



MAHARAJA SURAJMAL BRIJ UNIVERSITY
BHARATPUR (RAJASTHAN)
SYLLABUS FOR BACHELOR OF COMPUTER
APPLICATION (BCA)
(UNDER GRADUTE PROGRAMME)
(III & IV SEMESTER)
ACADEMIC SESSION 2024-25

PS

डॉ. अरुण कुमार पाण्डेय
उपकुलसचिव
प्रभारी अकादमिक प्रथम

BCA Part - II (III & IV Sem) 2024-25 Onwards

Semester-wise Titles of the Papers in Bachelor of Computer Application						
Diploma in Computer Application						
Semester	Course Code	Course Title	Course Type	Theory/ Practical	Teaching Hours/ Week	Credits
III	BCA-63T-201	Data Structures and Algorithms	CC(Major)	Theory	4	4
	BCA-63P-202	Data Structures Lab Using C	CC(Major)	Practical	4	2
	BCA-63T-203	Object Oriented Programming Through C++	CC(Major)	Theory	4	4
	BCA-63P-204	OOP Lab	CC(Major)	Practical	4	2
	BCA-63T-205	Software Engineering	CC(Major/ Minor)	Theory	6	6
	BCA-63T-206	MEC1	MEC	Theory	4	4
	BCA-63P-207	SEC3	SEC	Practical	4	2
	BCA-63T-208	VAC3	VAC	Theory	2	2
			Total			32
IV	BCA-64T-211	PHP Programming	CC(Major)	Theory	4	4
	BCA-64P-212	PHP Lab	CC(Major)	Practical	4	2
	BCA-64T-213	Object Oriented Concepts Using Java Programming	CC(Major)	Theory	4	4
	BCA-64P-214	Java Lab	CC(Major)	Practical	4	2
	BCA-64T-215	Mathematics & Statistics	CC(Major/ Minor)	Theory	6	6
	BCA-64T-216	MEC2	MEC	Theory	4	4
	BCA-64T-217	SEC4	SEC	Theory	2	2
	BCA-64T-218	VAC4	VAC	Theory	2	2
			Total			30



डॉ. अरुण कुमार पाण्डेय
उपकुलसचिव
प्रभारी अकादमिक प्रथम

List of Multidisciplinary Elective Courses(MEC) in Bachelor of Computer Application

S.No.	Course Code	Course Title	Theory/ Practical	Teaching Hours/ Week	Credits	To be Opted in the Semester
1	BCAMEC1	C Programming Concepts	Theory	4	4	III
2	BCAMEC2	Web Application Development	Theory	4	4	III
3	BCAMEC3	Fundamentals of Computer	Theory	4	4	III
4	BCAMEC4	Office Management Tools	Theory	4	4	III
5	BCAMEC5	E-Commerce Technologies	Theory	4	4	IV
6	BCAMEC6	Programming in Python	Theory	4	4	IV
7	BCAMEC7	Digital Marketing	Theory	4	4	IV
8	BCAMEC8	Computer Accounting	Theory	4	4	IV
9	BCAMEC9	Multimedia and Animation	Theory	4	4	V
10	BCAMEC10	Introduction to Cyber Security	Theory	4	4	V
11	BCAMEC11	Open Source with PHP	Theory	4	4	V
12	BCAMEC12	Graphic Design	Theory	4	4	V

डॉ. अरुण कुमार पाण्डेय
उपकुलसचिव
प्रभारी अकादमिक प्रथम

Course Content for BCA, Semesters III and IV 2024-25

Semester: III

Course Code: BCA-40T-301	Course Title: Data Structures and Algorithms
Course Credit : 04	Hours/Week: 04

Course Objectives (COs):

By the end of this course, students will be able to:

- To design efficient algorithms using various algorithm designing strategies
- To analyze the problem and develop the algorithms related to these problems
- To classify the problem and apply the appropriate design strategy to develop algorithm
- To design algorithm in context of space and time complexity and apply asymptotic notation

Course Outcomes (COs):

After completing this course satisfactorily, a student will be able to:

- Understand the concepts of data structures and their importance in computing.
- Implement and use common data structures such as arrays, linked lists, stacks, queues, trees, and graphs.
- Analyze the time and space complexity of algorithms related to data structures.
- Apply data structures to efficiently solve real-world problems

BCA-40T-301 : Data Structures and Algorithms

UNIT – I

Introduction to Algorithm Design: Algorithm, its characteristics, efficiency of algorithms, analyzing Algorithms and problems.

Linear Structure: Arrays, records, stack, operation on stack, implementation of stack as an array, queue, types of queues, operations on queue, implementation of queue.

UNIT – II

Linked Structure : List representation, Polish notations, operations on linked list - get node and free node operation, implementing the list operation, inserting into an ordered linked list, deleting, circular linked list.

Tree Structure : Concept and terminology, Types of trees, Binary search tree, inserting, deleting and searching into binary search tree, tree traversals.



डॉ. अरुण कुमार पाण्डेय
उपकुलसचिव
प्रभारी अकादमिक प्रथम

UNIT – III

Graph Structure : Graph representation - Adjacency matrix, adjacency list, Warshall's algorithm, adjacency multilist representation. Orthogonal representation of graph . Graph traversals - BFS and DFS. Shortest path, transitive closure.

UNIT – IV

Searching and sorting : Searching - sequential searching, binary searching, hashing. **Sorting** - selection sort, bubble sort, quick sort, heap sort, merge sort, and insertion sort, efficiency considerations.

Recommended reference books

1. S.Lioschutz: Data Structures, Mc Graw Hill International Edition.
2. A.V.Aho., J.E.Hopcroft, and J.D.Ullman, Data Structures and Algorithms, Pearson.
3. A. MichaelBerman: Data Structures via C++, OxfordUniversity Press.
4. SaraBaase and AllenVan Gelder: Computer Algorithms, Pearson Education Asia.

Corse Code: BCA-40P-302	Course Title: Data Structures Lab Using C
Course Credit : 02	Hours/Week: 04

Content : Recommended exercises :

1. Given {4,7,3,2,1,7,9,0} find the location of 7 using Linear and Binary search and also display its first occurrence.
2. Given {5,3,1,6,0,2,4} order the numbers in ascending order using Bubble Sort Algorithm
3. Perform the Insertion and Selection Sort on the input {75,8,1,16,48,3,7,0} and display the output in descending order.
4. Given {5,3,1,6,0,2,4} order the numbers in ascending order using Quick Sort Algorithm
5. Given {5,3,1,6,0,2,4} order the numbers in ascending order using Merge Sort Algorithm
6. Write a program to insert the elements {61,16,8,27} into singly linked list and delete 8,61,27 from the list. Display your list after each insertion and deletion.
7. Write a program to insert the elements {61,16,8,27} into linear queue and delete three elements from the list. Display your list after each insertion and deletion.
8. Write a program to insert the elements {61,16,8,27} into circular queue and delete 4 elements from the list. Display your list after each insertion and deletion.
9. Write a program to insert the elements {61,16,8,27} into ordered singly linked list and delete 8,61,27 from the list. Display your list after each insertion and deletion.
10. Write a program to add $6x^3+10x^2+0x+5$ and $4x^2+2x+1$ using linked list.
11. Write a program to push 5,9,34,17,32 into stack and pop 3 times from the stack, also display the popped numbers.



डॉ. अरुण कुमार पाण्डेय
उपकुलसचिव
प्रभारी अकादमिक प्रथम

12. Write a recursive program to find GCD of 4,6,8.
13. Write a program to insert the elements {5,7,0,6,3,9} into circular queue and delete 6,9&5 from it(using linked list implementation)..
14. Write a program to create a binary tree with the elements {18,15,40,50,30,17,41} after creation insert 45 and 19 into tree and delete 15,17 and 41 from tree. Display the tree on each insertion and deletion operation
15. Write a program to create binary search tree with the elements {2,5,1,3,9,0,6} and perform inorder, preorder and post order traversal.
16. Write a program to Sort the following elements using heap sort {9,16,32,8,4,1,5,8,0}
17. Write a program to implement DFS search in a graph.
18. Write a program to implement DFS search in a graph.

Corse Code: BCA-40T-303	Course Title: Object Oriented Programming Through C++
Course Credit : 04	Hours/Week: 04

Course Objectives (COs):

Upon finishing the course, students will be able to:

- Introduction to Object-Oriented Programming: Understand the fundamental concepts of object-oriented programming (OOP) and how it differs from procedural programming.
- Java Syntax and Semantics: Learn the basic syntax and semantics of the Java programming language, including data types, operators, and control structures.
- Classes and Objects: Understand the principles of classes and objects in Java. Learn how to define and instantiate classes, and how to use objects to encapsulate data and methods.
- Inheritance and Polymorphism: Explore the concepts of inheritance and polymorphism in Java. Understand how to create class hierarchies and use polymorphic behavior to enhance code flexibility and reusability.
- Encapsulation and Abstraction: Learn about encapsulation and abstraction principles. Understand how to use access modifiers to protect data and methods, and how to define abstract classes and interfaces.
- Exception Handling: Understand the mechanisms for error and exception handling in Java. Learn how to use try-catch blocks, create custom exceptions, and manage resources with the try-with-resources statement.



डॉ. अरुण कुमार पाण्डेय
उपकुलसचिव
प्रभारी अकादमिक प्रथम

Course Outcomes (COs): On completion of the course, the student will be able to:

- Understand the fundamental concepts of object-oriented programming.
- Design and implement C++ programs using classes, objects, and inheritance.
- Apply polymorphism and templates to develop reusable code.
- Utilize advanced features of C++ to develop efficient and modular programs.

BCA-40T-303 : Object Oriented Programming Through C++

UNIT – I

Introduction to Object Oriented Concepts: Evolution of OOP, OOP Paradigm, advantages of OOP, comparison between functional programming and OOP approach, characteristics of object oriented language – objects, classes, inheritance, reusability, user defined data types, polymorphism, overloading.

UNIT – II

Introduction to C++: C++ tokens, data types, C++ operators, type conversion, variable declaration, arrays, statements, expressions, conditional statements, Jumping statements, loops, functions, pointers, structures.

Classes and Objects: Classes, objects, defining member functions, arrays of class objects, pointers and classes, passing objects, constructors, types of constructors, destructors, this pointer, access specifiers, friend functions, inline functions.

Unit – III

Inheritance: Introduction, Importance of Inheritance, types of inheritance, Constructor and Destructor in derived classes., member access control.

Polymorphism: Functions Overloading, Operator Overloading, early binding polymorphism with pointers, Unary and Binary Operator Overloading, Overload Assignment Operator, Copy Constructor.

Unit –IV

Virtual Function : Virtual Function, late binding, pure virtual functions, abstract classes, Generic Programming with Templates, Friend function, Overloaded Function Templates, Multiple Arguments function Template.

File Management: Handling Data files (sequential and random), Opening and closing of files, stream state member functions, Operations on File, Exception Handling.

Recommended Books:

1. Deitel HM & Deitel JP; C/C++ How to program; 5thEdn; Pearson Pub.
2. Balagurusamy ; Object Oriented Programming in C++; 4th Edition TMH.
3. Venugopal, Rajkumar; Mastering C++; Tata Mcgrow Hill.,



डॉ. अरुण कुमार पाण्डेय
उपकुलसचिव
प्रभारी अकादमिक प्रथम

4. Kanetkar Y.: LET US C++; BPB;
5. Byron Gottfried; Programming with C; TMH;

Course Code: BCA-40P-404	Course Title: OOP Lab
Course Credit : 02	Hours/Week: 04

Course Contents : Recommended exercises

1. Simple C++ applications for understanding references to an instant of a class
2. Handling Arrays and strings in C++
3. Inheritance applications
4. Functions overloading
5. Operators overloading
6. Use Virtual functions
7. Generic programming
8. Exception Handling
9. File operations

Course Code: BCA-40T-305	Course Title: Software Engineering
Course Credit : 06	Hours/Week: 06

Course Objectives (COs):

By the end of this course, students will be able to:

- Understand the principles and practices of software engineering.
- Apply software engineering processes and methodologies to develop software systems.
- Perform requirements analysis and software design.
- Implement software using appropriate programming languages and development tools.
- Apply software testing and quality assurance techniques.

Course Outcomes (COs):

After completing this course satisfactorily, a student will be able to:

- Understand the principles and practices of software engineering.
- Apply software engineering processes and methodologies to develop software systems.
- Perform requirements analysis and software design.



डॉ. अरुण कुमार पाण्डे
उपकुलसचिव
प्रभारी अकादमिक प्रथम

- Implement software using appropriate programming languages and development tools.
- Apply software testing and quality assurance techniques.

BCA-40T-305 : Software Engineering

Unit-I

Software Engineering Fundamentals: Software, Problem Domain, Software Engineering Challenges, Software Processes (processes, projects & products, component), Software Requirement Analysis & Specification.

Software Development Process Models: Waterfall Model, Prototyping, Iterative Enhancement Model, Spiral Model. Introduction to Agile Model: Principles, Steps, Various Agile Process Models.

Unit-II

Software Project Planning: Cost Estimation- Uncertainties in Cost Estimation, Building Cost Estimation Models, On Size Estimation, COCOMO Model.

Project Scheduling: Average Duration Estimation, Project Scheduling & Milestones. Quality Assurance Plans: Verification & Validation, Inspection & Reviews.

Unit-III

Design Engineering: Design Process & Design Quality, Design Concepts (abstraction, architecture, modularity, functional independence, refinement, and design classes), The Design Model (data design elements, architectural design elements, interface design elements, component-level design elements, deployment-level design elements).

Testing Strategies & Tactics: A strategic approach to software testing, Strategic issues, Software testing fundamentals, Test characteristics, Test Strategies for conventional software: Unit Testing, Integration testing, Validation Testing, System testing, Black-Box testing, White Box testing.

Unit-IV

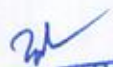
Software Reliability: Risk Management, Measures of Reliability & Availability, Software Safety.

Maintenance and Reengineering: Introduction to: Software Maintenance, Software Supportability. Reengineering, Reverse Engineering, Restructuring, and Forward Engineering.

Reference /Text Books

1. Pressman, Roger (2001) Software Engineering; A Practitioner's Approach, 8th ed. M Graw-Hill, 2014.
2. Sommerville Ian; Software Engineering, 9th Ed. Pearson Education, 2014
3. Jalote, Pankaj (7) An integrated Approach to Software Engineering 2nd Ed.
4. JamesRumbaugh. MichealBlaha, "Object oriented Modeling and Design with UML", 2nd Edition, 2007.
5. SimonBennett, SteveMcRobb and RayFarmer, " Object-Oriented Systems Analysis and Design Using UML" 4th Edition, McGraw Hill Education, 2010




डॉ. अरुण कुमार पाण्डेय
उपकुलसचिव
प्रभारी अकादमिक प्रथम

Semester: IV

Course Code: BCA-40T-401	Course Title: PHP Programming
Course Credit : 04	Hours/Week: 04

Course Objectives (COs):

In this course, you will learn about:

- Fundamental concepts of PHP scripting language
- The basic structure of a web application
- The request/response cycle
- Basics of MySQL database
- The relationship between the client-side and server-side scripts
- Creating functional websites and web apps in PHP
- PHP web application testing and security
- Creating a PHP web application using a CMS

Course Outcomes (COs):

After completing this course satisfactorily, a student will be able to:

- Able to learn Core-PHP, Server Side Scripting Language.
- Able to design dynamic and interactive web pages, websites.
- Able to run PHP scripts on server and retrieve results.
- Able to handle databases like MySQL using PHP in web sites.

BCA-40T-401 : PHP Programming

UNIT-I

Introduction to PHP: Installation of PHP and MySQL, PHP configuration in IIS & Apache Web Server. Features of PHP, Writing PHP, Parsing PHP code, Embedding PHP and HTML Executing PHP and viewing in Browser.

Unit - II

Control Structures: Data types, Operators, PHP variables: static and global variables, Comments in PHP. Control Structures, Condition statements, If...Else, Switch, ? operator, Loops, While, Break Statement Continue. Do...While, For, For each, Exit, Die, Return. Arrays: Numeric, Associative and Multidimensional Arrays

UNIT-III



डॉ. अरुण कुमार पाण्डेय
उपकुलसचिव
प्रभारी अकादमिक प्रथम

Strings: Creating and accessing String, Searching & Replacing String, Formatting String, String Related Library function, Pattern matching, Replacing text, Splitting a string with a Regular Expression

Functions: Defining a Function, Calling a Function, Parameter passing, Returning value from function

Form Data Handling: \$_GET, \$_POST, \$_REQUEST Variables, Cookies handling, Session Management

UNIT-IV

Exception Handling: Understanding Exception and error, Try, catch, throw

File Handling: Opening and closing a file, Copying, renaming and deleting a file

Database Handling: Connection with MySql Database or ODBC, Performing basic database operation (Insert, Delete, Update, Select, Truncate Alias, Order By), Setting query parameter.

References

1. PHP, The Complete Reference, Steven Holzner, TMH
2. Beginning PHP 5.3, Matt Doyle, John Wiley & Sons
3. Core PHP Programming Leon Atkinson Pearson publishers
4. Beginning PHP 5.0 Database Christopher Scollo, Harish, Rawat, Deepak Thomas, Wrox Press

Course Code: BCA-40P-402	Course Title: PHP Lab
Course Credit : 02	Hours/Week: 04

Content : Recommended exercises : Exercise based on paper BCA-40T-401

1. Installing XAMPP
2. Variables, Data Types, Constants, Operators, Programming Loops,
3. PHP Functions,
4. Arrays
5. Strings Functions
6. PHP Form Handling, Require & Include
7. PHP with MySQL

Course Code: BCA-40T-403	Course Title: Object Oriented Concepts Using Java Programming
Course Credit : 04	Hours/Week: 04

Course Objectives (COs):

By the end of this course, students will be able to:



डॉ. अरुण कुमार पाण्डेय
उपकुलसचिव
प्रभारी अकादमिक प्रथम

- Learn the Object-Oriented Programming concepts to write, compile and debug programs using Java language.
- Apply the concepts of object-oriented programming like polymorphism, inheritance, Exception Handling, and Multithreading.
- Design and develop console and GUI applications using Java Programming Language.
- Work on programming project as individual or as team member in design, development and implementation phase.

Course Outcomes (COs):

After completing this course satisfactorily, a student will be able to:

- Understand the features of Java and the architecture of JVM
- Write, compile, and execute Java programs that may include basic data types and control flow constructs and how type casting is done
- Identify classes, objects, members of a class and relationships among them needed for a specific problem and demonstrate the concepts of polymorphism and inheritance
- The students will be able to demonstrate programs based on interfaces and threads and explain the benefits of JAVA's Exceptional handling mechanism compared to other Programming Language
- Write, compile, execute Java programs that include GUIs and event driven programming and also programs based on files

BCA-40T-403 : Object Oriented Concepts Using Java Programming

UNIT - I

Java Programming : Basic concepts of object oriented programming (Objects and Classes, Data Abstraction & Encapsulation, Inheritance, Polymorphism, Dynamic binding, Message passing), Java features, JVM, Byte code interpretation, simple java program, command line argument, Data types, type casting, operators (Arithmetic, increment, decrement, relational, logical, bit wise, conditional) and expressions.

UNIT - II

Decision Making and Branching : Decision making and branching (if...else, else if, switch), looping, classes, objects and methods, visibility control, constructors, wrapper classes, nesting of methods, Arrays and strings handling. **Polymorphism:** Function overriding, Operator overloading, final classes.

UNIT - III



डॉ. अरुण कुमार पाण्डेय
उपकुलसचिव
प्रभारी अकादमिक प्रथम

Inheritance & Multithreaded Programming : Inheritance, Types of Inheritance, Abstract class, interfaces, packages, multithreaded programming, extending thread, life cycle of thread, using thread methods, thread priority, synchronization.

Exception Handling : Exception-Handling fundamentals, Exception types, try, catch, throw, finally, creating exception sub classes.

UNIT – IV

JSP : Introduction to JSP, Directory Structure, Lifecycle JSP, Scripting Elements .

JAR files, Servlets Life cycle of servlet, JDBC connectivity.

Recommended Text Books


1. Mastering java 2 ", BPB Publications. Programming with Java A Primer, E.Balagurusamy Tata McGraw Hill Companies
2. Java Programming JohnP.FlyntThomson2nd
3. The complete reference JAVA2, Herbertschildt. TMH
4. Arnold,Gosling, " The Java Programming Professional 2000", AddisonWesley Publication
5. C.Thomaswu, "An introduction to oop with Java", TMH

Corse Code: BCA-40P-404	Course Title: Java Lab
Course Credit : 02	Hours/Week: 04

Content : Recommended exercises :

1. Simple java applications for understanding references to an instant of a class
2. Handling Arrays in JAVA
3. Handling strings in JAVA
4. Implementation polymorphism
5. Package creation
6. Developing user defined packages in java
7. Use of Inheritances
8. Use of Interfaces
9. Threads, Multithreading
10. Collection handling
11. GUI/Swings applications
12. I/O Stream handling
13. Exception Handling
14. JSP
15. Servlets

Corse Code: BCA-40T-405	Course Title: Mathematics & Statistics
Course Credit : 06	Hours/Week: 06


डॉ. अरुण कुमार पाण्डेय
उपकुलसचिव
प्रभारी अकादमिक प्रथम

Course Objectives (COs):

By the end of this course, students will be able to:

- Be able to apply problem-solving and logical skills
- Have a deeper understanding of mathematical theory
- Have a solid knowledge of elementary statistics
- Be able to communicate mathematical/logical ideas in writing
- Be competent in computer programming
- Be familiar with several subfields of mathematics (e.g. numerical analysis, topology, operations research).
- Be exposed to undergraduate research or internship opportunities

Course Outcomes (COs):

After completing this course satisfactorily, a student will be able to:

- To understand the basic concepts of Mathematical reasoning, set and Relations and functions.
- To understand the basic concepts of functions and logic/proofs.
- To understand various counting techniques.
- Understand the concepts of various types of Matrices and Determinants.
- To understand the concept of Statistics: Data collection and Classification.
- To understand the concept of measurement of central tendency.
- To understand the correlation and regression analysis.

BCA-40T-405 : Mathematics & Statistics

UNIT - I

Sets : Definition of sets, representation of sets, type of sets. Operations on sets, Sub sets, Power set, Universal set, Complement of a set, Union and Intersection of two sets, Venn diagrams, Principles of Inclusion and Exclusion. **Relations:** Cartesian product of sets, Definition of relation, Types of relations- reflexive, symmetric, anti-symmetric, transitive, equivalence.

Functions : Definition, Domain & Range of a functions, one to one and onto functions, Bijective functions, composite functions, inverse of functions.

UNIT - II

Logic and Proofs : Proposition, Conjunction, Disjunction, Negation, Compound proposition, De Morgan's laws, Tautology and Contradiction.

Matrices: Definition and Types of Matrices, Addition, Subtraction and Multiplication of Matrices, Non-commutativity of multiplication of matrices, Scalar Multiplication, Transpose of a Matrix.



डॉ. अरुण कुमार पाण्डेय
उपकुलसचिव
प्रमारी अकादमिक प्रथम

Determinant: Determinant of a square matrix (up to 3×3 matrices), properties of determinants, minors, cofactors, expansion of determinants, application of determinants in finding the area of a triangle. Adjoint and Inverse of a matrix, Solution of system of linear equations by Cramer's Rule.

UNIT -III

Statistics : Data collection methods, Data classification, Frequency Distribution, Graphical representation of frequency distribution. **Measures of Central Tendency-** Mean, Median, Mode, **Measures of Dispersion-** Mean Deviations, Standard Deviations, Variance

UNIT -IV

Correlation Analysis : Correlation, Types of Correlations, Methods of Studying Correlations, Measure of Karl Pearson's coefficient of correlation, Rank Correlation Coefficient.

Regression Analysis: Regression, Use of regression analysis,, Difference between Correlation and Regression Analysis, Regression Lines Equations, Properties of regression lines.

Reference Books:

1. C.L.Liu: Elements of Discrete Mathematics, Tata Mc-Graw Hill Publishing Company Ltd., 2000
2. Seymour Lipschutz; Discrete Mathematics;TMH.
3. KennethH Rosen; Discrete Mathemtics& Its Applications; 6 Edition,MGH;
4. RichardJohnsonbaugh: Discrete Mathematics, Pearson Education, Asia, 2001
5. JohnTruss: Discrete Mathematics for Computer Scientists, Pearson Education, Asia, 2001.
6. Basic Mathematics, R.D.Sharma
7. B.L.Agrawal; Basic Statistics; KhannaPub.
8. S.P.Gupta; Statistical Methods; Sultan Chand & Sons
9. S.C.Gupta, V.K.Kapoor ; fundamental of statics; Sultan Chand & Sons



डॉ. अरुण कुमार पाण्डेय
उपकुलसचिव
प्रभारी अकादमिक प्रथम