DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,
CHHATRAPATI SAMBHAJINAGAR.

NAAC- 'A ++' Grade

CIRCULAR NO.SU/ AEDP/ Deptt./78/2026

It is hereby inform to all concerned that, on the recommended by the Dean, *Academic Council at its meeting held on 02nd June 2026 has accepted* the following Subject wise Curriculum as per *"Apprenticeship Embedded Degree Programme (AEDP)"* run at University Department, Dr. Babasaheb Ambedkar Marathwada University, Chhatrapathi Sambhajinagar as appended herewith.

Sr.No.	Name of the Courses	Department	Faculty	Semester
1.	**B.Sc.Electronics (Honours) Industrial Electronics Minor in Sensor Technology /Energy Storage Devices**	**Electronics**	**Faculty of Science & Technology**	**IIIrd & IVth**
2.	**B.Sc.Data Science**	**Computer Science & IT**		
3.	**B.C.A. (Honors)**	**Management Science**	**Faculty of Commerce & Management Science**	
4.	**B.A.Psychology**	**Psychology**	**Faculty of Humanities**	

This is effective from the Academic Year 2026-27 and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and ncccssary action.

University Campus,
Chhatrapati Sambhajinagar.
Ref.No.SS/AC/I.No.04/2026/4498-506
Date:-05/06/2026

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Deputy Registrar
Syllabus Section

Copy forwarded with compliments to :-

1] **The Head of the Department, CS & IT, Electronics & Management Science, Psychology.**

2] The Deputy Registrar, Post Graduate Section,
Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

3] **The Director, University Network & Information Centre, UNIC, with a request to upload this Circular on University Website.**

Copy to :-

1] The Director, Board of Examinations & Evaluation

2] The Section Officer,[B.Sc./B.Com. BA/Unit]

3] The Programmer [Computer Unit-1 & 2]

4] The In-charge, [E-Suvidha Kendra],
Rajarshi Shahu Maharaj Pariksha Bhavan,
Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

JD*05062026/- -=**=-

Ref. No. Mgt Sci. /2026-2027/12

Date: 22-06-2026

To,
The Deputy Registrar,
Syllabus Section,
Dr. Babasaheb Ambedkar Marathwada University,
Chhatrapati Sambhajinagar.

Subject: Submission of Curriculum Structure for BCA (Honours) - Apprenticeship Embedded Degree Programme (AEDP) **Second Year** for Approval.

Sir,

With reference to the subject cited above, I am pleased to submit herewith the finalized **Curriculum Structure and Syllabus** for the **Bachelor of Computer Applications (BCA) Honours - Apprenticeship Embedded Degree Programme (AEDP) Second Year**.

The structure and syllabus have been meticulously prepared in accordance with the following guidelines:

- National Education Policy (NEP) 2020,
- UGC's Framework for Apprenticeship Embedded Degree Programme (AEDP),
- Government of Maharashtra GR dated 22nd April 2025,
- and the university's prescribed norms and standards.

You are requested to accept and process the **Curriculum Structure and Syllabus** for further necessary action and approval.

Enclosure:

- Final BCA (Honours) AEDP Curriculum Structure and Syllabus of Second Year

Thanking you in anticipation.

Director
Director
Department of Management Science
Dr.Babasaheb Ambedkar Marathwada University,
Chhatrapati Sambhajinagar -431004.Maharashtra

Faculty of Commerce and Management

Science REGULATIONS SPECIFIC TO

B.C.A. Honors Programme
Apprenticeship Embedded Degree Programme (AEDP)

Second Year (Third and Fourth Sem) Syllabus

Applicable to University Department of Management Science

Dr. Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar

As per UGC's AEDP Guidelines, Maharashtra Govt GR and NEP 2020

(With Effect from Academic Year 2025-26)

Bachelor of Computer Applications (BCA) Honours
Curriculum Structure 2025-26
Based on NEP 2020 and AEDP 2025
Semester III

Sr. No.	Course Title	Third Semester			Total Credits	Total Lectures (Teaching / Lectures/ Week)	Scheme of Examination			
		Course Code	Course Type	Credits			Max Marks	UA	IA	Min Marks
1	Java – 1	BCA301T	DSC-7	2	8	2	50	30	20	20
	Java – 1 Lab	BCA301P		2		4	50	30	20	20
2	Introduction to Python	BCA302T	DSC-8	2		2	50	30	20	20
	Introduction to Python Lab	BCA302P		2		4	50	30	20	20
3	Software Testing	BCA303T	M-1	2	4	2	50	30	20	20
	Software Testing Lab	BCA303P	M-2	2		4	50	30	20	20
4	**GE/OE-3**	BCA304T	GE/OE-3	2	2	2	50	30	20	20
5	NoSQL (Mongo DB)	BCA305T	VSC-2	2	2	2	50	---	50	20
6	English – II	BCA306T	AEC-3	2	2	2	50	30	20	20
7	Environment Studies	BCA307T	VEC-2	2	4	2	50	--	50	20
8	Graphical Design	BCA308T	CC-3	2		2	50	--	50	20
				Total	**22**		**550**	**240**	**310**	**220**

Semester IV

Sr. No.	Course Title	Fourth Semester			Total Credits	Total Lectures (Teaching / Lectures/ Week)	Scheme of Examination			
		Course Code	Course Type	Credits			Max Marks	UA	IA	Min Marks
1	DBMS – II	BCA401T	DSC-9	2	8	2	50	30	20	20
	DBMS – II Lab	BCA401P		2		4	50	30	20	20
2	Advanced Python & Deep Learning Techniques	BCA402T	DSC-10	2		2	50	30	20	20
	Advanced Python & Deep Learning Techniques Lab	BCA402P		2		4	50	30	20	20
3	Data Structure using Java	BCA403T	M-3	2	4	2	50	30	20	20
	Data Structure using Java Lab	BCA403P	M-4	2		4	50	30	20	20
4	**GE/OE-4**	BCA404T		2	2	2	50	30	20	20
5	Node JS	BCA405T1	SEC-2	2	2	2	50	--	50	20
	OR					**OR**				
	AI Ethics & Governance	BCA405T2				2	50	--	50	20
6	Communication and Personality Development – II	BCA406T	AEC-4	2	2	2	50	30	20	20
7	Project	BCA407P	FP-1	2	4	2	50	30	20	20
8	Social Work	BCA408P	CC-4	2		2	50	30	20	20
				Total	**22**		**550**	**300**	**250**	**220**

GE 3 / OE -3 from other Departments to BCA students (for Third Semester)

Sr. No.	Course Title	Third Semester			Total Credits	Total Lectures (Teaching / Lectures/ Week	Scheme of Examination			
		Course Code	Course Type	Credits			Max Marks	UA	IA	Min Marks
1	Course from Dept of CSIT	BCA304T	GE/OE-3	2	2	2	50	30	20	20
2	Course from Dept Electronics			2	2	2	50	30	20	20
3	Course from Dept Psychology			2	2	2	50	30	20	20

GE 3 / OE -3 to other Departments from UDMS (for Third Semester)

Sr. No.	Course Title	Third Semester			Total Credits	Total Lectures (Teaching / Lectures/ Week	Scheme of Examination			
		Course Code	Course Type	Credits			Max Marks	UA	IA	Min Marks
1	BCA304T : Prompt Engineering and Generative AI	BCA304T	GE/OE-3	2	2	2	50	30	20	20

GE 4 / OE -4 from other Departments to BCA students (for Fourth Semester)

Sr. No.	Course Title	Fourth Semester			Total Credits	Total Lectures (Teaching / Lectures/ Week	Scheme of Examination			
		Course Code	Course Type	Credits			Max Marks	UA	IA	Min Marks
1	Course from Dept of CSIT	BCA404T	GE/OE-4	2	2	2	50	30	20	20
2	Course from Dept Electronics			2	2	2	50	30	20	20
3	Course from Dept Psychology			2	2	2	50	30	20	20

GE 4 / OE -4 to other Departments from UDMS (for Fourth Semester)

Sr. No.	Course Title	Fourth Semester			Total Credits	Total Lectures (Teaching / Lectures/ Week	Scheme of Examination			
		Course Code	Course Type	Credits			Max Marks	UA	IA	Min Marks
1	BCA404T : Fundamentals of Business Management	BCA404T	GE/OE-4	2	2	2	50	30	20	20

Semester III

Course Title	Java – I			
Course Type	DSC-7			
Course Code	BCA301T	**No. of Credits**		2
		No. of Periods / Week		2
		Assignments / Sessional		20
		Semester Examination		30

Course Objectives:

1. To introduce object-oriented programming concepts using Java.
2. To familiarize students with Java syntax and programming constructs.
3. To develop problem-solving skills using classes, objects, and methods.
4. To understand exception handling and package concepts.
5. To enable students to develop simple Java applications.

Course Outcomes (COs)

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

CO-1	Understand the Concepts of OOPs and apply it on real Time applications
CO-2	Design the fundamentals of object oriented applications, web base applications using AWT . Swing & Applet
CO-3	Implement Exceptions and Multithreading Concept in real time applications

Mapping of Course Outcomes (COs) with Program Outcomes (POs)
(Course Articulation Matrix)

	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10
CO-1	3	2	-	-	-	-	3	2	-	-
CO-2	3	3	2	-	-	-	3	3	2	-
CO-3	3	3	3	2	2	-	3	3	3	2
AVG										

Prerequisites	Fundamentals of computers, Basic programming concepts, Logical and analytical thinking.
Unit I	Fundamentals of Java & OOPOOP Paradigms: Difference between procedure-oriented and object-oriented programming.Java Basics: History, features (Platform Independence), JVM, JDK, and JRE.Language Syntax: Data types, variables, operators, control statements, and arrays.Core OOP: Classes, objects, methods, constructors, and garbage collection. Inheritance, Polymorphism and Abstraction
Unit II	Exceptions & Multithreading : Exception Handling: Unchecked and checked exceptions, try-catch, throw, throws, and user-defined exceptions.

	Multithreading: Thread lifecycle, thread priorities, synchronization, and inter-thread communication.
Unit III	GUI Development & I/O Operations : Files and Streams: Reading/writing to files and serialization. AWT & Swing: Event handling, layouts, and creating graphical user interfaces using buttons, text fields, and panels. Applets: Introduction to Applets and basic web embedding (varies by university)
Text Books	**Programming with Java A Primer, E.Balaguruswamy Tata McGraw Hill Companies,Core Java, Dietel and Dietel**
Reference books	**The complete reference JAVA2, Herbert schildt. TMH, Java Programming John P. Flynt Thomson 2nd, Java Programming Language Ken Arnold Pearson , Big Java, Cay Horstmann 2nd edition, Wiley India Edition**
Web References	

Course Title	Java - I Lab			
Course Type	DSC-7 (Practical)			
Course Code	BCA301P	**No. of Credits**		2
		No. of Periods / Week		2
		Assignments / Sessional		20
		Semester Examination		30

Course Outcomes (COs)

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

CO-1	Understand the Concepts of OOPs and apply it on real Time applications
CO-2	Design the fundamentals of object oriented applications, web base applications using AWT . Swing & Applet
CO-3	Implement Exceptions and Multithreading Concept in real time applications

Mapping of Course Outcomes (COs) with Program Outcomes (POs) (Course Articulation Matrix)

	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**PO-9**	**PO-10**
CO-1	3	-	-	-	-	-	-	-	-	-
CO-2	3	3	-	-	-	-	-	-	-	-
CO-3	3	3	2	3	3	-	-	-	-	-
AVG										

Prerequisites	Basic Knowledge of IDE , JDK tools & programming attitude	
	1.	Practical demo on JDK installation, Path setting , Classpath Setting , Run programon Console, MyEclipse
	2.	WAP to demonstrate the primitive data types with their default values.
	3.	WAP to demonstrate the Looping and decision statements in Java.
	4.	WAP to demonstrate the function of Predefined class ***Scanner***., Date & Random
	5.	WAP a program to demonstrate the use of Static member and static method
	6.	WAP a program to demonstrate the use of Static member, static block and static method
	7.	WAP a program to demonstrate the use of this, Instance Initializer block

	8.	WAP a program to demonstrate the application of Inheritance using IS-Arelation & Has-A relation.
	9.	WAP a program to demonstrate the application of constructors in Inheritance concept using IS-A relation & Has-A relation.
	10.	WAP to implement static binding in JAVA.
	11.	WAP to implement dynamic binding in JAVA.
	12.	WAP to demonstrate the use of super keyword in inheritance.
	13.	WAP to demonstrate the use of final keyword with instance variable , with method and with class name.
	14.	WAP to demonstrate the implementation of an Array & Vector in Java and its access methods using enhance for a& Enumeration
	15.	WAP to demonstrate all Access Modifiers in JAVA. Default, public, private & protected.
	16.	WAP that demonstrate the applications of abstract class and interface in JAVA
	17.	WAP that demonstrate the applications of package in JAVA
	18.	WAP that demonstrate how to import package, class and how to access the static members and methods of class in JAVA
	19.	WAP to demonstrate the implementation of Multi Threading using Thread Class.
	20.	WAP to demonstrate the implementation of Multi Threading using Runnable Interface.
	21.	WAP to demonstrate the implementation of sleep() & join() methods with Multi-Threading.
	22.	WAP to demonstrate the application of Daemon thread in java.
	23.	WAP to demonstrate the application of Synchronized thread for Mutual Exclusion in java.
	24.	WAP to manage Basic Exceptions in Java.
	25.	WAP to demonstrate a Simple Applet Functionality in JAVA.
	26.	WAP to demonstrate various shapes avaiLabel in Graphics class which can be implements in JAVA Applet.
	27.	WAP to demonstrate the Applet with FontSize, Font, Color.
	28.	WAP to implement Mutli threading in Applet.
	29.	WAP to configure the components in HTML file and fetch it in Applet & manipulate.
	30.	WAP to configure the number in HTML file and print its table in Applet.
	31.	WAP to create Random Circles in Applet using Random Class and Multi Threading.
	32.	WAP to create Random Circles in different colors in Applet using Random Class and Multi Threading.
	33.	WAP a program to Create a Frame by using Inheritance and Association
	34.	WAP to demonstrate all Layouts
	35.	WAP a program to validate Login Page using TextField & Button

	36.	WAP to create a Calculator in awt
	37.	WAP to perform All Arithmetic Operations on two numbers and print its addition using Label, TextField & Button ActionListener Interface
	38.	WAP to create MenuBar using Menu and MenuItem application using Label.
	39.	WAP to create MenuBar using Menu and MenuItem application using Label and apply ActionListener Interface
	40.	Other Awt Assignments
	41.	WAP to demonstrate the Use of WindowsListeners.
	42.	Implement all Listeners
	43.	WAP to demonstrate the Use of Adapter Classes .
	44.	WAP to implement WindowCloseEvent .
	45.	WAP to implement Awt control in Applet
	46.	WAP to write & read a character to File.
	47.	WAP to write & read a string to File.
	48.	WAP to write & read the data from&to File using BufferedOutputStream & BufferedInputStream
	49.	WAP to read the data from two files and writes into another file using FileStreams and SequenceStreams.
	50.	Design real time application using applet, swing and AWT
Text Books	**Programming with Java A Primer, E.Balaguruswamy Tata McGraw Hill Companies, Core Java, Dietel and Dietel**	
Reference books	**The complete reference JAVA2, Herbert schildt. TMH, Java Programming John P. Flynt Thomson 2nd, Java Programming Language Ken Arnold Pearson , Big Java, Cay Horstmann 2nd edition, Wiley India Edition**	
Web References		

Course Title	:	**Introduction to Python**			
Course Type		DSC-8			
Course Code		**BCA302T**	**No. of Credits**		2
			No. of Periods / Week		2
			Internal Assessment		20
			Semester Examination		30

Course Objectives:

1. To introduce students to the fundamentals of Python programming.
2. To familiarize students with Python syntax and data types.
3. To develop problem-solving skills using functions and modules.
4. To understand object-oriented programming concepts in Python.
5. To enable students to develop simple Python applications.

Course Outcomes (COs)

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

CO Code	Course Outcome	Bloom's Taxonomy Level
CO1	Recall Python syntax, keywords, and programming constructs.	Remembering (L1)
CO2	Explain Python data structures and programming concepts.	Understanding (L2)
CO3	Develop Python programs using control structures and functions.	Applying (L3)
CO4	Analyze programs using modules, files, and exception handling mechanisms.	Analyzing (L4)
CO5	Evaluate different approaches for solving computational problems using Python.	Evaluating (L5)
CO6	Design and develop Python-based applications using object-oriented concepts.	Creating (L6)

Mapping of Course Outcomes (COs) with Program Outcomes (POs) (Course Articulation Matrix) (3-High, 2-Medium, 1-Low)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-
CO3	3	3	3	2	2	-	-	-	-	-
CO4	3	3	2	3	2	-	-	-	-	-
CO5	2	3	3	3	2	1	-	-	-	-
CO6	3	3	3	3	3	2	-	-	1	1

Prerequisites	• Fundamentals of computers. • Logical and analytical thinking.

	• Basic understanding of algorithms and flowcharts.

Unit I	**Introduction to Python Programming**
	• Features and Applications of Python Installing Python and Python IDEs
	• Python Tokens Variables and Data Types Input and Output Functions
	• Operators and Expressions Type Conversion Comments and Documentation Strings
	• Conditional Statements
	  ○ if if-else nested if elif ladder
	• Looping Statements
	  ○ while loop for loop break, continue and pass statements

Unit II	**Functions and Data Structures** • Introduction to Functions Function Definition and Calling • Arguments and Return Values Recursive Functions • Lambda Functions Modules and Packages • Lists Tuples Sets Dictionaries • String Manipulation and Operations List Comprehension
Unit III	**File Handling and Object-Oriented Programming** • File Handling Opening and Closing Files Reading and Writing Files • Exception Handling try, except, finally User-defined Exceptions • Classes and Objects Constructors Instance Variables and Methods • Inheritance Polymorphism Introduction to Python Libraries • NumPy Pandas
Text Books	Reema Thareja, **Python Programming Using Problem Solving Approach**, Oxford University Press. Yashavant Kanetkar, **Let Us Python**, BPB Publications. Allen B. Downey, **Think Python**, O'Reilly Publications.
Reference books	1. Mark Lutz, Learning Python, O'Reilly Publications. 2. Kenneth A. Lambert, Fundamentals of Python, Cengage Learning. 3. Charles Dierbach, Introduction to Computer Science Using Python, Wiley. 4. Paul Barry, Head First Python, O'Reilly Publications. 5. Eric Matthes, Python Crash Course, No Starch Press.

Course Title		Introduction to Python Lab			
Course Type		DSC-8			
Course Code		BCA302P	**No. of Credits**		2
			No. of Periods / Week		2
			Internal Assessment		20
			Semester Examination		30

Course Objectives:

1. To provide practical exposure to Python programming concepts.
2. To develop problem-solving skills using Python.
3. To implement functions, data structures, and file operations.
4. To familiarize students with object-oriented programming concepts in Python.
5. To enable students to develop simple Python applications.

Course Outcomes (COs)

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

CO Code	Course Outcome	Bloom's Level
CO1	Develop Python programs using basic programming constructs and control statements.	Applying (L3)
CO2	Implement functions and built-in data structures for solving computational problems.	Creating (L6)
CO3	Analyze programs involving files and exception handling mechanisms.	Applying (L3)
CO4	Design Python applications using object-oriented programming concepts.	Creating (L6)

Mapping of Course Outcomes (COs) with Program Outcomes (POs) (Course Articulation Matrix)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	3	2	2	-	-	-	-	-
CO2	3	3	3	2	2	-	-	-	-	-
CO3	3	3	2	3	3	-	-	-	-	-
CO4	3	3	3	3	3	2	-	-	1	1

Prerequisites	• Knowledge of computer fundamentals.

	• Understanding of algorithms and flowcharts. • Basic programming concepts.
List of Experiments	1. Write a Python program to demonstrate arithmetic, relational, and logical operators. 2. Write a program to find factorial of a number using loops. 3. Write a Python program to generate Fibonacci series. 4. Write a program to determine whether a number is prime or not. 5. Write a program to perform matrix addition using nested lists. 6. Write programs using one-dimensional and two-dimensional lists. 7. Write programs to demonstrate string operations and slicing. 8. Write a program to implement user-defined functions. 9. Write a program illustrating recursive functions. 10. Write a program to perform operations on tuples, sets, and dictionaries. 11. Write a program using lambda functions. 12. Write a program demonstrating file handling operations. 13. Write a program illustrating exception handling using try-except-finally. 14. Write a program to create classes and objects. 15. Write a program demonstrating inheritance and polymorphism.
Software/ Tools Required:	☐ Python 3.12 or above ☐ IDLE Python Environment ☐ Visual Studio Code / PyCharm Community Edition ☐ Jupyter Notebook ☐ Windows or Linux Operating System

Course Title	:	**Software Testing**			
Course Type		M-1			
Course Code		**BCA303T**	**No. of Credits**		2
			No. of Periods / Week		2
			Internal Assessment		20
			Semester Examination		30

Course Objectives:

1. To introduce the fundamentals and importance of software testing.
2. To understand various testing techniques and methodologies.
3. To familiarize students with black-box and white-box testing approaches.
4. To develop skills for designing and executing test cases.
5. To understand debugging and automation testing concepts.

Course Outcomes (COs)

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

CO Code	Course Outcome	Bloom's Taxonomy Level
CO1	Recall the concepts, principles, and terminologies of software testing.	Remembering (L1)
CO2	Explain various software testing methods and testing life cycle.	Understanding (L2)
CO3	Apply black-box and white-box testing techniques to software applications.	Applying (L3)
CO4	Analyze software defects and evaluate test cases for quality assurance.	Analyzing (L4)
CO5	Evaluate different testing strategies and tools used in software development.	Evaluating (L5)
CO6	Design effective test plans and testing procedures for software systems.	Creating (L6)

Mapping of Course Outcomes (COs) with Program Outcomes (POs)
(Course Articulation Matrix) (3-High, 2-Medium, 1-Low)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-
CO3	3	3	3	2	2	-	-	-	-	-
CO4	3	3	2	3	2	-	-	-	-	-
CO5	2	3	3	3	2	1	-	-	-	-
CO6	3	3	3	3	3	2	-	-	1	1

Prerequisites	1. Fundamentals of Software Engineering. 2. Basic knowledge of programming concepts. 3. Understanding of Software Development Life Cycle (SDLC).
Unit I	**Introduction to Software Testing** • Introduction to Software Testing Need and Objectives of Testing • Errors, Faults and Failures Verification and Validation • Principles of Software Testing Software Testing Life Cycle (STLC) • Levels of Testing Unit Testing Integration Testing • System Testing Acceptance Testing ○ Functional and Non-functional Testing
Unit II	**Testing Techniques** • Black Box Testing White Box Testing Gray Box Testing • Equivalence Class Partitioning Boundary Value Analysis • Decision Table Testing Cause-Effect Graphing Path Testing • Basis Path Testing Control Structure Testing • Cyclomatic Complexity Mutation Testing
Unit III	**Test Management and Automation** • Test Case Design Test Plan Preparation Defect Life Cycle Debugging Techniques Regression Testing Smoke Testing Performance Testing Load Testing Stress Testing Introduction to Automation Testing Selenium Framework Software Testing Tools Test Documentation and Reporting
Text Books	**1. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International.** **2. Boris Beizer, Software Testing Techniques, Dreamtech Press.** **3. Srinivasan Desikan and Gopalaswamy Ramesh, Software Testing: Principles and Practices, Pearson Education.**
Reference books	1. Roger S. Pressman, Software Engineering – A Practitioner's Approach, McGraw-Hill. 2. Ron Patton, Software Testing, Pearson Education. 3. William Perry, Effective Methods for Software Testing, Wiley India. 4. Rex Black, Foundations of Software Testing, Cengage Learning. 5. Aditya P. Mathur, Foundations of Software Testing, Pearson Education.

Course Title	Software Testing Lab			
Course Type	M-2 (Practical)			
Course Code	BCA303P	**No. of Credits**		2
		No. of Periods / Week		2
		Internal Assessment		20
		Semester Examination		30

Course Objectives:

1. To provide practical exposure to software testing methodologies.
2. To develop skills in designing and executing test cases.
3. To understand defect management and debugging techniques.
4. To familiarize students with manual testing techniques.
5. To enable students to perform quality assurance activities for software applications.

Course Outcomes (COs)

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

CO Code	Course Outcome	Bloom's Level
CO1	Apply software testing techniques for identifying defects in software applications.	Applying (L3)
CO2	Develop and execute test cases using manual testing methods.	Creating (L6)
CO3	Analyze software behavior and prepare defect reports.	Applying (L3)
CO4	Create test management artifacts (Test Plans, Traceability Matrices, Test Summary Reports) following industry standards.	Creating (L6)

Mapping of Course Outcomes (COs) with Program Outcomes (POs)
(Course Articulation Matrix)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	3	2	2	-	-	-	-	-
CO2	3	3	3	2	2	-	-	-	-	-
CO3	3	3	2	3	3	-	-	-	-	-
CO4	3	3	3	3	3	2	-	-	1	1

Prerequisites	
Unit I	**Test Design Fundamentals** 1.1: Static Testing • Examine a sample SRS document • Identify 10 requirement defects • Prepare review report 1.2: Equivalence Partitioning • For a "Age Verification" field (valid range: 18-60): o Identify equivalence classes o Design 5 test cases

	1.3: Boundary Value Analysis • For the same "Age Verification" field: o Design boundary test cases o Execute and document results 1.4: Decision Table • Test a library book renewal system with: o Membership status (active/expired) o Book status (available/checked out) o Create decision matrix with 4 test cases **Based on above objective any other exercises can be performed.*
Unit II	**Test Execution** 2.1: Unit Test Cases • Test a "Password Strength Checker" with: o 5 valid/invalid password combinations o Document failures 2.2: Integration Testing • Test interaction between: o User registration form → Database o Report defects in data saving 2.3: System Testing • Execute 10 test cases on a demo e-commerce site: o Product search o Cart functionality o Checkout process 2.4: Defect Reporting • Log 5 defects found during system testing: o Screenshots o Steps to reproduce o Severity/Priority assessment **Based on above objective any other exercises can be performed.*
Unit III	**Test Management** 3.1: Test Plan Creation • Develop plan for testing a: o Flight booking system o Include: Objectives, Scope, Schedule 3.2: Traceability Matrix • Link 5 requirements → 15 test cases → 3 defects 3.3: Test Summary Report • Prepare final report with: o % test cases passed o Defect density o Release recommendation 3.4: Exploratory Testing • 30-minute session on a food delivery app: o Document 10 observations o Categorize as defects/enhancements **Based on above objective any other exercises can be performed.*
Reference Books	A. Introducing Software Testing by Louise Tamres B. Effective Methods for software Testing by William Perry C. Software Testing in Real World by Edward Kit D. Software Testing Techniques by Boris Beizer

GE3 / OE 3 for other Departments

Course Title	:	**BCA304T : Prompt Engineering and Generative AI**			
Course Type		**GE/OE-3**			
Course Code		**BCA304T**	**No. of Credits**		2
			No. of Periods / Week		2
			Internal Assessment		20
			Semester Examination		30

Course Objectives:

1. To introduce the fundamentals of Generative AI and Prompt Engineering.
2. To familiarize students with various AI tools and their applications.
3. To develop skills for effective interaction with AI systems.
4. To explore the use of AI tools for learning, creativity, and productivity.
5. To understand ethical and responsible use of Generative AI.

Course Outcomes (COs)

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

CO Code	Course Outcome	Bloom's Taxonomy Level
CO1	Recall the basic concepts of Generative AI and Prompt Engineering.	Remembering (L1)
CO2	Explain the features and applications of popular AI tools.	Understanding (L2)
CO3	Apply prompt engineering techniques for obtaining desired outputs from AI systems.	Applying (L3)
CO4	Analyze the usefulness and limitations of AI-generated content.	Analyzing (L4)
CO5	Evaluate ethical issues and responsible use of Generative AI.	Evaluating (L5)
CO6	Create content and solve simple real-world problems using AI tools.	Creating (L6)

Mapping of Course Outcomes (COs) with Program Outcomes (POs) (Course Articulation Matrix) (3-High, 2-Medium, 1-Low)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-
CO3	3	3	3	2	3	-	-	-	-	-
CO4	3	3	2	3	3	-	-	-	-	-
CO5	2	3	3	3	3	2	-	-	1	-
CO6	3	3	3	3	3	2	-	-	2	1

Prerequisites	Basic computer literacy and familiarity with internet applications.
Unit I	**Introduction to Generative AI and Prompt Engineering** Introduction to Artificial Intelligence and Generative AI, importance and applications of AI in daily life, overview of popular AI tools such as ChatGPT, Gemini, Microsoft Copilot and Perplexity AI, fundamentals of Prompt Engineering, characteristics of a good prompt, writing effective prompts, asking questions and obtaining meaningful responses, advantages and limitations of Generative AI.
Unit II	**Applications of Generative AI** Use of AI for content writing, letter drafting, report generation and presentations, summarization and translation, image generation and creative content development, use of AI in education and learning, AI-assisted productivity tools, applications of Generative AI in psychology, geography, commerce, languages, printing technology and other disciplines.
Unit III	**Ethical Use and Future of Generative AI** Responsible use of Artificial Intelligence, ethical issues and challenges, misinformation and bias in AI systems, privacy and security concerns, plagiarism and copyright issues, limitations of Generative AI, emerging trends in AI technologies, career opportunities and impact of AI on society.

Course Title	:	**NoSQL (MongoDB)**			
Course Type		VSC-2			
Course Code		**BCA305T**	**No. of Credits**		2
			No. of Periods / Week		2
			Internal Assessment		20
			Semester Examination		30

Course Objectives:

1. To introduce the concepts and characteristics of NoSQL databases.
2. To understand document-oriented databases with MongoDB.
3. To develop skills for storing, retrieving, and manipulating data using MongoDB.
4. To familiarize students with indexing, aggregation, and replication concepts.
5. To enable students to design and implement NoSQL database applications.

Course Outcomes (COs)

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

CO Code	Course Outcome	Bloom's Taxonomy Level
CO1	Recall the concepts and characteristics of NoSQL databases and MongoDB.	Remembering (L1)
CO2	Explain MongoDB architecture and document-oriented data models.	Understanding (L2)
CO3	Apply MongoDB commands for creating, querying, updating, and deleting documents.	Applying (L3)
CO4	Analyze indexing and aggregation techniques for efficient data management.	Analyzing (L4)
CO5	Evaluate MongoDB features such as replication and sharding for distributed systems.	Evaluating (L5)
CO6	Design and implement database applications using MongoDB.	Creating (L6)

Mapping of Course Outcomes (COs) with Program Outcomes (POs)
(Course Articulation Matrix) (3-High, 2-Medium, 1-Low)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-
CO3	3	3	3	2	3	-	-	-	-	-
CO4	3	3	2	3	3	-	-	-	-	-
CO5	2	3	3	3	2	1	-	-	-	-

CO6	3	3	3	3	3	2	-	-	1	1

Prerequisites	• Fundamentals of Database Management Systems. • Basic knowledge of SQL and relational databases. • Understanding of data structures and computer fundamentals.
Unit I	• **Introduction to NoSQL and MongoDB** Introduction to databases and limitations of relational databases, need for NoSQL databases, types of NoSQL databases, features and advantages of MongoDB, installation and configuration of MongoDB, MongoDB architecture, documents and collections, BSON data format, MongoDB shell and MongoDB Compass, creating databases and collections, inserting and viewing documents.
Unit II	• **CRUD Operations and Querying** CRUD operations in MongoDB, inserting, updating and deleting documents, querying documents using find() method, comparison and logical operators, sorting and limiting records, embedded documents and arrays, projections, data types in MongoDB, indexing concepts and advantages of indexing, introduction to aggregation and grouping operations.
Unit III	• **Advanced Features and Applications of MongoDB** Aggregation framework and pipeline, backup and restore operations, import and export of data, introduction to replication and sharding, MongoDB Atlas and cloud databases, integration of MongoDB with applications, applications of MongoDB in web development, e-commerce and social media platforms, advantages and limitations of MongoDB, future trends and use cases of NoSQL databases.
Text Books	**Kristina Chodorow, MongoDB: The Definitive Guide, O'Reilly Media.** **Shashank Tiwari, Professional NoSQL, Wiley India.** **Alex Giamas, Mastering MongoDB, Packt Publishing.**
Reference books	Dan Sullivan, NoSQL for Mere Mortals, Pearson Education. Pramod J. Sadalage and Martin Fowler, NoSQL Distilled, Addison-Wesley. Shannon Bradshaw, Kristina Chodorow and Eoin Brazil, MongoDB: The Definitive Guide, O'Reilly. Kyle Banker, MongoDB in Action, Manning Publications. Rick Copeland, MongoDB Applied Design Patterns, O'Reilly Media.

Course Title		**BCA306T : English – II**		
Course Type		AEC-3		
Course Code		BCA306T	**No. of Credits**	2
			No. of Periods / Week	2
			Internal Assessment	20
			Semester Examination	30

Course Objectives:

1. To develop effective communication skills in English.
2. To improve reading, writing, listening, and speaking abilities.
3. To enhance vocabulary and grammatical competence.
4. To develop professional and interpersonal communication skills.
5. To prepare students for workplace communication and higher studies.

Course Outcomes (COs)

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

CO Code	Course Outcome	Bloom's Level
CO1	Recall the fundamentals of English grammar and communication.	Applying (L3)
CO2	Explain various forms of written and oral communication.	Creating (L6)
CO3	Apply grammatical rules and communication techniques in practical situations.	Applying (L3)
CO4	Analyze different communication contexts and language usage.	Creating (L6)
CO5	Evaluate written and oral communications for effectiveness.	Evaluating (L5)

Mapping of Course Outcomes (COs) with Program Outcomes (POs) (Course Articulation Matrix)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	-	-	-	-	-	-	-	-
CO2	2	3	2	-	-	-	-	-	2	-
CO3	2	3	3	2	-	-	-	-	3	2
CO4	2	3	2	3	-	-	-	-	3	2
CO5	2	3	3	3	-	-	-	-	3	3

Prerequisites	Basic understanding of English language, elementary grammar, and communication skills.

Unit I	**Fundamentals of Communication and Grammar:** Introduction to communication and its importance, process and types of communication, verbal and non-verbal communication, barriers to communication and methods to overcome them, fundamentals of English grammar including parts of speech, tenses, articles, prepositions, subject-verb agreement, sentence structure, vocabulary building techniques and commonly used expressions.
Unit II	**Writing Skills and Professional Communication** Principles of effective writing, paragraph writing, report writing, précis writing, email writing, notice writing, agenda and minutes of meetings, business correspondence, preparation of resume and cover letter, job application letters, official communication, interview etiquette and group discussion skills.
Unit III	**Listening, Speaking and Presentation Skills** Listening skills and techniques for effective listening, pronunciation and phonetics, speaking skills, public speaking, presentation techniques, seminar presentation, interpersonal communication, team communication, communication in workplace environment, personality development, confidence building and professional ethics in communication.
Text Books	S. P. Dhanavel, English and Communication Skills for Students, Orient Blackswan. Krishna Mohan and Meera Banerji, Developing Communication Skills, Macmillan India. Raymond Murphy, Essential English Grammar, Cambridge University Press.
Reference books	1. B. K. Das and A. David, **An Introduction to Professional English and Soft Skills**, Cambridge University Press. 2. R. C. Sharma and Krishna Mohan, **Business Correspondence and Report Writing**, Tata McGraw-Hill. 3. Sanjay Kumar and Pushp Lata, **Communication Skills**, Oxford University Press. 4. Wren and Martin, **High School English Grammar and Composition**, S. Chand. 5. Barun K. Mitra, **Personality Development and Soft Skills**, Oxford University Press.

Course Title	:	**Environment Studies**			
Course Type		VEC-2			
Course Code		**BCA307T**	**No. of Credits**		2
			No. of Periods / Week		2
			Internal Assessment		20
			Semester Examination		30

Course Objectives:

1. To create awareness about environmental issues and sustainable development.
2. To understand the structure and functioning of ecosystems.
3. To familiarize students with natural resources and biodiversity conservation.
4. To study environmental pollution and its control measures.
5. To inculcate environmental ethics and social responsibility among students.

Course Outcomes (COs)

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

CO Code	Course Outcome	Bloom's Taxonomy Level
CO1	Recall the basic concepts related to environment and ecology.	Remembering (L1)
CO2	Explain ecosystem structure, biodiversity, and natural resources.	Understanding (L2)
CO3	Apply environmental conservation practices for sustainable development.	Applying (L3)
CO4	Analyze the causes and effects of environmental pollution and global issues.	Analyzing (L4)
CO5	Evaluate environmental policies and conservation measures.	Evaluating (L5)
CO6	Develop environmentally responsible attitudes and sustainable solutions.	Creating (L6)

Mapping of Course Outcomes (COs) with Program Outcomes (POs)
(Course Articulation Matrix) (3-High, 2-Medium, 1-Low)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	-	-	-	-	3	-	-	-
CO2	2	2	2	-	-	-	3	-	-	-
CO3	2	2	3	2	-	-	3	-	-	-
CO4	2	3	2	3	-	-	3	-	-	-
CO5	2	3	3	3	-	2	3	-	-	-
CO6	2	3	3	3	2	2	3	1	2	2

Prerequisites	Basic knowledge of science, awareness of environmental issues, and

	understanding of natural resources and their importance.
Unit I	**Ecosystem and Natural Resources** Introduction to environmental studies and multidisciplinary nature of environment, concept of ecosystem and its components, structure and functions of ecosystem, food chains, food webs and ecological pyramids, energy flow in ecosystems, types of ecosystems, renewable and non-renewable resources, forest resources, water resources, mineral resources, food resources, energy resources and conservation of natural resources for sustainable development.
Unit II	**Biodiversity and Environmental Pollution** Concept and levels of biodiversity, value of biodiversity, threats to biodiversity, endangered species and conservation strategies, in-situ and ex-situ conservation, environmental pollution and its types including air pollution, water pollution, soil pollution, marine pollution, noise pollution and thermal pollution, causes, effects and control measures, solid waste management, e-waste management and disaster management.
Unit III	**Social Issues and Sustainable Development** Sustainable development and environmental ethics, climate change, global warming, ozone layer depletion and acid rain, urban problems related to energy, population growth and environmental challenges, environmental protection acts and policies, Carbon Credit, EMS-Environment Management Science, Recycling Industries, Climate Change, Global Warming, Environmental Accounting.
Text Books	**1. Erach Bharucha, Textbook of Environmental Studies, Universities Press.** **2. Anubha Kaushik and C. P. Kaushik, Perspectives in Environmental Studies, New Age International.** **3. R. Rajagopalan, Environmental Studies: From Crisis to Cure, Oxford University Press.**
Reference books	Gilbert M. Masters, Introduction to Environmental Engineering and Science, Pearson Education. Benny Joseph, Environmental Studies, Tata McGraw-Hill. A. K. De, Environmental Chemistry, New Age International. P. D. Sharma, Ecology and Environment, Rastogi Publications. G. Tyler Miller and Scott Spoolman, Environmental Science, Cengage Learning.

Course Title	:	**Graphical Design**			
Course Type		D CC-3			
Course Code		**BCA308T**	**No. of Credits**		2
			No. of Periods / Week		2
			Internal Assessment		20
			Semester Examination		30

Course Objectives:

1. To introduce the fundamental concepts and principles of graphical design.
2. To develop creativity and visual communication skills among students.
3. To familiarize students with image editing and vector graphics tools.
4. To understand typography, color theory, and layout design techniques.
5. To enable students to create professional digital designs for various applications.

Course Outcomes (COs)

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

CO Code	Course Outcome	Bloom's Taxonomy Level
CO1	Recall the principles and elements of graphical design.	Remembering (L1)
CO2	Explain color theory, typography, and visual communication concepts.	Understanding (L2)
CO3	Apply design principles and software tools for creating graphics.	Applying (L3)
CO4	Analyze different design elements and layouts for effective communication.	Analyzing (L4)
CO5	Evaluate various graphical design techniques and digital media formats.	Evaluating (L5)
CO6	Design professional logos, posters, brochures, and digital graphics.	Creating (L6)

Mapping of Course Outcomes (COs) with Program Outcomes (POs)
(Course Articulation Matrix) (3-High, 2-Medium, 1-Low)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	-	-	2	-	-	-	-	-
CO2	2	3	2	-	2	-	-	-	-	-
CO3	2	3	3	2	3	-	-	-	2	-
CO4	2	3	2	3	3	-	-	-	2	-
CO5	2	3	3	3	3	2	-	-	2	2
CO6	2	3	3	3	3	2	-	-	3	3

Prerequisites	Basic computer literacy, understanding of digital media concepts, familiarity with image formats and creativity in visual communication.
Unit I	**Fundamentals of Graphic Design** Introduction to graphic design and visual communication, history and applications of graphic design, elements of design including line, shape, texture, color and space, principles of design such as balance, contrast, alignment, repetition, proximity and hierarchy, color theory and color models including RGB and CMYK, typography and font selection, image resolution and file formats, raster and vector graphics, introduction to graphic design software and digital media.
Unit II	**Image Editing and Vector Graphics** Concepts of digital image editing, layers and masks, image enhancement techniques, cropping and resizing, selection tools and transformations, filters and effects, retouching and color correction, vector graphics and drawing tools, creation of shapes and objects, use of gradients and patterns, logo design techniques, icon design, illustration fundamentals and working with software tools such as Adobe Photoshop, Adobe Illustrator, CorelDRAW and Canva.
Unit III	**Layout Design and Digital Publishing** Principles of layout design, page composition and alignment, poster and banner design, brochure and flyer creation, social media graphics, infographic design, branding and identity design, packaging concepts, digital publishing techniques, preparation of print-ready documents, exporting graphics in different formats, web graphics and responsive design concepts, trends in graphic design and applications of artificial intelligence in digital creativity.
Text Books	**David Dabner, Sandra Stewart and Eric Zempol, Graphic Design School, Wiley Publications.** **Alan Hashimoto and Mike Clayton, Visual Design Fundamentals, Charles River Media.** **Robin Williams, The Non-Designer's Design Book, Peachpit Press.**
Reference books	Gavin Ambrose and Paul Harris, The Fundamentals of Graphic Design, AVA Publishing. Steven Heller and Jennifer Cole Phillips, Graphic Design: The New Basics, Princeton Architectural Press. Cath Caldwell and Yolanda Zappaterra, Editorial Design: Digital and Print, Laurence King Publishing. David Airey, Logo Design Love, Peachpit Press. Ellen Lupton, Thinking with Type, Princeton Architectural Press.

Semester IV

Course Title	:	**BCA401T : DBMS – II**			
Course Type		DSC-9			
Course Code		**BCA401T**	**No. of Credits**		2
			No. of Periods / Week		2
			Internal Assessment		20
			Semester Examination		30

Course Objectives:

1. To provide knowledge of advanced database concepts and SQL programming.
2. To understand normalization and relational database design principles.
3. To familiarize students with transaction management and concurrency control mechanisms.
4. To study query processing, indexing, and recovery techniques.
5. To introduce distributed databases and procedural SQL concepts.

Course Outcomes (COs)

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

CO Code	Course Outcome	Bloom's Taxonomy Level
CO1	Recall the concepts of advanced relational databases and SQL operations.	Remembering (L1)
CO2	Explain normalization, transaction processing, and concurrency control mechanisms.	Understanding (L2)
CO3	Apply SQL queries and database design principles to solve real-world problems.	Applying (L3)
CO4	Analyze transaction management and database recovery techniques.	Analyzing (L4)
CO5	Evaluate indexing methods and query optimization techniques for efficient database management.	Evaluating (L5)
CO6	Design secure and efficient database systems using advanced database concepts.	Creating (L6)

Mapping of Course Outcomes (COs) with Program Outcomes (POs)
(Course Articulation Matrix) (3-High, 2-Medium, 1-Low)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-

CO3	3	3	3	2	3	-	-	-	-	-
CO4	3	3	2	3	2	-	-	-	-	-
CO5	2	3	3	3	3	1	-	-	-	-
CO6	3	3	3	3	3	2	-	-	1	1

Prerequisites	Fundamentals of Database Management Systems, knowledge of relational data models and SQL, understanding of normalization concepts and database design principles.
Unit I	**Advanced SQL and Database Design** Introduction to advanced SQL concepts, joins including inner join, outer join and self join, subqueries and nested queries, views and indexes, integrity constraints, normalization concepts including First Normal Form (1NF), Second Normal Form (2NF) and Third Normal Form (3NF), advantages of normalization, relational database design and schema refinement.
Unit II	**Transaction Processing and Database Security** Concept of transactions and ACID properties, transaction states, concurrent execution of transactions, locking techniques, deadlocks and their handling methods, database recovery concepts, backup and restore techniques, database security and authorization, user roles and privileges, importance of data security in database systems.
Unit III	**Query Processing and PL/SQL** Introduction to query processing and query optimization, indexing techniques and file organization, introduction to distributed databases and client-server architecture, overview of data warehousing and data mining concepts, fundamentals of PL/SQL, PL/SQL blocks, control structures, cursors, procedures, functions and triggers, applications of PL/SQL in database management.
Text Books	**Korth, Silberschatz and Sudarshan, Database System Concepts, McGraw-Hill Education.** **Ramez Elmasri and Shamkant B. Navathe, Fundamentals of Database Systems, Pearson Education.** **Ivan Bayross, SQL, PL/SQL: The Programming Language of Oracle, BPB Publications.**
Reference books	C.J. Date, An Introduction to Database Systems, Pearson Education. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems, McGraw-Hill. Peter Rob and Carlos Coronel, Database Systems: Design, Implementation and Management, Cengage Learning. Abraham Silberschatz, Henry F. Korth and S. Sudarshan, Database System Concepts, McGraw-Hill. Bipin Desai, An Introduction to Database Systems, Galgotia Publications.

Course Title		**DBMS – II Lab**			
Course Type		DSC-9 (Practical)			
Course Code		**BCA401P**	**No. of Credits**		2
			No. of Periods / Week		2
			Internal Assessment		20
			Semester Examination		30

Course Objectives:

1. To provide practical exposure to advanced SQL and database programming concepts.
2. To develop skills in designing and implementing relational databases.
3. To familiarize students with joins, views, PL/SQL and transaction control.
4. To understand indexing and query optimization concepts.
5. To enable students to develop database applications using SQL and PL/SQL.

Course Outcomes (COs)

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

CO Code	Course Outcome	Bloom's Level
CO1	Apply SQL queries and relational database concepts to solve database problems.	Applying (L3)
CO2	Develop database applications using joins, views and subqueries.	Creating (L6)
CO3	Analyze transactions and security mechanisms in database systems.	Applying (L3)
CO4	Design and implement PL/SQL programs, procedures and triggers for database applications.	Creating (L6)

Mapping of Course Outcomes (COs) with Program Outcomes (POs) (Course Articulation Matrix)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	3	2	2	-	-	-	-	-
CO2	3	3	3	2	3	-	-	-	-	-
CO3	3	3	2	3	2	-	-	-	-	-
CO4	3	3	3	3	3	2	-	-	1	1

Prerequisites	Knowledge of relational databases, SQL commands, normalization concepts, and basic DBMS principles.
List of	**List of Experiments**

Experiments	1. Create database tables with primary key, foreign key and integrity constraints. 2. Perform DDL operations including CREATE, ALTER and DROP commands. 3. Execute DML commands such as INSERT, UPDATE and DELETE. 4. Implement various SQL joins including inner join, left join, right join and self join. 5. Write SQL queries using aggregate functions and GROUP BY clause. 6. Implement nested queries and correlated subqueries. 7. Create and use views and sequences. 8. Perform normalization up to Third Normal Form (3NF). 9. Execute transaction control commands such as COMMIT, ROLLBACK and SAVEPOINT. 10. Create indexes and analyze their effect on query performance. 11. Write PL/SQL programs using conditional and iterative statements. 12. Develop PL/SQL procedures and functions. 13. Implement cursors in PL/SQL. 14. Create and execute database triggers. 15. Design and implement a mini database application using SQL and PL/SQL.
Software/ Tools Required:	Oracle Database Express Edition (XE), MySQL Server, Oracle SQL Developer, MySQL Workbench, PostgreSQL, XAMPP/WAMP Server, Windows/Linux Operating System.

Course Title	:	**BCA402T: Advanced Python & Deep Learning Techniques**			
Course Type		DSC-10			
Course Code		**BCA402T**	**No. of Credits**		2
			No. of Periods / Week		2
			Internal Assessment		20
			Semester Examination		30

Course Objectives:

1. To introduce advanced concepts of Python programming and scientific computing.
2. To familiarize students with data analysis and visualization techniques using Python libraries.
3. To provide a foundation in machine learning and deep learning concepts.
4. To understand artificial neural networks and deep learning architectures.
5. To enable students to develop intelligent applications using TensorFlow and Keras frameworks.

Course Outcomes (COs)

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

CO Code	Course Outcome	Bloom's Taxonomy Level
CO1	Recall advanced Python concepts and deep learning terminologies.	Remembering (L1)
CO2	Explain machine learning and neural network concepts.	Understanding (L2)
CO3	Apply Python libraries and deep learning frameworks for data analysis and prediction.	Applying (L3)
CO4	Analyze different neural network architectures and their performance.	Analyzing (L4)
CO5	Evaluate suitable deep learning models for various applications.	Evaluating (L5)
CO6	Design and develop intelligent systems using deep learning techniques.	Creating (L6)

Mapping of Course Outcomes (COs) with Program Outcomes (POs) (Course Articulation Matrix) (3-High, 2-Medium, 1-Low)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-
CO3	3	3	3	2	3	-	-	-	-	-
CO4	3	3	2	3	3	-	-	-	-	-
CO5	2	3	3	3	3	1	-	-	-	-
CO6	3	3	3	3	3	2	-	-	1	1

Prerequisites	Knowledge of Python programming, fundamentals of statistics and mathematics, basic understanding of linear algebra and computer programming concepts.
Unit I	**Advanced Python Programming and Data Analysis** Advanced Python concepts including lambda functions, iterators, generators and decorators, exception handling and file operations, introduction to scientific computing libraries, NumPy arrays and operations, multidimensional arrays and matrix manipulation, Pandas data structures including Series and DataFrames, data preprocessing techniques, handling missing values, data transformation and aggregation, data visualization using Matplotlib and Seaborn, statistical analysis and exploratory data analysis techniques.
Unit II	**Machine Learning and Neural Networks** Introduction to artificial intelligence, machine learning and deep learning, supervised and unsupervised learning approaches, classification and regression concepts, performance evaluation metrics, fundamentals of artificial neural networks, perceptron model and activation functions, feedforward neural networks, backpropagation algorithm, gradient descent optimization, overfitting and underfitting, regularization techniques, model evaluation and validation methods.
Unit III	**Deep Learning Architectures and Applications** Introduction to TensorFlow and Keras frameworks, building sequential models, training and testing deep learning models, convolutional neural networks and their architecture, pooling layers and feature extraction, recurrent neural networks and long short-term memory networks, transfer learning concepts, image classification and natural language processing applications, model deployment concepts, ethical issues in artificial intelligence and future trends in deep learning technologies.
Text Books	**1. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras and TensorFlow, O'Reilly Publications.** **2. Jake VanderPlas, Python Data Science Handbook, O'Reilly Publications.** **3. François Chollet, Deep Learning with Python, Manning Publications.**
Reference books	1. Ian Goodfellow, Yoshua Bengio and Aaron Courville, Deep Learning, MIT Press. 2. Sebastian Raschka and Vahid Mirjalili, Python Machine Learning, Packt Publishing. 3. Wes McKinney, Python for Data Analysis, O'Reilly Publications. 4. Andreas Müller and Sarah Guido, Introduction to Machine Learning with Python, O'Reilly Publications. 5. Ethem Alpaydin, Introduction to Machine Learning, MIT Press.

Course Title		**BCA402P : Advanced Python & Deep Learning Techniques Lab**		
Course Type		DSC-10 (Practical)		
Course Code		BCA402P	**No. of Credits**	2
			No. of Periods / Week	2
			Internal Assessment	20
			Semester Examination	30

Course Objectives:

1. To provide hands-on experience in advanced Python programming and data analysis.
2. To familiarize students with scientific computing and visualization libraries.
3. To develop skills in implementing machine learning and deep learning models.
4. To understand the use of TensorFlow and Keras frameworks.
5. To enable students to develop intelligent applications using deep learning techniques

Course Outcomes (COs)

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

CO Code	Course Outcome	Bloom's Level
CO1	Apply advanced Python libraries for data manipulation and visualization.	Applying (L3)
CO2	Develop machine learning and neural network models using Python frameworks.	Creating (L6)
CO3	Analyze the performance of deep learning models and prediction techniques.	Applying (L3)
CO4	Design intelligent applications using TensorFlow and Keras frameworks.	Creating (L6)

Mapping of Course Outcomes (COs) with Program Outcomes (POs) (Course Articulation Matrix)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	3	2	3	-	-	-	-	-
CO2	3	3	3	2	3	-	-	-	-	-
CO3	3	3	2	3	3	-	-	-	-	-
CO4	3	3	3	3	3	2	-	-	1	1

Prerequisites	Knowledge of Python programming, basic statistics, and familiarity with machine learning concepts.

List of Experiments	1. Installation and configuration of Anaconda and Jupyter Notebook environment. 2. Perform NumPy array creation and matrix operations. 3. Implement various operations on Pandas Series and DataFrames. 4. Handle missing values and perform data preprocessing. 5. Create visualizations using Matplotlib. 6. Generate statistical plots using Seaborn. 7. Implement linear regression using Scikit-Learn. 8. Perform classification using Decision Tree and K-Nearest Neighbor algorithms. 9. Evaluate machine learning models using confusion matrix and accuracy measures. 10. Implement a simple perceptron model. 11. Build an Artificial Neural Network using TensorFlow and Keras. 12. Train and test a deep learning model for prediction. 13. Implement a Convolutional Neural Network for image classification. 14. Perform transfer learning using pre-trained models. 15. Develop a mini project based on deep learning applications. 16. Software / Tools Required
Software/ Tools Required:	Python 3.x, Jupyter Notebook, Anaconda Distribution, NumPy, Pandas, Matplotlib, Seaborn, Scikit-Learn, TensorFlow, Keras, Google Colab, Visual Studio Code.

Course Title	:	**BCA403T : Data Structure Using Java**			
Course Type		DM-3			
Course Code		**BCA403T**	**No. of Credits**		2
			No. of Periods / Week		2
			Internal Assessment		20
			Semester Examination		30

Course Objectives:

1. To introduce fundamental concepts of data structures and algorithms.
2. To understand linear and non-linear data structures using Java.
3. To develop problem-solving skills using efficient searching and sorting techniques.
4. To analyze the performance of algorithms and data structures.
5. To enable students to design efficient programs using appropriate data structures.

Course Outcomes (COs)

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

CO-1	Analyze performance & Evaluate algorithm efficiency using time and space complexities with asymptotic notations (Big-O, Omega, Theta).
CO-2	Implement Linear & non-linear data structure & apply algorithms to find optimal spanning cost
CO-3	Construct hierarchical structures for optimal data sorting and retrieval and Apply network modeling using DFS & BFS

Mapping of Course Outcomes (COs) with Program Outcomes (POs)
(Course Articulation Matrix) (3-High, 2-Medium, 1-Low)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	-	-	-	-	-	-	-	-
CO2	-	3	2	-	-	-	-	-	-	-
CO3	-	-	3	2	-	-	-	-	-	-

Prerequisites	Knowledge of programming concepts, object-oriented programming using Java, arrays, functions, and basic algorithmic problem-solving techniques.
Unit I	**Introduction to Data Structures** Advanced Java Frameworks: Generics, custom wrapper classes, and the basic Java Collections Framework.Complexity Analysis: Big-O, Big-Omega, and Big-Theta notation definitions.Performance Math: Space and time metrics calculated via mathematical induction or master theorems. Linear Data Structures Linear structures store data elements sequentially, making them the most frequently encountered patterns in technical evaluations. Arrays: Memory layouts, 1D and 2D transformations, and standard element rotations. Linked Lists: Node configurations for singly, doubly, and circular chain designs. Stacks: Last-In-First-Out (LIFO)

	tracking built through array models or pointer logic. Queues: First-In-First-Out (FIFO) logic, circular variants, and dynamic double-ended queues (Deque)
Unit II	**Non-Linear & Hierarchical Structures :** Trees: Binary Trees, Binary Search Trees (BST), and node manipulation workflows. Balanced Trees: AVL trees. Heaps & Priority Queues: Max-heap and min-heap construction, array mappings, and priority tracking. Hash Tables: Key-value pairing, hash function design, and collision management like chaining.
Unit III	**Graph Representation:** System translation approaches via Adjacency Matrices or Adjacency Lists. Graph Traversals: Network exploration pathways using Breadth-First Search (BFS) and Depth-First Search (DFS).Shortest Path Maps: Weight-optimized path tracking through Dijkstra's or Bellman-Ford formulas. Spanning Trees: Dynamic cost reduction networks built with Prim's and Kruskal's methods. Sorting Algorithms
Reference books	1. Data Structures & Algorithms in Java by Robert Lafore (Author) 2. Data Structures and Algorithms Made Easy in Java by Narasimha Karumanchi (Author) 3. **Data Structures and Algorithms in Java, 6ed, ISV (An Indian Adaptation) by Michael T. Goodrich; Roberto Tamassia; Michael H. Goldwasser; Subhasish Banerjee (Author)**

Course Title	:	**BCA403P : Data Structure Using Java Lab**			
Course Type		M-4 (Practical)			
Course Code		**BCA403P**	**No. of Credits**		2
			No. of Periods / Week		2
			Internal Assessment		20
			Semester Examination		30

Course Objectives:

1. To provide practical exposure to the implementation of linear and non-linear data structures using Java.
2. To develop programming skills for solving computational problems using suitable data structures.
3. To understand searching and sorting algorithms and their applications.
4. To familiarize students with Java Collection Framework classes.
5. To enable students to analyze the performance of data structures and algorithms.

Course Outcomes (COs)

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

CO-1	Analyze performance & Evaluate algorithm efficiency using time and space complexities with asymptotic notations (Big-O, Omega, Theta).	
CO-2	Implement Linear & non-linear data structure & apply algorithms to find optimal spanning cost	
CO-3	Construct hierarchical structures for optimal data sorting and retrieval and Apply network modeling using DFS & BFS	

Mapping of Course Outcomes (COs) with Program Outcomes (POs)
(Course Articulation Matrix) (3-High, 2-Medium, 1-Low)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	-	-	-	-	-	-	-	-
CO2	-	3	3	-	-	-	-	-	-	-
CO3	-	-	2	2	-	-	-	-	-	-

Prerequisites	Knowledge of Java programming, object-oriented programming concepts, arrays, loops and functions.
List of Experiments	1. WAP program to implement the addition of two Polynomial using an Array . 2. WAP program to implement the multiplication of two Polynomial using an Array . 3. WAP program to convert Array into Sparse Array using an Array . 4. WAP program to implement the stack operations such as push, pop, display & search element using an Array . 5. WAP program to implement the queue operation such as front , rear, display & search using an Array . 6. WAP program to implement the Circular Queue using an Array .

	7. WAP program to implement the Priority Queue using an Array 8. WAP program to implement the DeQueue Queue using an Array 9. WAP program to implement the Reverse Stack using Queue implementation. 10. WAP program to demonstrate the application of malloc, calloc and free function. 11. WAP program to implement the addition of two Polynomial using Linked List. 12. WAP program to implement the multiplication of two Polynomial using using Linked List. 13. WAP program to Create the Linked List and Print it. 14. Write s menu driven program in to perform all operations such as create , delete (first,last & between), insert(first,last & between), display, search element in Linked List. 15. Write a menu driven program in to perform all operations of stack such as create , delete, insert, display, search element by using Linked List. 16. Write a menu driven program in to perform all operations of queue such as create , delete, insert, display, search element by using Linked List. 17. Write a menu driven program in to perform all operations such as create , delete (first,last & between), insert(first,last & between), display, search element in Circular Linked List. 18. Write a menu driven program in to perform all operations such as create , delete (first,last & between), insert(first,last & between), display, search element in Doubly Linked List. 19. Write a menu driven program in to perform all operations such as create , delete (first,last & between), insert(first,last & between), display, search element in Doubly Circular Linked List. 20. Write a program to convert normal linked List into Reverse Linked List. 21. Write a program to construct Tree by using three arrays. 22. Write a program to construct Tree by using one array. 23. Write a program to construct Tree by using Linked List 24. Write a program to construct BST by using array. 25. Write a program to construct BST by using Linked List. 26. Write a program to construct Tree by using three arrays and perform inorder, preorder and post order on it. 27. Write a program to construct Graph using Adjacency Matrix. 28. Write a program to construct Graph using Adjacency List. 29. Write a program to construct Graph using Incidence Matrix. 30. Write a program to perform Bubble Sorting. 31. Write a program to perform Insertion Sorting. 32. Write a program to perform Selection Sorting. 33. Write a program to perform Merge Sorting. 34. Write a program to perform Shell Sorting. 35. Write a program to perform Quick Sorting.
Text Books	1. Data Structures & Algorithms in Java by Robert Lafore (Author) 2. Data Structures and Algorithms Made Easy in Java by Narasimha Karumanchi (Author) 3. Data Structures and Algorithms in Java, 6ed, ISV (An Indian Adaptation) by Michael T. Goodrich; Roberto Tamassia; Michael H. Goldwasser; Subhasish Banerjee (Author)

GE4 / OE 4 for other Departments

Course Title	:	**BCA404T : Fundamentals of Business Management**			
Course Type		GE-4 / OE-4			
Course Code		**BCA404T**	**No. of Credits**		2
			No. of Periods / Week		2
			Internal Assessment		20
			Semester Examination		30

Course Objectives:

1. To introduce the basic principles and functions of management.
2. To understand the role of managers in modern organizations.
3. To familiarize students with planning, organizing, leadership, and control functions.
4. To develop awareness of entrepreneurship and business ethics.
5. To understand the importance of communication and decision-making in organizations.

Course Outcomes (COs)

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

CO Code	Course Outcome	Bloom's Taxonomy Level
CO1	Recall the basic concepts and principles of management.	Remembering (L1)
CO2	Explain the functions and importance of management in organizations.	Understanding (L2)
CO3	Apply management principles to solve organizational problems.	Applying (L3)
CO4	Analyze the role of leadership and communication in business organizations.	Analyzing (L4)
CO5	Evaluate ethical and entrepreneurial practices in management.	Evaluating (L5)
CO6	Develop managerial and decision-making skills for professional growth.	Creating (L6)

Mapping of Course Outcomes (COs) with Program Outcomes (POs)
(Course Articulation Matrix) (3-High, 2-Medium, 1-Low)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-
CO3	3	3	3	2	3	-	-	-	-	-
CO4	3	3	2	3	3	-	-	-	-	-

CO5	2	3	3	3	3	1	-	-	-	-
CO6	3	3	3	3	3	2	-	-	1	1

Prerequisites	Basic understanding of society, organizations, and communication skills.
Unit I	**Introduction to Management** Meaning and importance of management, characteristics and objectives of management, levels of management, managerial roles and skills, functions of management including planning, organizing, staffing, directing and controlling, principles of management, contribution of Henri Fayol and F. W. Taylor, nature and scope of management and challenges faced by modern organizations.
Unit II	**Leadership, Communication and Decision Making** Concept of leadership and leadership styles, motivation and teamwork, communication process and barriers to communication, importance of effective communication, decision-making process and types of decisions, conflict management, coordination and organizational culture, role of managers in organizational success and development of interpersonal skills.
Unit III	**Entrepreneurship, Ethics and Emerging Trends** Concept of entrepreneurship and characteristics of entrepreneurs, small business and startup concepts, business ethics and corporate social responsibility, social entrepreneurship, innovation and creativity in business, digital transformation and e-business, emerging trends in management, sustainable development and future opportunities in business and management.
Text Books	C. B. Gupta, Business Organization and Management, Sultan Chand & Sons. P. C. Tripathi and P. N. Reddy, Principles of Management, McGraw Hill. Koontz and Weihrich, Essentials of Management, Tata Mc Graw Hill.
Reference books	Stephen P. Robbins and Mary Coulter, Management, Pearson Education. Harold Koontz and Heinz Weihrich, Principles of Management, McGraw Hill. Peter F. Drucker, The Practice of Management, Harper Business. V. S. P. Rao and P. S. Narayana, Principles and Practice of Management, Konark Publishers. Ricky W. Griffin, Management, Cengage Learning.

Course Title	:	**BCA405T1 : Node JS**			
Course Type		SEC-2			
Course Code		**BCA405T1**	**No. of Credits**		2
			No. of Periods / Week		2
			Internal Assessment		20
			Semester Examination		30

Course Objectives:

6. To introduce students to server-side JavaScript programming using Node.js.
7. To understand asynchronous and event-driven programming paradigms.
8. To develop web applications and RESTful APIs using Express.js.
9. To familiarize students with MongoDB integration and authentication mechanisms.
10. To enable students to build scalable and real-time web applica

Course Outcomes (COs)

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

CO Code	Course Outcome	Bloom's Taxonomy Level
CO1	Recall the concepts and architecture of Node.js and server-side programming.	Remembering (L1)
CO2	Explain asynchronous programming, modules, and Express framework concepts.	Understanding (L2)
CO3	Apply Node.js and Express.js to develop web applications and APIs.	Applying (L3)
CO4	Analyze middleware, routing mechanisms, and database integration techniques.	Analyzing (L4)
CO5	Evaluate different authentication and API development approaches.	Evaluating (L5)
CO6	Design scalable and real-time applications using Node.js technologies.	Creating (L6)

Mapping of Course Outcomes (COs) with Program Outcomes (POs)
(Course Articulation Matrix) (3-High, 2-Medium, 1-Low)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-
CO3	3	3	3	2	3	-	-	-	-	-
CO4	3	3	2	3	3	-	-	-	-	-
CO5	2	3	3	3	3	1	-	-	-	-

CO6	3	3	3	3	3	2	-	-	1	1

Prerequisites	Knowledge of JavaScript programming, HTML and CSS, basic understanding of web technologies and databases.
Unit I	**Introduction to Node.js and Core Modules** Introduction to server-side JavaScript, features and architecture of Node.js, installation and setup of Node.js environment, Node REPL, event-driven and asynchronous programming concepts, callback functions, promises and async-await, Node Package Manager (NPM), package installation and management, modules and module system, built-in modules including File System, Path, OS, Events and Streams, buffer objects and stream processing, handling files and directories in Node.js.
Unit II	**Web Application Development Using Express.js** Introduction to Express.js framework, creating web servers, routing mechanisms and route parameters, middleware concepts and types of middleware, handling HTTP requests and responses, serving static files, template engines, form handling and validation, RESTful web services and API development, JSON data exchange, error handling techniques, CRUD operations, integration of MongoDB with Node.js using Mongoose, schema creation and data modeling.
Unit III	**Authentication and Real-Time Applications** User authentication and authorization concepts, session management and cookies, JSON Web Tokens (JWT), password encryption using bcrypt, environment variables and configuration management, introduction to Socket.IO, real-time communication and event handling, development of chat applications, API security and best practices, deployment of Node.js applications, cloud hosting platforms, introduction to microservices architecture and emerging trends in Node.js development.
Text Books	**Alex Young, Node.js in Action, Manning Publications.** **Shelley Powers, Learning Node.js, O'Reilly Media.** **David Herron, Node.js Web Development, Packt Publishing.**
Reference books	Ethan Brown, Web Development with Node and Express, O'Reilly Media. Azat Mardan, Practical Node.js, Apress Publications. Mike Cantelon, Marc Harter and T.J. Holowaychuk, Node.js in Practice, Manning Publications. Simon Holmes, Clive Harber and Romain Marins, Getting MEAN with Mongo, Express, Angular and Node, Manning Publications. Pedro Teixeira, Professional Node.js, Wiley Publications.

Course Title	:	**BCA405T2 : AI Ethics & Governance**			
Course Type		SEC-2			
Course Code		**BCA405T2**	**No. of Credits**		2
			No. of Periods / Week		2
			Internal Assessment		20
			Semester Examination		30

Course Objectives:

1. To introduce the fundamental concepts of Artificial Intelligence and responsible AI.
2. To understand ethical issues and challenges associated with AI systems.
3. To familiarize students with fairness, transparency, accountability, and explainability in AI.
4. To study privacy, security, and governance frameworks for AI technologies.
5. To enable students to develop socially responsible and ethical AI solutions.

Course Outcomes (COs)

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

CO Code	Course Outcome	Bloom's Taxonomy Level
CO1	Recall the concepts and principles of ethical and responsible AI.	Remembering (L1)
CO2	Explain ethical issues, biases, and governance frameworks in AI systems.	Understanding (L2)
CO3	Apply principles of fairness, transparency, and accountability in AI applications.	Applying (L3)
CO4	Analyze privacy, security, and societal implications of AI technologies.	Analyzing (L4)
CO5	Evaluate ethical challenges and regulatory frameworks for AI governance.	Evaluating (L5)
CO6	Design responsible and trustworthy AI solutions for real-world applications.	Creating (L6)

Mapping of Course Outcomes (COs) with Program Outcomes (POs)
(Course Articulation Matrix) (3-High, 2-Medium, 1-Low)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	-	-	-	-	2	-	-	-
CO2	3	3	2	-	-	-	2	-	-	-
CO3	3	3	3	2	2	-	2	-	-	-
CO4	3	3	2	3	2	-	3	-	-	-
CO5	2	3	3	3	2	2	3	-	1	-

CO6	3	3	3	3	3	2	3	1	2	2

Prerequisites	Knowledge of JavaScript programming, HTML and CSS, basic understanding of web technologies and databases.
Unit I	**Foundations of AI Ethics and Responsible AI** Introduction to Artificial Intelligence and its applications, evolution of AI technologies, concept of responsible AI, ethical principles in AI systems, trustworthiness in AI, opportunities and challenges of AI adoption, fairness and non-discrimination, transparency and accountability in AI systems, ethical dilemmas in autonomous systems, role of humans in AI decision-making, explainable artificial intelligence (XAI), principles of human-centered AI and international perspectives on ethical AI.
Unit II	**Bias, Privacy and Security in AI** Sources of bias in datasets and algorithms, algorithmic fairness and mitigation techniques, data privacy and confidentiality, ethical issues related to data collection and surveillance, privacy-preserving techniques, cybersecurity and adversarial attacks on AI systems, secure AI development practices, AI safety concerns, ethical challenges in facial recognition and biometric systems, responsible use of generative AI technologies, misinformation and deepfakes, intellectual property issues and ethical concerns in large language models.
Unit III	**AI Governance and Societal Impact** Need for AI governance and regulation, national and international AI policies, regulatory frameworks and standards, risk assessment and AI auditing, ethical implications of AI in healthcare, education, finance and criminal justice, social and economic impacts of AI, employment and workforce transformation, sustainability and green AI, digital inclusion and accessibility, emerging trends in AI governance, future challenges and opportunities, best practices for responsible AI development and deployment.
Text Books	**Mark Coeckelbergh, AI Ethics, MIT Press.** **Ronald Ashri, The AI-Powered Workplace, Apress Publications.** **David Watson, Mariarosaria Taddeo and Luciano Floridi, The Ethics of Artificial Intelligence, Oxford University Press.**
Reference books	Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, Pearson Education. Virginia Dignum, Responsible Artificial Intelligence, Springer Publications. Luciano Floridi, Ethics, Governance and Policies in Artificial Intelligence, Springer Publications. Mark Ryan, Ethics of Artificial Intelligence and Robotics, Routledge Publications. Andreas Kaplan and Michael Haenlein, Artificial Intelligence, Business and Society, Cambridge University Press.

Course Title	:	**BCA406T : Communication and Personality Development – II**			
Course Type		AEC-4			
Course Code		**BCA406T**	**No. of Credits**		2
			No. of Periods / Week		2
			Internal Assessment		20
			Semester Examination		30

Course Objectives:

1. To enhance verbal and non-verbal communication skills required for professional environments.
2. To develop leadership qualities, teamwork, and interpersonal skills.
3. To improve presentation, interview, and group discussion skills.
4. To understand emotional intelligence, stress management, and time management techniques.
5. To promote personality development and professional ethics among students.

Course Outcomes (COs)

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

CO Code	Course Outcome	Bloom's Taxonomy Level
CO1	Recall the principles of effective communication and personality development.	Remembering (L1)
CO2	Explain professional communication, leadership, and interpersonal skills.	Understanding (L2)
CO3	Apply communication and personality development techniques in workplace situations.	Applying (L3)
CO4	Analyze individual strengths, emotional intelligence, and behavioral aspects.	Analyzing (L4)
CO5	Evaluate leadership styles and strategies for personal and professional growth.	Evaluating (L5)
CO6	Develop professional competencies and ethical values required for career success.	Creating (L6)

Mapping of Course Outcomes (COs) with Program Outcomes (POs)
(Course Articulation Matrix) (3-High, 2-Medium, 1-Low)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	-	-	-	-	-	-	2	2
CO2	2	3	2	-	-	-	-	-	3	2
CO3	2	3	3	2	-	-	-	-	3	3

CO4	2	3	2	3	-	-	-	-	3	3
CO5	2	3	3	3	2	1	-	-	3	3
CO6	2	3	3	3	2	2	-	-	3	3

Prerequisites	Basic communication skills, understanding of interpersonal relationships, and willingness to improve personality and professional competencies.
Unit I	**Professional Communication and Interpersonal Skills** Introduction to communication and personality development, barriers to communication and methods to overcome them, verbal and non-verbal communication, interpersonal communication and relationship building, active listening skills, empathy and emotional intelligence, professional etiquette and workplace communication, written communication, email etiquette, business correspondence, cross-cultural communication and communication in digital environments.
Unit II	**Leadership, Teamwork and Personal Effectiveness** Concept of personality and determinants of personality, self-awareness and self-assessment, leadership qualities and leadership styles, teamwork and team building, conflict management and negotiation skills, motivation and goal setting, decision-making techniques, creativity and critical thinking, time management strategies, stress management techniques, work-life balance and development of positive attitude and self-confidence.
Unit III	**Employability Skills and Professional Ethics** Presentation skills and public speaking, seminar presentation techniques, group discussion strategies, interview preparation and mock interviews, resume writing and cover letter preparation, aptitude and career planning, professional ethics and values, corporate social responsibility, workplace behavior and ethics, lifelong learning, adaptability and emerging employability skills required in the digital era, entrepreneurship and personal branding.
Text Books	**Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press.** **S. P. Dhanavel, English and Soft Skills, Orient Blackswan.** **Sanjay Kumar and Pushp Lata, Communication Skills, Oxford University Press.**
Reference books	B. K. Das and A. David, An Introduction to Professional English and Soft Skills, Cambridge University Press. Dale Carnegie, How to Win Friends and Influence People, Simon & Schuster. Stephen R. Covey, The 7 Habits of Highly Effective People, Free Press. Shiv Khera, You Can Win, Macmillan Publications. Meenakshi Raman and Sangeeta Sharma, Technical Communication: Principles and Practice, Oxford University Press.

Course Title		**Project**			
Course Type		**FP-1**			
Course Code		**BCA407P**	**No. of Credits**		2
			No. of Periods / Week		2
			Internal Assessment		20
			Semester Examination		30

Course Objectives:

1. To provide students with practical exposure to software development and problem-solving techniques.
2. To enable students to apply theoretical knowledge to real-world applications.
3. To develop skills in project planning, design, implementation, testing, and documentation.
4. To encourage teamwork, creativity, and innovation in software development.
5. To enhance communication and presentation skills through project work.

Course Outcomes (COs)

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

CO Code	Course Outcome	Bloom's Level
CO1	Apply programming and software engineering concepts to develop a project.	Applying (L3)
CO2	Analyze requirements and design appropriate solutions for real-world problems.	Creating (L6)
CO3	Evaluate alternative approaches and technologies for project development.	Applying (L3)
CO4	Design, implement and document a software project using appropriate tools and methodologies.	Creating (L6)

Mapping of Course Outcomes (COs) with Program Outcomes (POs) (Course Articulation Matrix)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	2	3	-	-	-	-	-
CO2	3	3	3	3	3	-	-	-	2	-
CO3	3	3	3	3	3	2	-	-	2	1
CO4	3	3	3	3	3	2	-	-	3	2

Prerequisites	Knowledge of programming languages, database systems, web technologies,

	software engineering principles, and basic understanding of project management concepts.
Importance of Project Work	Project work provides students with an opportunity to integrate and apply the knowledge acquired during the program to solve real-world problems. It promotes analytical thinking, creativity, teamwork, innovation, communication skills, and professional ethics. The project helps students understand the software development life cycle and prepares them for industry, entrepreneurship, and higher studies.
Project Development Methodology	The project shall be carried out in a systematic manner consisting of problem identification and topic selection, literature survey and requirement analysis, feasibility study and project planning, system design and database design, coding and implementation, testing and debugging, documentation, demonstration, and presentation. Students are expected to use appropriate tools and technologies and follow standard software engineering practices throughout the project development process.
Project Areas	Projects may be undertaken in areas such as Artificial Intelligence, Machine Learning, Deep Learning, Data Science, Web Development, Mobile Application Development, Cloud Computing, Internet of Things, Cyber Security, Blockchain Technology, Database Applications, Healthcare Systems, Agriculture Applications, Educational Applications, and other emerging technologies.
Project Documentation	The project report shall contain title page, certificate, declaration, acknowledgement, abstract, table of contents, introduction, literature survey, requirement analysis, system design, implementation details, testing and results, conclusion, future scope, references, and user manual wherever applicable.
Evaluation Scheme	**Component** — **Marks** Problem Definition and Objectives — 5 System Design and Implementation — 5 Innovation and Technical Complexity — 10 Documentation and Report Writing — 10 Demonstration and Presentation — 10 Viva-Voce — 10 **Total** — **50**

Course Title		**BCA408P : Social Work**			
Course Type		**CC-4**			
Course Code		**BCA408P**	**No. of Credits**		2
			No. of Periods / Week		2
			Internal Assessment		20
			Semester Examination		30

Course Objectives:

1. To develop social awareness and civic responsibility among students.
2. To encourage active participation in community engagement and nation-building activities.
3. To inculcate values of social service, leadership, and teamwork.
4. To promote environmental consciousness, health awareness, and ethical values.
5. To enable students to contribute towards sustainable social development.

Course Outcomes (COs)

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

CO Code	Course Outcome	Bloom's Level
CO1	Apply social and ethical values while participating in community development activities.	Applying (L3)
CO2	Analyze social issues and propose suitable solutions for community welfare.	Creating (L6)
CO3	Evaluate the impact of various social awareness and environmental activities.	Applying (L3)
CO4	Design and organize community engagement programs and social initiatives.	Creating (L6)

Mapping of Course Outcomes (COs) with Program Outcomes (POs) (Course Articulation Matrix)

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	2	-	-	-	3	2	2	2
CO2	2	3	2	3	-	-	3	2	2	2
CO3	2	3	3	3	-	2	3	2	2	2
CO4	2	3	3	3	2	2	3	2	3	3

Prerequisites	Awareness of social issues, willingness to participate in community activities,

	and a sense of social responsibility and ethical values.
Importance of Social Work	Social work plays a significant role in developing responsible citizens and promoting sustainable development. It provides students with opportunities to understand social problems, interact with communities, and contribute towards nation-building. Participation in social activities helps students develop leadership qualities, communication skills, teamwork, empathy, environmental awareness, and ethical values required for personal and professional growth.
Community Engagement Activities	Students shall actively participate in one or more community-oriented activities such as cleanliness drives, tree plantation campaigns, blood donation awareness programs, digital literacy programs, health and hygiene awareness campaigns, voter awareness activities, road safety campaigns, women empowerment initiatives, cyber awareness programs, water conservation activities, village adoption programs, environmental protection initiatives, plastic-free campaigns, literacy programs, disaster management awareness programs, and activities related to Sustainable Development Goals (SDGs).
Methodology and Working Procedure	The social work activity shall be carried out in a systematic manner consisting of identification of social issues, selection of community activities, planning and execution of programs, interaction with beneficiaries, documentation of activities, preparation of reports, and presentation of outcomes. Students may perform these activities individually or in groups under the guidance of faculty members. The activities may be conducted in collaboration with NSS, NGOs, government agencies, local bodies, schools, hospitals, and community organizations.
Project Documentation	Students shall maintain a record of activities including objectives, planning, photographs, participation details, observations, outcomes, and conclusions. A final report containing introduction, description of activities, impact assessment, photographs, and references shall be submitted at the end of the semester.
Evaluation Scheme	Component — Marks Participation and Attendance — 10 Planning and Execution of Activities — 10 Report Writing and Documentation — 15 Presentation and Viva-Voce — 15 Total — 50
Suggested Activities	• Tree Plantation and Environmental Awareness. • Digital Literacy Campaign. • Cyber Security Awareness Program. • Swachh Bharat Abhiyan Activities. • Blood Donation and Health Awareness Programs. • Water Conservation and Rainwater Harvesting Awareness. • Women Empowerment and Gender Equality Programs. • Voter Awareness Campaigns. • Road Safety and Traffic Awareness Programs. • Plastic-Free Campus and Green Campus Initiatives. • Community Service in Rural Areas.

	• Disaster Management and Emergency Preparedness Programs. • Social Media Awareness and Responsible Use of Technology. • Sustainable Development Goal (SDG) Activities. • Community-Based Mini Projects.