

Syllabi Scheme

Session 2026-27 (For Batch 2025-27)

BCA-II (Semester-III)									
Sr. No.	Code	Course Type	Title of Paper	L+T	P	External Marks	Internal Marks	Max. Marks	Credits
1	BCA301-T	MAJOR	Python Programming	3+0	0	70	30	100	3
2	BCA302-T	MAJOR	Software Engineering	4+0	0	70	30	100	4
3	BCA303-T	MAJOR	DBMS	4+0	0	70	30	100	4
4	BCA304-P	MAJOR LAB	Software Lab-III (Python Programming)	0	4	35	15	50	1
5	BCA305-T	DSE	Basic Computations	4+0	0	70	30	100	4
6	BCA306-T	SEC	Data Structures	3+0	0	70	30	100	3
7	BCA307-P	SEC LAB	SEC LAB (Data Structures)	0	4	35	15	50	2
Total						455	195	650	21



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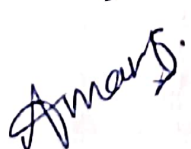
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Syllabi Scheme

Session 2026-27 (For Batch 2025-26)

BCA-II (Semester-IV)									
Sr. No.	Code	Course Type	Title of Paper	L+T	P	External Marks	Internal Marks	Max. Marks	Credits
1	BCA401-T	MAJOR	Operating System	4+0	0	70	30	100	4
2	BCA402-T	MAJOR	AI Application and Prompt Engineering	4+0	0	70	30	100	4
3	BCA403-T	MAJOR	Mobile Application Development Using Kotlin	3	0	70	30	100	3
4	BCA404-P	MAJOR LAB	Software Lab-IV (Mobile Application Development Using Kotlin)	0	4	35	15	50	1
5	BCA405-T	DSE	AI and ML	4	0	70	30	100	4
6	BCA406-T	SEC	Data Analysis and Visualisation using Spreadsheet	3+0	0	70	30	100	3
7	BCA407-P	SEC LAB	SEC LAB (Data Analysis and Visualisation using Spreadsheet)	0	4	35	15	50	2
Total						455	195	650	23







BCA II (SEMESTER-III)

SESSION- 2026-27

BCA301T: Major: Python Programming

Total Marks: 100

External Examination: 70

Internal Assessment: 30

Credits: 3

Maximum Time: 3 Hours

Minimum Pass Marks: 35%

Lectures to be delivered: 55-60 Hours

L: 4 T: 0 P: 0

Instructions for Paper-Setter:

The question paper will consist of three sections: A, B, and C. Sections A and B will each contain four questions based on their respective sections of the syllabus and will carry 30% of the total marks each. Section C will comprise 6 to 12 short answer-type questions, covering the entire syllabus uniformly, and will carry the remaining 40% of the total marks.

Instructions for candidates:

Candidates are required to attempt any two questions from each of Sections A and B, and all questions from Section C.

Course Objectives

This course provides the knowledge of Python programming language concepts like Data Types, Loops, Functions, Python Lists, Strings, Tuples, Dictionaries etc. After completion of this course the learner is expected to analyse the real-life problem and write a program in Python to solve the problem. After completion of the module, the student will be able to:

- Setup Python to develop simple applications.
- Make use of the Python programming language to construct basic programs.
- Know how to use collections such as list, tuple, range, dictionary and sets.
- Make use of functions and modules.

SECTION A

Introduction to Python Programming Language: Programming Language, History and Origin of Python Language, Features of Python, Limitations, Major Applications of Python, Getting Python, Installing Python, Setting up Path and Environment Variables, Running Python, First Python Program, Python Interactive Help Feature, Python differences from other languages.

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Python Data Types & Input/Output: Keywords, Identifiers, Python Statements, Indentation, Documentation, Variables, Multiple Assignment, Understanding Data Type, Data Type Conversion, Python Input and Output Functions, Import Command.

Operators and Expressions: Operators in Python, Expressions, Precedence, Associativity of Operators, Non-Associative Operators.

Control Structures: Decision Making Statements, Python Loops, Python Control Statements.

Python Native Data Types: Numbers, Lists, Tuples, Sets, Dictionary, Functions & Methods of Dictionary, Strings (in detail with their methods and operations).

SECTION B

Python Functions: Functions, Advantages of Functions, Built-in Functions, User-defined Functions, Anonymous Functions, Pass by Value vs. Pass by Reference, Recursion, Scope and Lifetime of Variables.

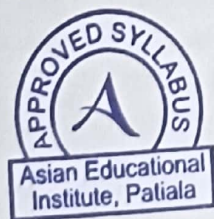
Python Modules: Module Definition, Need of Modules, Creating a Module, Importing Module, Path Searching of a Module, Module Reloading, Standard Modules, Python Packages.

Exception Handling: Exceptions, Built-in Exceptions, Exception Handling, User-defined Exceptions in Python.

Recommended Books

1. **Python Programming – A Modular Approach (with Graphics, Database, Mobile and Web Applications)** by Sheetal Taneja and Naveen Kumar, Pearson.
2. **Head First Python** by Paul Barry, O'Reilly.
3. **Dive Into Python** by Mark Pilgrim, APress.
4. **Beginning Programming with Python For Dummies** by John Paul Mueller.

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BCA302T:MAJOR: Software Engineering

Total Marks: 100

Maximum Time: 3 Hours

External Examination: 70

Minimum Pass Marks: 35%

Internal Assessment: 30

Lectures to be delivered: 55-60 Hours

Credits: 4

L: 4 T: 0 P: 0

A) Instructions for paper-setter

The question paper will consist of three sections A, B & C. Sections A & B will have four questions from the respective sections of the syllabus and will carry 30% marks each. Section C will have 6-12 short answer type questions which will cover the entire syllabus uniformly and will carry 40% marks in all.

B) Instructions for candidates

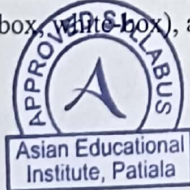
Candidates are required to attempt two questions each from sections A & B of the question paper and the entire section C.

Course Objective:

- To understand the various phases of software development, from requirements gathering to deployment and maintenance.
- To learn, elicit, analyze, specify and validate software requirements.
- Knowledge of various testing techniques, including unit testing, integration testing, and system testing.
- To understand software quality attributes, metrics, and assurance techniques.

Learning Outcome

- To ability to analyze, design, implement, test, and maintain software systems
- To understand the importance of teamwork, communication, and ethical considerations in the field.
- To gain proficiency in requirements engineering, software design patterns, testing methodologies, and project management.
- To understand different testing levels (unit, integration, system, acceptance), techniques (black-box, white-box), and tools.

**SECTION A***Yadwinder kaur**Amars**hu**Hearts*

Introduction: The Problem Domain, Software Engineering Challenges, Software Engineering Approach, Software development life cycle, its phases. Software development process models: Waterfall, Prototyping, Iterative.

Software Process: Characteristics of software process, Project management process, Software configuration management process.

Project Planning: Activities, COCOMO model.

Software Metrics: Definition, Importance, Categories of metrics, Software Quality Attributes, Cyclomatic complexity metric.

Software Requirements Analysis: Need for SRS, Data flow diagrams, Data Dictionary, entity relationship diagram. Characteristics and components of SRS, validation, metrics.

SECTION B

Software Design: Design principles, Module-level concepts, Structure Chart and Structured Design methodology, verification, metrics: network metrics, information flow metrics.

Coding: Programming Principles and Guidelines, Verification-code inspections, static analysis.

Software Testing: Testing fundamentals, Black Box Testing: Equivalence class partitioning, Boundary value analysis, cause-effect graphing: White Box Testing. Control flow and Data flow based testing, mutation testing: levels of testing, test plan, test case specification, test case execution and analysis.

Software maintenance: Categories of maintenance.

Software Reliability: Definition, uses of reliability studies

Text/References Book:

1. An Integrated approach to Software Engineering: Third Edition 2005. Pankaj Jalote. Narosa Publications.
2. Software Engineering: Revised Second Edition, K.K. Aggarwal, Yogesh Singh, New Age International Publishers.
3. Software Engineering :A Practitioner's Approach, Fifth Edition, Roger. S. Pressman, McGraw Hill

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BCA303T:MAJOR: Database Management System

Total Marks: 100

Maximum Time: 3 Hours

External Examination: 70

Minimum Pass Marks: 35%

Internal Assessment: 30

Lectures to be delivered: 55-60 Hours

Credits: 4

L: 4 T: 0 P: 0

A. Instructions for paper-setter

The question paper will consist of three sections A, B & C. Sections A & B will have four questions from the respective sections of the syllabus and will carry 30% marks each. Section C will have 6-12 short answer type questions which will cover the entire syllabus uniformly and will carry 40% marks in all.

B. Instructions for the candidates

1. Candidates are required to attempt five questions in all, selecting two questions each from Section A and Section B and compulsory questions of Section C.
2. Use of non-programmable scientific calculators is allowed.

Section A

Introduction: Database Systems, Database and its purpose, Characteristics of the database approach, Advantages and disadvantages of database systems. Classification of DBMS Users: Actors on the scene, Database Administrators, Database Designers, End Users, System Analysts and Application Programmers .

Database System Concepts and Architecture : Data models, schemas, instances, data base state. DBMS Architecture; The External level, The conceptual level, The internal level, Mappings. Data Independence; Logical data Independence, Physical data Independence. Database Languages and Interfaces; DBMS Language, DBMS Interfaces. Classification of Database Management Systems.

Data Modeling using E.R. Model (Entity Relationship Model) : Data Models Classification; File based or primitive models, traditional data models, semantic data models. Entities and Attributes, Entity types and Entity sets, Relationship among entities

Section B

Relational Model: Relational Model Concepts: Domain, Attributes, Tuples and Relations.



Relational constraints and relational database schemes; Domain constraints, Key constraints and constraints on Null. Relational databases and relational database schemes, Entity integrity, referential integrity and foreign key

Normalization: Non-loss decomposition and functional dependencies, First, Second and Third normal forms, denormalization

Database Access and Security : Database security, process controls, database protection, grant and revoke

RECOMMENDED BOOKS

- 1) Vig, Dr. Renu, and Ekta Walia, "Fundamentals of Database Management Systems", an ISTE, Publication, New Delhi.
- 2) ISRD Group, "Introduction to DBMS", Tata McGraw Hill Education Pvt Ltd, New Delhi.
- 3) Wesley, Date C.J. Adison, "An Introduction to Database Systems".
- 4) Elmasri, Navathe, Adison Wesley, "Fundamentals of Database Systems".
- 5) Desai, Bipin C., "An Introduction to Database Systems", Galgotia Publications Pvt. Ltd., Daryaganj, New Delhi 110002.



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BCA304P: MAJOR LAB: Software Lab-III (Python Programming)

Total Marks: 50

External Examination: 35

Internal Assessment: 15

Credits: 01

Maximum Time: 3 Hours

Minimum Pass Marks: 35%

Practical Sessions: 45-55 Hours

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This laboratory course will comprise exercises to supplement what is learnt under paper BCA304P: MAJOR LAB: Software Lab-III (Python Programming).

LIST OF PRACTICALS (Python Programming)

1. Getting started with Python and IDLE in interactive and batch modes
2. Use of the string methods: - lower, count and replace
3. Write instructions to perform each of the steps below
 - a. Create a string containing at least five words and store it in a variable.
 - b. Print out the string.
 - c. Convert the string to a list of words using the string split method.
 - d. Sort the list into reverse alphabetical order using some of the list methods(you might need to use dir(list) or help(list) to find appropriate methods).
 - e. Print out the sorted, reversed list of words.
4. Write a program that determines whether the number is prime or not.
5. Find all numbers which are multiple of any number a, but not the multiple of number b, between any given range.
6. Swap two integer numbers using a temporary variable. Repeat the exercise using the code format: a, b = b, a. Verify your results in both the cases.
7. Find the largest of n numbers, using a user defined function largest().
8. Write a function myReverse() which receives a string as an input and returns the reverse of the string.
9. Check if a given string is palindrome or not.

The breakup of marks for the practical will be as under:

i	Internal Assessment	30% Marks
ii	Viva Voce (External Evaluation)	30% Marks
iii	Lab Record, Program Development and Execution (External Evaluation)	30% Marks
iv	Attendance	10% Marks

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Total Marks: 100

Maximum Time: 3 Hours

External Examination: 70

Minimum Pass Marks: 35%

Internal Assessment: 30

Lectures to be delivered: 55-60 Hours

Credits: 4

L: 4 T: 0 P: 0

A) Instructions for paper-setter

The question paper will consist of three sections A, B & C. Sections A & B will have four questions from the respective sections of the syllabus and will carry 30% marks each. Section C will have 6-12 short answer type questions which will cover the entire syllabus uniformly and will carry 40% marks in all.

B) Instructions for candidates

1. Candidates are required to attempt two questions each from sections A & B of the question paper and the entire section C.
2. Use of non-programmable scientific calculators is allowed.

COURSE OBJECTIVE

- To give fundamental knowledge of set theories, abstract algebra.
- To explain the basic concepts of matrices, trigonometry.
- To make the learners acquainted with the use of Calculus and vector analysis.

LEARNING OUTCOME:

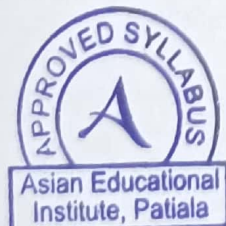
On the successful completion of the course, students will be able to:

- Have a clear understanding of Mathematical functions.
- Develop an in-depth knowledge of Mathematical theories.
- Develop skills to get employment in I.T and Analysis Field

SECTION A

Complex Numbers: Complex Numbers in the form of Real and Imaginary parts of a complex number, Complex conjugate, algebra of complex numbers, square roots of a complex number, cube roots of unity.

Quadratic Equations: Solutions of Quadratic equations (with real and complex coefficients), Relations between roots and coefficients, Nature of roots, Equations reducible to quadratic equations.

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Cartesian System of Rectangular Coordinates: Cartesian coordinate system, distance formula, section formula, centroid and incentre, area of triangle, condition for collinearities of three points in a plane.

SECTION B

Matrices: Types of Matrices, Addition, Subtraction, Multiplication, Transpose, Conjugate and their properties, Symmetric, Skew-symmetric, Minor, co-factors, Adjoint, Inverse of matrices, Solution of linear system of equations using matrices.

Rank of a matrix, consistency of linear system of equations

Determinants: Expansion of determinants (upto order 4), solution of linear system of equations using Cramer rule.

Text/Reference Books:

1. NCERT Textbooks of Mathematics for +1 and +2.
2. M K. Jain, S.R.K. Iyengar and R.K. Jain, " Numerical Methods for Scientific and Engineering Computation", Wiley.
3. B. S. Grewal, Higher Engineering Mathematics", Khanna Publishers.



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BCA306T:SEC: Data Structures

Total Marks: 100

Maximum Time: 3 Hours

External Examination: 70

Minimum Pass Marks: 35%

Internal Assessment: 30

Lectures to be delivered: 55-60 Hours

Credits: 3

L:3 T:0 P:0

A) Instructions for paper-setter

The question paper will consist of three sections A, B & C. Sections A & B will have four questions from the respective sections of the syllabus and will carry 30% marks each. Section C will have 6-12 short answer type questions which will cover the entire syllabus uniformly and will carry 40% marks in all.

B) Instructions for candidates

1. Candidates are required to attempt two questions each from sections A & B of the question paper and the entire section C.
2. Use of non-programmable scientific calculators is allowed.

COURSE OBJECTIVE:

- To give fundamental knowledge data type various data structures.
- To explain the basic concepts of searching and graph theories.
- To make the learners acquainted with the use of different theories.

LEARNING OUTCOME:

- Understand the need for Data Structures when building Applications.
- Appreciate the need for optimized algorithms.
- Able to walk through insert and delete for different data techniques.
- Improve programming skills.

SECTION A

Basic concepts and notations: Types of data structures, Data structure operations, Mathematical notations and functions, Algorithmic complexity, Big 'O' notation, Time and space trade off.

Arrays: Linear array, representation of array in memory, traversing linear array, insertion and deletion in an array, Two-dimensional array, row major and column major orders, sparse matrix.

Stacks: Representation of stacks in memory (linked and sequential), operations on stacks, Applications of stacks: string reversal, parentheses matching.

Queues: Representation of queues in memory (linked and sequential), operations on queues, insertion in rear, deletion from front.

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SECTION B

Linked list: Representation of linked list using static and dynamic data structures, insertion and deletion of a node from linked list, searching in link list, searching in sorted link list.

Trees: Definition and basic concepts, linked representation and representation in contiguous storage, binary tree, binary tree traversal, Binary search tree, searching, insertion and deletion in binary search tree.

Searching and sorting algorithms: Linear and binary search, bubble sort, insertion sort, selection sort, quick sort, merge sort.

Text/Reference Books:

- Seymour Lipschutz, Theory and Practice of Data Structures, McGraw-Hill.
- Vishal Goyal, Lalit Goyal, Pawan Kumar, A Simplified Approach to Data Structures, Shroff Publications.
- Y.L.Tenenbaum, and A. J. Augenstein, Data Structures using C and C++, PHI.
- Robert Sedgewick, Algorithms in C, Pearson Education.



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BCA307P: SEC LAB: Software Lab (Data Structures)

Total Marks: 50

External Examination: 35

Internal Assessment: 15

Credits: 02

Maximum Time: 3 Hours

Minimum Pass Marks: 35%

Practical Sessions: 45-55 Hours

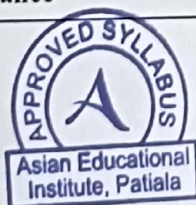
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This laboratory course will comprise exercises to supplement what is learnt under paper **BCA307P: SEC LAB: Software Lab (Data Structures)**. Students are required to develop following programs in C language with internal documentation:

1. Program to insert an element in an array.
2. Program to delete an element from an array.
3. Program to store an array using sparse representation.
4. Program to apply various operations on stack.
5. Program for parenthesis matching using stack.
6. Program for String reversal using stack.
7. Program to insert and delete nodes in a queue.
8. Program to insert and delete nodes in a linked list.
9. Program to search a node in a linked list.
10. Program to insert or delete nodes in a binary tree.
11. Program to traverse binary trees.
12. Program for implementing linear search.
13. Program for implementing binary search.
14. Program for implementing Bubble sort.
15. Program for implementing Selection sort.
16. Program for implementing Insertion sort.
17. Program for implementing Quick sort.
18. Program for implementing Merge sort.

The breakup of marks for the practical will be as under:

i	Internal Assessment	30% Marks
ii	Viva Voce (External Evaluation)	30% Marks
iii	Lab Record, Program Development and Execution (External Evaluation)	30% Marks
iv	Attendance	10% Marks



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Syllabi Scheme

Session 2026-27 (For Batch 2025-26)

BCA-II (Semester-IV)								
Code	Course Type	Title of Paper	L+T	P	External Marks	Internal Marks	Max. Marks	Credits
BCA401-T	MAJOR	Operating System	4+0	0	70	30	100	4
BCA402-T	MAJOR	AI Application and Prompt Engineering	4+0	0	70	30	100	4
BCA403-T	MAJOR	Mobile Application Development Using Kotlin	3	0	70	30	100	3
BCA404-P	MAJOR LAB	Software Lab-IV (Mobile Application Development Using Kotlin)	0	4	35	15	50	1
BCA405-T	DSE	AI and ML	4	0	70	30	100	4
BCA406-T	SEC	Data Analysis and Visualisation using Spreadsheet	3+0	0	70	30	100	3
BCA407-P	SEC LAB	SEC LAB (Data Analysis and Visualisation using Spreadsheet)	0	4	35	15	50	2
Total					455	195	650	23



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BCA II (SEMESTER-IV)**SESSION 2026-27****BCA401T:MAJOR: Operating System**

Total Marks: 100

Maximum Time: 3 Hours

External Examination: 70

Minimum Pass Marks: 35%

Internal Assessment: 30

Lectures to be delivered: 55-60 Hours

Credits: 4

L: 4 T: 0 P: 0

A) Instructions for paper-setter

The question paper will consist of three sections A, B & C. Sections A & B will have four questions from the respective sections of the syllabus and will carry 30% marks each. Section C will have 6-12 short answer type questions which will cover the entire syllabus uniformly and will carry 40% marks in all.

B) Instructions for candidates

Candidates are required to attempt two questions each from sections A & B of the question paper and the entire section C.

Course Objective:

- To focus on understanding the fundamental concepts, structure, and functionality of operating systems.
- To gain knowledge about how the OS manages hardware and software resources.
- To provide an interface between the user and the computer, and ensure efficient and reliable system operation.

Learning Outcome :

- Students will be able to apply the knowledge and skills to understand, analyze, and implement key OS concepts
- Understanding process management, memory management, file systems, and I/O management, along with the ability to implement and analyze scheduling algorithms and synchronization techniques.
- Apply these concepts to real-world scenarios and understand the design principles behind various OS architectures.

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SECTION A

Operating System: Definition, Need, Services, Types of operating systems, simple batch system, multi programmed batch system, time sharing system, parallel system, distributed system, real time system, personal computer system. Operating system components, operating system services, system calls.

Process Management process: definition, process state, process scheduling, operations on processes. Basic concepts of thread. Difference between process and thread.

CPU Scheduling: Basic concepts, scheduling criteria, scheduling algorithms FCFS, SJF, Round Robin and Multilevel queue scheduling.

SECTION B

Deadlocks: Characteristics of deadlocks, methods for handling deadlocks, deadlock prevention, deadlock avoidance

Memory Management: Logical versus Physical address space, swapping, contiguous allocation, Paging, Concept of Virtual memory. Implementation by Demand Paging, Page replacement algorithms- FIFO, Optimal, LRU, Concept of thrashing.

File Management: Allocation methods: contiguous allocation, linked allocation and indexed allocation.

Device Management: Disk Scheduling: FCFS, SSTF, SCAN, C-SCAN, LOOK.

Text/Reference Books:

Abraham Silberschatz. Peter B. Galvin. Operating System Concepts. Addison Wesley Publishing Co. Engineering. Third Edition 2005 Pankaj Jolote, Narosa Publications. 5th Edition.



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BCA402T: MAJOR: AI Applications and Prompt Engineering

Total Marks: 100
External Examination: 70
Internal Assessment: 30
Credits: 4

Maximum Time: 3 Hours
Minimum Pass Marks: 35%
Lectures to be delivered: 55-60 Hours
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Course outcome :

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

- Explain the concepts and types of artificial intelligence.
- Illustrate basic machine learning methods for regression, classification and clustering.
- CO3: Identify real-world applications across different disciplines.
- Make use of prompt engineering techniques to interact with generative AI tools. CO5: Outline recent trends in artificial intelligence and machine learning.

A) Instructions for the paper setter

The question paper will consist of three sections A, B & C. Sections A & B will have four questions from the respective sections of the syllabus and will carry 30% marks each. Section C will have 6-12 short answer type questions which will cover the entire syllabus uniformly and will carry 40% marks in all.

B) Instructions for the candidates

1. Candidates are required to attempt five questions in all, selecting two questions each from Section A and Section B and compulsory questions of Section C.
2. Use of non-programmable scientific calculators is allowed.

Section A

Introduction to Artificial Intelligence: Artificial Intelligence, How Does AI Work?, Advantages and Disadvantages of Artificial Intelligence, History of Artificial Intelligence, Types of Artificial Intelligence, Weak AI, Strong AI.

Applications of AI: Application of AI in Healthcare, Application of AI in Finance, Application of AI in Retail, Application of AI in Agriculture, Application of AI in Education, Application of AI in Transportation, AI in Experimentation and Multi-disciplinary research.

Machine Intelligence: Defining Intelligence, Components of Intelligence, Differences Between Human and Machine Intelligence, Agent and Environment, Search, Uninformed Search

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SECTION A

Introduction to Android and Kotlin :Android OS architecture and components(Activities, Services, Broadcast Receivers, Content Providers), Setting up Android Studio, Kotlin syntax: variables, data types, functions, control flow, Null safety, classes, and object-oriented programming in Kotlin, Version control with Git/GitHub.

Mobile Computing & Android Architecture: History and evolution of mobile platforms, Application lifecycle and Android OS internals, MVVM and Clean Architecture overview

Android UI Development: XML Layouts, View Hierarchy, and Material Design, UI components (TextView, Button, ImageView, etc.), Layouts: Linear, Constraint, Relative

Introduction to Jetpack Compose and responsive design: Activities, Fragments & Navigation, Activity and Fragment lifecycles, Intents, navigation components, Safe Args, Dialogs, Menus, Bottom Sheets

State Management & ViewModel Architecture: ViewModel, LiveData, and Data Binding, StateFlow and handling configuration changes, User Interface Design, RecyclerView and Adapters, Navigation Graph and data transfer between screens.

SECTION B

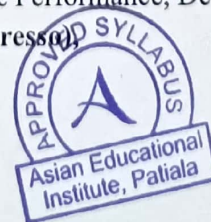
Data Persistence & Local Storage:SharedPreferences, internal & external storage, SQLite and Room Database, Jetpack DataStore and offline caching techniques

Networking & API Integration:REST APIs using Retrofit/Volley/OkHttp, JSON/XML handling, coroutines for async calls, WorkManager and AlarmManager for background tasks

Dependency Injection & Modular Architecture:DI principles, Dagger Hilt, Modular app development and clean code practices, Firebase & Cloud Integration, Firebase Authentication, Firestore, Realtime Database, Push notifications, Firebase Analytics, Crashlytics

Security in Android Applications: Encrypted storage, network security config, ProGuard, R8, and runtime permissions, Testing, Debugging & Performance, Debugging tools (ADB, Logcat, Profiler), **Unit testing (JUnit), UI testing (Espresso)**

CI tools: GitHub Actions, Firebase Test Lab



Algorithms, Informed Search Algorithms: Pure Heuristic Search, Best-First Search Algorithm (Greedy Search).

Knowledge Representation: Introduction, Knowledge Representation, Knowledge-Based Agent, Types of Knowledge.

Section B

Introduction to Prompt Engineering: Introduction to Prompt Engineering, The Evolution of Prompt Engineering, Types of Prompts, How Does Prompt Engineering Work?, Comprehending Prompt Engineering's Function in Communication, The Advantages of Prompt Engineering, The Future of LLM Communication.

Prompt Engineering Techniques for ChatGPT: Introduction to Prompt Engineering Techniques, Instructions Prompt Technique, Zero, One, and Few Shot Prompting, Self-Consistency Prompt.

Prompts for Creative Thinking: Introduction, Unlocking Imagination and Innovation.

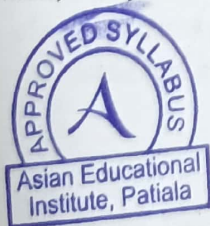
Prompts for Effective Writing: Introduction, Igniting the Writing Process with Prompts.

Textbooks:

1. Reema Thareja, Artificial Intelligence: Beyond Classical AI, Pearson Education, 2023.
2. Ajantha Devi Vairamani and Anand Nayyar, Prompt Engineering: Empowering Communication, 1st Edition, CRC Press, Taylor & Francis Group, 2024. (DOI: <https://doi.org/10.1201/9781032692319>).
3. Saptarsi Goswami, Amit Kumar Das and Amlan Chakrabarti, "AI for Everyone – A Beginner's Handbook for Artificial Intelligence", Pearson, 2024.

Reference books / Manuals:

1. Stuart Russell and Peter Norvig, *Artificial Intelligence: A Modern Approach* (4th Edition), Pearson Education, 2023.
2. Elaine Rich, Kevin Knight, and Shivashankar B. Nair, *Artificial Intelligence*, McGraw Hill Education.
3. Tom Taulli, *Prompt Engineering for Generative AI: ChatGPT, LLMs, and Beyond*, Apress, Springer Nature. Nilakshi Jain, *Artificial Intelligence: Making A System Intelligent*, First Edition, Wiley.



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BCA403T: Mobile Application Development Using Kotlin

Total Marks : 100

Maximum Time : 3 Hrs.

Minimum Pass Marks: 35%

University Examination: 70

Lectures to be delivered: 45-55 Hrs.

Internal Assessment: 30

A).Instructions for paper-setter

The question paper will consist of three sections A, B & C. Sections A & B will have four questions from the respective sections of the syllabus and will carry 30% marks each. Section C will have 6-12 short answer type questions which will cover the entire syllabus uniformly and will carry 40% marks in all.

B) Instructions for candidates

Candidates are required to attempt two questions each from sections A & B of the question paper and the entire section C.

Course Objective :

- To understand Kotlin syntax and features, mastering Android UI design, implementing app functionality with Kotlin, and publishing applications to the app store.
- To design user interfaces using XML layouts, including different types of views (buttons, text views, etc.) and layout managers.
- To utilize location services and device sensors for location-based features.
- To integrate external web services and APIs to retrieve and display data dynamically

Learning Outcome :

- Learn the architecture and components of major mobile operating systems like Android .
- To gain expertise in programming languages relevant to mobile development, such as Kotlin for Android .
- To design user interfaces (UI) and user experiences (UX) that are intuitive and engaging for mobile users.
- Learn to handle data storage and retrieval using techniques like SQLite databases, cloud databases (like Firebase), and content providers.
- To understand how to integrate mobile apps with web services and APIs.

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App Deployment, Monetization & Capstone: Preparing APKs and AABs, release signing, Play Store publishing, ASO, in-app purchases, ads

Text/Reference Books :

- Android Programming with Kotlin for Beginners – John Horton
- Kotlin Programming: The Big Nerd Ranch Guide – Josh Skeen & David Greenhalgh
- Head First Android Development – Dawn Griffiths & David Griffiths
- Kotlin in Action – Dmitry Jemerov & Svetlana Isakova
- Professional Android – Reto Meier & Ian Lake
- Official Documentation: <https://developer.android.com>

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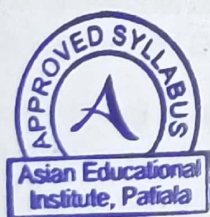


BCA404P: Software Lab IV (Based On Paper BCA403T)**Total Marks: 50****Maximum Time: 3 Hrs.****University Examination:35****Minimum Pass Marks: 35%****Internal Assessment:15****Practical sessions: 45-55 Hrs**

The breakup of marks for the practical will be as under

i	Internal Assessment	30% Marks
ii	Viva Voce (External Evaluation)	30% Marks
iii	Lab Record, Program Development and Execution (External Evaluation)	30% Marks
iv	Attendance	10% Marks

This laboratory course will mainly consist of exercise based on subject BCA403T (Mobile Application Development Using Kotlin).



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BCA405T:DSE: Artificial Intelligence & Machine Learning

Total Marks: 100

External Examination: 70

Internal Assessment: 30

Credits: 4

Maximum Time: 3 Hours

Minimum Pass Marks: 35%

Lectures to be delivered: 55-60 Hours

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A) Instructions for the paper setter

The question paper will consist of three sections A, B & C. Sections A & B will have four questions from the respective sections of the syllabus and will carry 30% marks each. Section C will have 6-12 short answer type questions which will cover the entire syllabus uniformly and will carry 40% marks in all.

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AI?**B) Instructions for the candidates**

1. Candidates are required to attempt five questions in all, selecting two questions each from Section A and Section B and compulsory questions of Section C.
2. Use of non-programmable scientific calculators is allowed.

Section A

Introduction to Artificial Intelligence: Artificial Intelligence, How Does AI Work?, Advantages and Disadvantages of Artificial Intelligence, History of Artificial Intelligence, Types of Artificial Intelligence, Weak AI, Strong AI, Reactive Machines, Limited Memory, Theory of Mind, Self-Awareness, Is Artificial Intelligence Same as Augmented Intelligence and Cognitive Computing, Machine Learning and Deep Learning.

Machine Intelligence: Defining Intelligence, Components of Intelligence, Differences Between Human and Machine Intelligence, Agent and Environment, Search, Uninformed Search Algorithms, Informed Search Algorithms: Pure Heuristic Search, Best-First Search Algorithm (Greedy Search).

Knowledge Representation: Introduction, Knowledge Representation, Knowledge-Based Agent, Types of Knowledge.

Section B

Introduction to Machine Learning: Applications, Challenges, Model Representation, Basic introduction to Scikit-Learn.



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Supervised Learning: Linear regression (with one variable and multiple variables), Cost Function, Gradient Descent, Polynomial Regression, Decision Trees, Classification (Logistic Regression, Overfitting, Regularization), SVM

Unsupervised Learning: K-means Clustering, Hierarchical clustering

Neural Networks: Multilayer Neural network, Activation Function, Back propagation algorithm, Gradient Checking, Multiclass Classification.

Textbooks:

1. Reema Thareja, Artificial Intelligence: Beyond Classical AI, Pearson Education, 2023.
2. Ajantha Devi Vairamani and Anand Nayyar, Prompt Engineering: Empowering Communication, 1st Edition, CRC Press, Taylor & Francis Group, 2024. (DOI: <https://doi.org/10.1201/9781032692319>).
3. Saptarsi Goswami, Amit Kumar Das and Amlan Chakrabarti, "AI for Everyone – A Beginner's Handbook for Artificial Intelligence", Pearson, 2024.



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BCA406T: SEC: Data Analysis and visualization using Spreadsheet

Total Marks: 100
External Examination: 70
Internal Assessment: 30
Credits: 3

Minimum Pass Marks: 55%
Lectures to be delivered: 55-60 Hours
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A. Instructions for paper-setter:

The question paper will consist of three sections A, B & C. Sections A & B will have four questions from the respective sections of the syllabus and will carry 30% marks each. Section C will have 6-12 short answer type questions which will cover the entire syllabus uniformly and will carry 40% marks in all.

B. Instructions for candidates.

Candidates are required to attempt two questions each from sections A & B of the question paper and the entire section C.

Course Objective:

- To handle, analyse, visualize, manage and present data using various tools and techniques.
- To understand and apply descriptive statistics (mean, median, standard deviation, etc.) to summarize and understand data.
- To create various types of visualizations (charts, graphs, dashboards) to represent data effectively.
- To understand which visualization types are best suited for different types of data and analytical goals.

Learning Outcome:

- Understand the basics of data analytics and its applications.
- Develop proficiency in using spreadsheet software for data manipulation and analysis.
- Build and use spreadsheets models for decision making and communicate data sights effectively.
- Understand the fundamentals of data visualization and its importance.
- Study different types of visualizations and their appropriate uses.

SECTION – A

Introduction to Spreadsheet: Overview of Spreadsheet, setting up the workspace and preferences, basic data entry and formatting.



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Basic Functions and Formulas: Understanding formulas and functions. Basic arithmetic functions (SUM, AVERAGE, MIN, MAX), text functions (CONCATENATE, LEFT, RIGHT, MID), logical functions (IF, AND, OR, NOT).

Data Cleaning and Preparation: Importing data from various sources, data cleaning techniques: removing duplicates, handling missing values, data validation, text functions for data cleaning.

Data Manipulation and Transformation: Sorting and filtering data, using tables and structured references, using lookup functions (VLOOKUP, HLOOKUP, INDEX-MATCH), working with PivotTables for data summarization.

SECTION – B

Basic Data Analysis Techniques: Descriptive statistics in Excel: mean, median, mode, standard deviation, and variance, frequency distributions, using Excel's Data Analysis Tool pack.

Introduction to Data Visualization: Principles of data visualization, creating basic charts in Excel: bar charts, line charts, pie charts, customizing charts for better clarity.

Advanced Data Visualization Techniques: Creating advanced charts- scatter plots, histograms, box plots, introduction to Pivot Charts, using sparklines for data trends.

Advanced Excel Functions: SUMIFS, COUNTIFS, AVERAGEIFS, array formulas, performing scenario analysis and what-if analysis, using Solver for optimization problems.

Texts/Reference Books:

1. For Open Source: Documentation Team, Libre Office. Getting Started with Libre Office 6.0. Australia,
2. Friends of Open Document, Incorporated, 2019.
3. For Proprietary: Working in Microsoft Office - Richard Mansfield -Tata McGraw Hill Education



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BCA407P: SEC LAB: SEC LAB(Data Analysis and visualization using Spreadsheet

Total Marks: 50

Maximum Time: 3 Hours



University Examination:35

Minimum Pass Marks: 35%

Internal Assessment:15

Practical sessions: 45-55 Hours

*The breakup of marks for the practical will be as under

i	Internal Assessment	15 Marks
ii	Viva Voce (External Evaluation)	10 Marks
iii	Lab Record, Program Development and Execution (External Evaluation)	25 Marks

This laboratory course will mainly comprise of exercise based on subject BCA405T (Data Analysis and Visualization).



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CONTINUOUS ASSESSMENT (THEORY PAPERS)

1. Two tests will be conducted during the semester : 60% of the total marks allotted for continuous assessment.

Both the tests will be counted for assessment.

2. Assignment/Quizzes : 20% of the total marks allotted for continuous assessment.
3. Attendance : 10% of the total marks allotted for continuous assessment.
4. Class Participation and behavior : 10% of the total marks allotted for continuous assessment.

CONTINUOUS ASSESSMENT (PRACTICAL PAPERS)

1. Two tests will be conducted during the semester : 60% of the total marks allotted for continuous assessment

Both the tests will be counted for assessment.

2. Lab Assignments : 20% of the total marks allotted for continuous assessment.
3. Attendance : 10% of the total marks allotted for continuous assessment.
4. Practical File : 10% of the total marks allotted for continuous assessment.

NOTE: The Chairman of the Committee reserves the discretion to modify the syllabus, subject to changing circumstances or emerging needs.

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