS:

**BCA -2602: CRYPTOGRAPHY & COMPUTER NETWORK**

**External Marks:** 80  
**Internal Marks:** 20  
**Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

**UNIT-I**

**UNIT – II**
Symmetric key Ciphers: Block Cipher principles & Algorithms (DES, AES), Differential and Linear Cryptanalysis, Block cipher modes of operation, Key distribution, Asymmetric key Ciphers: Principles of public key cryptography to systems, Algorithms (RSA, ECC), Key Distribution.

**UNIT – III**
Network Reference Models: Layered architectures, protocol hierarchies, interface and services: ISO-OSI reference model; internet protocol stacks. Data Link Layer Functions and Protocols: Framing, Error-control, Flow-control; sliding window protocol; HDLC; Link State and Distance Vector Routing

**UNIT – IV**
Medium Access Sublayer: CSMA/CD Protocol, Token Bus, Token Ring, FDDI; satellite networks. Network functions and protocols: Switching Concept; cell switching, routing and congestion control, TCP/IP protocol architecture. Network Device: Repeater, hub, switch, router and gateway; IRC ; TCP and UDP.

**SUGGESTED READING:**

1. Cryptography and Network Security: C K Shyamala, N Harin i, Dr T R Padmanabhan, Wiley India, 1”
3. Information Security, Principles and Practice: Mark Stamp, Wiley India.
BCA-2603: PHP

External Marks: 80
Internal Marks: 20
Time: 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

UNIT-I

UNIT - II

UNIT - III
Date & Time: Formatting String with PHP, Using Date and time Functions with PHP. Forms: Creating simple input forms. Accessing Form input with user defined arrays, HTML and PHP Code on a single page.

UNIT - IV
Redirecting User. Working with File Upload. Uploading & Downloading. Pattern matching in PHP, Replacing text, splitting a string with a Regular Expression. Email: Sending Email, Headers, Reviewing SMTP, PHP Mailer.

SUGGESTED READINGS :

2. Teach Yourself PHP, MYSQL & Apache Meloni, Pearson Education.
BCA-2604: STATISTICAL COMPUTING & R PROGRAMMING

External Marks: 80
Internal Marks: 20
Time: 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

UNIT-I

UNIT-II
Creating matrices, Matrix operations, Applying Functions to Matrix Rows and Columns, Adding and deleting rows and columns, Vector/Matrix Distinction, Avoiding Dimension Reduction, Higher Dimensional arrays, lists, Creating lists, General list operations, Accessing list components and values, applying functions to lists, recursive lists.

UNIT-III
Creating Data Frames, Matrix-like operations in frames, Merging Data Frames, Applying functions to Data frames, Factors and Tables, factors and levels, Common functions used with factors, Working with tables, Other factors and table related functions, Control statements, Arithmetic and Boolean operators and values, Default values for arguments, Returning Boolean values, functions are objects.

UNIT-IV
Classes, Managing your objects, Input/Output, accessing keyboard and monitor, reading and writing files, accessing the internet, String Manipulation, Graphics, Creating Graphs, Customizing Graphs, Saving graphs to files, Creating three-dimensional plots.

SUGGESTED READINGS: