Kavayitri Bahinabai Chaudhari
North Maharashtra University, Jalgaon
Faculty of Science and Technology
BACHELOR IN COMPUTER APPLICATION (BCA(II))
BCA 301 -Fundamental Mathematics and Statistics
W.E.F.2023-24
[Total Marks: External 60 + Internal 40 =100Marks]

Semester:	**III**	CIE Marks:	**40**
Course Code:	**BCA 301**	SEE Marks:	**60**
Contact Hours (L:T:P):	**4:0:0**	Exam Hours:	**02**

Course Outcomes: At the end of the course student should be able to

1) Understanding of all terms related to mathematical logic.
2) Ability to know the types of sets, method of representation, operations, and laws related to it.
3) Ability to solve problems related to matrices.
4) Understand the basic concepts of Statistics.
5) Analyze statistical data using measures of central tendency.
6) Performing mathematical and statistical functions using MS-Excel.

Unit-1: Mathematical Logic **10 L 15 M**

Meaning of Statement, Primitive and Compound Statements, Truth Values of a Statement, Law of Excluded Middle, Logical Operations: Negation, Conjunction & Disjunction Implication, Double Implication, Equivalence, Equivalence of Logical Statements, Truth Tables & Construction of Truth Tables,Tautology and Contradiction, Argument: Valid And Invalid Arguments.

Unit-2: Sets **10 L 15 M**

Meaning of a Set, Methods of Describing a Set, Tabular Form, Set Builder Form, Types of a Set: Finite Set, Infinite Set, Empty Set, Subset, Universal Set, Equal Sets, Overlapping Sets, Disjoint Sets, Complementary Set. Operations on Sets, Union of Sets, Intersection of Sets ,Difference of Sets ,Demorgan's Laws (Without Proof) ,Venn Diagrams ,Cartesian Product of Two Sets ,Statement of Following Laws (Without Proof) Relating To Union and Intersection of Sets :- Idempotent Laws (ii) Identity Laws (iii) Commutative Laws (iv) Associative Laws (v) Distributive Laws

Unit-3: Matrices **10 L 15 M**

Meaning of a Matrix, Order Of Matrix ,Types of Matrix, Zero Matrix, Column Matrix, Square Matrix, Diagonal Matrix, Scalar Matrix, Unit Matrix , Symmetric Matrix, Skew-Symmetric Matrix, Transpose of a Matrix: Singular Matrix & Non -Singular Matrix, Algebra of Matrices:- Equality of Matrices , Multiplication of Matrix by A Scalar ,Addition of Matrices, Subtraction of Matrices ,Multiplication of Matrices

Unit-4: Introduction to Statistics **10 L 15 M**

Meaning of Statistics , Importance and Limitations of statistics , Meaning of data, Raw data, Primary data, Secondary data ,Variable and attribute, Types of variable: - districts and continuous ,Meaning of Population and sample ,Introduction to methods of sampling: - simple random sampling and stratified random sampling

Unit-5: Measures of central tendency **10 L 15 M**

Meaning and central tendency, Statement of measures of central tendency: - arithmetic mean, geometric mean, harmonic mean, median and mode, Computation of these measures of central tendency for given raw data, Partition values: - quartiles, deciles and percentiles, Computation of partition values for given raw data

Unit-6: Mathematical and Statistical Calculations using MS-EXCEL **10 L 15 M**

Step by step procedure to perform basic logical function, mathematical function and basic statistical function using MS Excel.

Exam Pattern:

Internal(40 Marks)	**External (60 Marks)**

Reference Books-

1. Business Mathematics Sancheti&Kapoor Sultan Chand & Co. New Delhi ISBN 10: 8180545385
2. Business Mathematics & Analytics Anand Sharma Himalaya Publishing ISBN 13: 9788180545382
3. Business Mathematics Dr.Ramnath Dixit and Dr. Jinendra Jain Himalaya Publishing
4. Business Mathematics & Statistics: Punaini, Pearson Education ISBN: 9780070612044
5. Business Statistics C M Chikkodi& B G SatyaPrasad Himalaya Publishing
6. Business Statistics S P Gupta Sultan Chand &Co.NewDelhi ISBN: 8180549453
7. MS-Excel Help files from Microsoft ISBN-13: 978-1285168432

Kavayitri Bahinabai Chaudhari
North Maharashtra University, Jalgaon
Faculty of Science and Technology
BACHELOR IN COMPUTER APPLICATION (BCA(II))
BCA 302 -Operating System
W.E.F. 2023-24
[Total Marks: External 60 + Internal 40 =100Marks]

Semester:	**III**	CIE Marks:	**40**
Course Code:	**BCA 302**	SEE Marks:	**60**
Contact Hours (L:T:P):	**4:0:0**	Exam Hours:	**02**

Course Outcomes:

After completion of this course students shall be able –

1) To get aware of the main components, computer organization interface, and system calls of OS.
2) Ability to apply process management and threading.
3) To Make understand the features of Linux OS
4) To Learn the basic Linux command

Unit-1: Introduction **10 L 15 M**

Introduction of an Operating System, Components of an OS, Types of OS, System Call, Introduction of Linux OS, Distribution of Linux System, Benefits of Linux.

Unit-2: Processes **10 L 15 M**

Process Concept, Process Scheduling: Definition, Categories of Scheduling ,Process Scheduling Queues, Schedulers, Context Switching, Scheduling algorithms :First-Come, First-Served (FCFS) Scheduling, Shortest-Job-Next (SJN) Scheduling, Operations on Processes**.**

Unit-3: Threads **10 L 15 M**

Introduction to Thread, Types of Thread, Multithreading Models, Thread Libraries, Thread Pools.

Unit-4: Linux Operating System **10 L 15 M**

A Brief History of Linux, Basic features of Linux OS, components of Linux System, Benefits of Linux, Logging In and out Using the Linux System, Logging In and out Using the Linux System, Creating Additional User Accounts.

Unit-5: File System **10 L 15 M**

Introduction to The File System and Working with Linux Permissions, File System Navigation, Managing the File System Understanding Permissions, Changing File and Directory Permissions, Changing Default Permissions and Ownership.

Unit-6: File Operations **10 L 15 M**

Archiving Files Archiving Files with Tar, Archiving Files With CPIO, Zipping Files, Creating and Viewing Files Using the Vi Editor, Studying Other Editors.

Exam Pattern:	
Internal (40 Marks)	**External (60 Marks)**

Reference Books

1. Nutt, Chaki, Neogy, Operating Systems, Pearson Education, Third Ed., 2009.
2. Peterson Silberschats, Operating System Concepts, Addition Wesley Publication.
3. Achut Godbole, Operating System, TMH.
4. Andrew s. Tenenbaum, A.S. Woodhill, Operating Systems Design & Implementation, Pearson Education.

Kavayitri Bahinabai Chaudhari
North Maharashtra University, Jalgaon
Faculty of Science and Technology
BACHELOR IN COMPUTER APPLICATION (BCA(II))
BCA 303 Programming in C++
W.E.F. 2023-24
[Total Marks: External 60 + Internal 40 =100Marks]

Semester:	**III**	CIE Marks:	**40**
Course Code:	**BCA 303**	SEE Marks:	**60**
Contact Hours (L:T:P):	**4:0:0**	Exam Hours:	**02**

Course Outcomes: After completing this course, you will be able to:

1) To Understand OOPs Concept
2) To Understand the concept to implements Functions, Pointer Array in C++
3) To Understand to implements Class, Object ,Inheritance and polymorphism
4) To understand the concepts of Exception handling and File management

Unit 1 – Introduction and Basics of OOP's **10 L 15 M**

Introduction to Object Oriented Paradigm, Need Object-Oriented Programming, Characteristics of Object-Oriented Programming. Difference of Structured Vs. OOPs.

Unit 2 –C++ Controls , Pointers & Functions **10 L 15 M**

Input/ Output in C++, Data Types, Operators, Control & Conditional Statements, Pointer variables, Array of pointer ,Pointer arithmetic, Function and its components, Different types of parameter passing mechanisms, Pointer as function argument ,Recursive function, Function overloading, Inline Function.

Unit 3 –Object and Classes **10 L 15 M**

Class declaration in C++, Objects, Constructors and types of constructor (Default constructor, Copy Constructor, Parameterized constructor). Destructor, Difference between classes and structures. Friend class, Friend Function.

Unit-4:Inheritance **10 L 15 M**

Inheritance- definition, Concept, Types of Inheritance, visibility modes- Public, Private, Protected, Virtual Base Class,Benefits of Inheritance.

Unit-5:Operator Overloading **10 L 15 M**

Operator Overloading: Definition, Unary Operator Overloading, Binary Operator overloading, Rules for Operators Overloading. Operators overloading using friend function.

Unit 6 – Virtual Functions, Templates & Exception& File handling **10 L 15 M**

Virtual Function, Pure Virtual Functions, Function Templates Exception handling constructs. Introduction to File System, Basic Read and Write file Functions.
Exam Pattern:

Internal (40 Marks)	**External (60 Marks)**

Reference Books

1. Object Oriented Programming with C++ by E. Balagurusamy,McGraw Hill
2. Mastering C++ by K R Venugopal Tata McGraw-Hill, NewDelhi.
3. Herbert Schild, “Complete Reference of C++”, McGraw Hill
4. The C++ Programming Language –Bjarne Stroustrup
5. Programming with C++ - Ravichandran
6. Programming with C++ - Robert Lafore

Kavayitri Bahinabai Chaudhari
North Maharashtra University, Jalgaon
Faculty of Science and Technology
BACHELOR IN COMPUTER APPLICATION (BCA)
BCA 304(A) - Web Development Technologies - I
W.E.F. 2023-24
[Total Marks: External 60 + Internal 40 =100Marks]

Semester:	**III**	CIE Marks:	**40**
Course Code:	**BCA 304(A)**	SEE Marks:	**60**
Contact Hours (L:T:P):	**4:0:0**	Exam Hours:	**02**

Course Outcomes: After completion of this course students shall be able to –

1) Design Web applications / Website using HTML and PHP.
2) Use PHP script with functions, Arrays, and Strings in web applications.
3) Use Forms and Handle Files using PHP Script.
4) Create web applications using MySQL database.

Unit-1:Introduction **10L 15M**

Introduction to PHP, History, Features & Drawbacks of PHP, Applications of PHP, Web architecture, web Server (xamp Server, apache server, Wamp server)Installation, Starting PHP Script, Hello World using PHP (Printing Single line in PHP), Commenting PHP Code, Running PHP Script.

Unit-2: Language Basics **10L 20M**

Structure and Syntax, Using HTML, Variables, Constants and Operators, Decision Making in PHP, PHP Loops, for-each Constructs, PHP string Manipulations, String functions, Functions in PHP, working with Arrays, Index Vs Associative Array, Sorting Arrays, Taking Advantages of arrays in Application, Different array functions in PHP.

Unit-3: PHP Forms **10L 15M**

<Form> tag and its attributes, Creating forms, PHP Form Validations, Passing Variables between Pages, Using PHP $_GET, $_POST, $_GET Vs $_POST, Exit, Return, Die, Include and Require Statements

Unit-4: Oops in PHP **10L 15M**

Class, Object, Visibility (Public, Private and Protected) Constructor, Destructors, Inheritance, Abstract classes, Final classes, Interface, Exception Handling,

Unit-5: Advanced PHP Concepts **10L 15M**

Advanced PHP: File Upload, Session, Cookies, Emailing in PHP, Study of different PHP Framework(Laravel, CodeIgniter, Symfony, Drupal)

Unit-6: PHP with MySQL **10L 20M**

Introduction to MySQL, installation & configuration with PHP, MySQL Structure and Syntax, interacting with Databases, MySQL Connect, Create, Insert, select, Where, Order by (DESC), Update, Delete.

Exam Pattern:

Internal (40 Marks)	**External (60 Marks)**

Reference Books:

1. Ivan Bayross, Sharanam Shah (2007), PHP for Beginners, THE X Team, SPD, ISBN: 9788184040753.
2. Dave Mercer, Allan Kent, Steven Nowicki, David Mercer, Dan Squier, Wankyu Choi, (2004), Beginning PHP5, Wiley Publishing (Wrox) ISBN: 0764557831.
3. Michael K. Glass, Yann Le Scouarnec, Elizabeth Naramore, Gary Mailer, Jeremy Stolz, Jason Gerner,(2004),Beginning PHP Apache, MySQL Web Development, Wiley Publishing(WROX), ISBN: 9780764557446.
4. 6. Beginning PHP, Apache, MySQL Web Development||, Wiley Publishing(WROX),March 2004, ISBN: 978-0-7645-5744-6

Kavayitri Bahinabai Chaudhari
North Maharashtra University, Jalgaon
Faculty of Science and Technology
BACHELOR OF COMPUTER APPLICATIONS (BCA)
BCA 304(B) Data Analytics-I W.E.F. 2023-24
[Total Marks: External 60 + Internal 40 =100 Marks]

Semester	**III**	CIE Marks :	**40**
Course Code	**BCA 304 (B)**	SEE Marks :	**60**
Contact Hours (L.T.P)	**4:0:0**	Exam Hours :	**02**

Course Outcomes –

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

1. Understanding the Role of data Analyst.
2. Understanding the basic concept of data management and data mining techniques.
3. To understand the basic concept of machine learning
4. To understand the application of business analysis.
5. Understanding the basic concept of Advanced Excel.

Unit - 1 : Introduction **10 L 15 M**

Introduction to data analytics, Historical Overview of data analytics, Types of Data Analytics, Data Scientist vs. Data Engineer vs. Business Analyst, Career in data Analytics, What is data science, Why Data Science, Applications for data science, Data Scientists Roles and Responsibility, Top Data Analytics Technology-Python, Advanced Excel, R Programming, SQL, Machine Learning.

Unit - 2 : Data **10 L 15 M**

Data Collection, Data Management, Big Data Management, Organization/sources of data, Importance of data quality, Dealing with missing or incomplete data, Data Visualization, Data Classification Data Science Project Life Cycle: Business Requirement, Data Acquisition, Data Preparation, Hypothesis and Modeling, Evaluation and Interpretation, Deployment, Operations, Optimization.

Unit - 3 : Introduction to Data Mining **10 L 15 M**

Introduction to Data Mining, The origins of Data Mining, Data Mining Tasks, OLAP and Multidimensional data analysis, Basic concept of Association Analysis and Cluster Analysis.

Unit - 4 : Application of Data Analytics **10 L 15 M**

Retail Analytics, Marketing Analytics, Financial Analytics, Healthcare Analytics, Supply Chain Analytics.

Unit - 5 : Machine learning techniques to Data Analytics **10 L 15 M**

Introduction to AI, AI Evolution, Introduction to Machine Learning: History and Evolution Supervised Learning, Unsupervised Learning, Reinforcement Learning , Decision Tree etc.

Unit - 6 Excel for Data Analytics **10 L 15 M**

Data Validation, Sorting, Filter, Excel Tables, Working of range, Conditional Formatting Excel functions, Charts, highlight top bottom, Using the IF formulas, Using Slicers, Graphs and Sparkline, pivot table and chart, CSV File, Histogram, Data Model in Excel.

Handling Text Data, Splitting, Combining, data imputation on text data ,Working with Dates in Excel, Data Conversion, Handling Missing Values, Data Cleaning ,Working with Tables in excel.

Data Visualization with Excel: Charts, Pie charts, Scatter and bubble charts, Bar Charts, Column Charts, Line Charts, Maps, Creating Dashboard.

Exam Pattern :

Internal (40 Marks)	**External (60 Marks)**

Reference Books -

1. Essentials of Business Analytics: An Introduction to the methodology and its application, Bhimasankaram Pochiraju, Sridhar Seshadri, Springer.
2. Introduction to Machine Learning with Python: A Guide for Data Scientists 1st Edition, by Andreas C. Müller, Sarah Guido, O'Reilly.
3. Introduction to Data Science, Laura Igual SantiSeguí, Springer
4. Introduction to Data Mining, Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Pearson Education India
5. An Introduction to Business Analytics, GerKoole, Lulu.com, 2019

Kavayitri Bahinabai Chaudhari
North Maharashtra University, Jalgaon
Faculty of Science and Technology
BACHELOR OF COMPUTER APPLICATIONS (BCA)
BCA 304(C) Python Programming
W.E.F. 2023-24
[Total Marks: External 60 + Internal 40 =100 Marks]

Semester	**III**	CIE Marks :	**40**
Course Code	**BCA 304 (C)**	SEE Marks :	**60**
Contact Hours (L.T.P)	**4:0:0**	Exam Hours :	**02**

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

1) Explain basic principles of Python programming language
2) Construct and apply various filters for a specific task.
3) Apply the best features of mathematics, engineering and natural sciences to program real life problems.

Unit - 1 :Introduction to Python Programming **10 L 10 M**

Introduction to Python: History of Python, Version of Python, Need, Features of Python, Applications of Python, Installing Python on Linux and Windows, Installing Python IDE,
Basics of Python Programming : Python Identifiers, Variables and Keywords, Putting Comments, Expressions and Statements
Standard Data Types – Basic, None, Boolean, Numbers, Type Conversion Function, Operators in Python, Operator Precedence, Accepting Input and Displaying Output

Unit - 2 :Flow Control Statements , Tuples and Dictionary **10 L 20 M**

Flow Control Statements: Conditional Statements, Looping Statements, break, continue, pass Statements.
Introduction to Tuples: Creating Tuples, Deleting Tuples, Accessing elements in a Tuple, Tuples Operations: Concatenation, Repetition, Membership, and Iteration. Built- in Tuples functions and methods
Introduction to Dictionary: Dictionaries: Concept of key-value pair. Creating, Initializing and Accessing elements in a Dictionary. Traversing, Updating and Deleting elements in a Dictionary Built- in Dictionary functions and methods.

Unit - 3 : Python Strings and Lists **10 L 20 M**

Introduction to String: String Literals, Assign String to a Variable, Multiline Strings, Operations on Strings.
Index Operator: Working with the Characters of a String, String Methods, Length, The Slice Operator, and String Comparison.
Concepts of Python Lists: Creating, Initializing and Accessing elements in lists, Traversing, Updating and deleting elements from Lists.
List Operations: Concatenation, List Indexing, Slices, Built- in List functions and methods

Unit - 4 : Python Functions and Modules	**10 L 15 M**
Introduction to Functions: Defining a Function (def.), Calling a Function, Function Arguments-Required arguments, Keyword arguments, Default arguments, Variable-length arguments, Scope of Variables, Void functions and Function returning values, Recursion, **Advance Function Topics:** Anonymous Function Lambda, Mapping Functions. **Introduction to Modules:** Creating Modules and Packages, Importing Modules, Using the dir.() Function, Built-in Modules	
Unit - 5 : Object Oriented Concepts in Python	**10 L 10 M**
Overview of OOP Terminology, Creating Classes, Creating Objects, Accessing Attributes, Built-In Class Attributes, **Garbage Collection:** Constructor, Overloading Methods, Overriding Methods **Inheritance** - Implementing a subclass	
Unit - 6 : Python Exception Handling and Regular Expression	**10 L 15 M**
Introduction, Handling Exception, try…finally, Raising Exception, List of Standard Exception, Regular Expression	
Exam Pattern :	
Internal (40 Marks)	**External (60 Marks)**
Reference Books -	

1. John V Guttag (2013), Introduction to Computation and Programming Using Python, Prentice Hallof India, 2013, ISBN: 9780262525008
2. Peter C. Norton, Alex Samuel and others, ―Beginning Python‖, Wrox Publication,2005 ISBN 10:0764596543 ISBN 13: 9780764596544
3. R. NageswaraRao(2016), Core Python Programming, Dreamtech Press, 2016, ISBN-13: 9789351199427
4. Wesley J. Chun (2006), Core Python Programming - Second Edition, Prentice Hall, ISBN-13: 978-0132269933, ISBN-10: 0132269937
5. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser(2013), Data Structures and Algorithms in Pyhon", Wiley, 2013, ISBN: 978-1-118-54958-2, ISBN: 978-1-118-29027-9(HardCover)
6. Kenneth A. Lambert (2011), Fundamentals of Python – First Programs, CENGAGEPublication, 2011, ISBN 1111822700, ISBN 9781111822705
7. Luke Sneeringer(2015), Professional Python, Wiley Inc.,2015, ISBN: 1119070856

Kavayitri Bahinabai Chaudhari
North Maharashtra University, Jalgaon
Faculty of Science and Technology
BACHELOR OF COMPUTER APPLICATIONS (BCA)
BCA 305 Lab on Operating System
W.E.F. 2023-24
[Total Marks: External 60 + Internal 40 =100 Marks]

Semester	**III**	CIE Marks :	**40**
Course Code	**BCA 305**	SEE Marks :	**60**
Contact Hours (L.T.P)	**0:0:4**	Exam Hours :	**02**

Course Outcomes –

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

1) Apply Linux operating system commands.
2) Understand different Linux shell scripts and execute various shell programs.

Assignments

1. Demonstration of Linux commands with attributes: - pwd, cd, ls, more, less, echo, clear, kill, ps, man, cal, date, who, who am I, wc, mkdir, rmdir, rm, sort.
2. Write a shell script to display first 20 terms of Fibonacci series.
3. Write a shell script to display current time of system and display the message according to the time.
4. Write a shell script to check the user is login or not and say hello.
5. Write a shell script to calculate factorial of a number.
6. Write a shell script to check number is divisible by 7 or not.
7. Write a shell script to check number is prime or not.
8. Write a shell script to check number is palindrome or not.
9. Write a shell script to check number is Armstrong or not.
10. Write a shell script to create result sheet using redirection and filters. (Using Head, tail, cut, paste)

Kavayitri Bahinabai Chaudhari
North Maharashtra University, Jalgaon
Faculty of Science and Technology
BACHELOR OF COMPUTER APPLICATIONS (BCA)
BCA 306 Lab on C++ Programming
W.E.F. 2023-24
[Total Marks: External 60 + Internal 40 =100 Marks]

Semester	**III**	CIE Marks :	**40**
Course Code	**BCA 306**	SEE Marks :	**60**
Contact Hours (L.T.P)	**0:0:4**	Exam Hours :	**02**

Course Outcomes –

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

1) Solve real time problems and isolate and fix common errors in C++ programs.
2) Understand the object-oriented approach for the program development and make use of the OOP concepts (data abstraction, encapsulation, polymorphism, overloading, and inheritance) of C++ appropriately in problem solving.

Assignments

1. Demonstrate the use of if……else and control structure.(even or odd, sum and average, prime or composite, sum, difference, product and quotient of two integers)
2. Write a program to demonstrate use of Function overloading.
3. Write a program to demonstrate encapsulation using of class.
4. Write a program to demonstrate use constructors and Destructor.
5. Write a program to demonstrate single inheritance.
6. Write a program to demonstrate multiple inheritances.
7. Write a program to demonstrate use of operator overloading using friend function.
8. Write a program to demonstrate use of friend function.
9. Write a program to demonstrate use of Virtual functions.
10. Write a program to demonstrate use of pointer.
    a) Write a program to demonstrate use of pointer to pointer.
    b) Write a program to demonstrate use of pointer to objects.
    c) Write a program to demonstrate use of pointer to function.
11. Write a program to demonstrate use of Exception Handling.

Kavayitri Bahinabai Chaudhari
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Faculty of Science and Technology
BACHELOR OF COMPUTER APPLICATIONS (BCA)
BCA 307(A) – Lab on Web Development Technologies - I
W.E.F. 2023-24
[Total Marks: External 60 + Internal 40 =100 Marks]

Semester	**III**	CIE Marks :	**40**
Course Code	**BCA 307(A)**	SEE Marks :	**60**
Contact Hours (L.T.P)	**0:0:4**	Exam Hours :	**02**

Course Outcomes –

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

1) Design web site / web applications using HTM and PHP script
2) File and directory handling using PHP for web applications.
3) Create web application using MySQL database.

Assignments

1. Demonstration of Installation of Xampp server, MySQL Server and setting path, user and password.
2. Write different PHP script to demonstrate passing variables through a URL.
3. Demonstrate arrays in PHP.
4. Write a PHP script to demonstrate use of user defined Function.
5. Create registration form using different controls (text box, check box, radio button, select, submit button) and display user entered data on new PHP page.
6. Write different PHP script to demonstrate session's variables.
7. Write PHP script to demonstrate Cookies variables.
8. Write a PHP script to Demonstrate Class and object.
9. Write a PHP script to Demonstrate Constructor.
10. Write a PHP script to create a Simple Login Window with database.
11. Write a PHP script to perform insert, update and delete operations in MySQL database.
12. Write a PHP script to read data from database table and display all data in table format on output screen.

Kavayitri Bahinabai Chaudhari
North Maharashtra University, Jalgaon
Faculty of Science and Technology
BACHELOR OF COMPUTER APPLICATIONS (BCA)
BCA 307(B) – Lab on Data Analytics - I
W.E.F. 2023-24
[Total Marks: External 60 + Internal 40 =100 Marks]

Semester	**III**	CIE Marks :	**40**
Course Code	**BCA 307(B)**	SEE Marks :	**60**
Contact Hours (L.T.P)	**0:0:4**	Exam Hours :	**02**

Course Outcomes –

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

1) To develop pivot table and understand the validating & auditing techniques.
2) To understand different formatting techniques in MS Excel.
3) To give an overview of the capabilities of popular statistical software packages.
4) To give hands on experience about the practical approach of Advanced Excel.

Assignments

1. Create an excel Spread Sheet for student list with marks details& calculate total, average, percentage & CGPA using custom formula & conditional, mathematical function.
2. Prepare your class time table using different Text formatting.
3. Create an excel spreadsheet to show summery of class & highlight top 10 of each subject, fail students using conditional formatting.
4. Create a payslip with details of employee salary.
5. Prepare an Excel sheet to calculate students result and grades based on their marks
6. Create spreadsheet for stock market analysis of 10 companies for 5year, and represent this data using various Graphs and Sparkline.
7. Create spreadsheet for area wise salesman report & apply pivot table & prepare pivot table.
8. Create spread sheet for importing data from text file, CSV file, Access file & export excel data into CSV File.
9. Develop an interactive Employee dashboard in MS Excel.
10. Create spread sheet for a personal spending budget.
11. Create spread sheet for histogram in Advanced Excel.
12. Create spread sheet for forecasting model in Advanced Excel.
13. Create spread sheet for data validation on Student Data.

Kavayitri Bahinabai Chaudhari
North Maharashtra University, Jalgaon
Faculty of Science and Technology
BACHELOR OF COMPUTER APPLICATIONS (BCA)
BCA 307(C) – Lab on Python Programming
W.E.F. 2023-24
[Total Marks: External 60 + Internal 40 =100 Marks]

Semester	**III**	CIE Marks :	**40**
Course Code	**BCA 307(C)**	SEE Marks :	**60**
Contact Hours (L.T.P)	**0:0:4**	Exam Hours :	**02**

Course Outcomes –

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

1) To understand basics of python programming.
2) To implement different applications using python.

Assignments

Instruction: At the time of Practical you can have used any Python IDEs and Code Editors (PyCharm, Spyder, Thonny, etc.).

1. Installing python and setting up environment. Simple statements like printing the names ("Hello World"), numbers, mathematical calculations, etc.
2. Write a program to find all prime numbers within a given range.
3. Write a program to print "n" terms of Fibonacci Series using Iteration
4. Write a program to demonstrate the use of slicing in string.
5. Write a Program related to Functions & Modules.
6. Write a program that demonstrate concept of Functional Programming.
7. Write a program to demonstrate the use of list & related functions.
8. Write a program to demonstrate the use of Dictionary & related functions.
9. Write a program to demonstrate the use of Tuple.
10. Write a program to demonstrate Regular Expression in Python.
11. Write a program to demonstrate the working of Class and Objects.
12. Write a program to demonstrate the working of Inheritance
13. Write a program to demonstrate the working of Overloading Methods
14. Write a program to demonstrate Exception Handling Mechanism

Kavayitri Bahinabai Chaudhari
North Maharashtra University, Jalgaon
Faculty of Science and Technology
BACHELOR OF COMPUTER APPLICATIONS (BCA)
BCA 401 Software Engineering W.E.F. 2023-24
[Total Marks: External 60 + Internal 40 =100 Marks]

Semester	**IV**	CIE Marks :	**40**
Course Code	**BCA 401**	SEE Marks :	**60**
Contact Hours (L.T.P)	**4:0:0**	Exam Hours :	**02**

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

1) To design and develop a software in learned language.
2) To prepare software requirement specification.
3) Estimate the size and cost of software product.
4) Get knowledge of different types of software testing

1. System Concept and Information **10 L 15 M**

- Definition and Characteristics of System
- Elements of Systems
- **Types of system** – Conceptual, Physical, Natural, Artificial, Open & Closed, Deterministic etc.

2. System Development Life Cycle **10 L 15 M**

- **Roles of System Analysts**- As an Architect, Change Agent, Investigator & Monitor, Organizer, Motivator etc.
- Introduction of Systems Development Life Cycle (SDLC)
- **SDLC Models :**
  - Waterfall Model,
  - Spiral Model
  - RAD Model,
  - Prototyping Model

3. System Planning **10 L 15 M**

- **Data and fact gathering techniques:** Interviews & Questionnaires, Group discussion, On-site observation, Review of Written Documents.
- **Introduction to Feasibility Study**
- Types of feasibility study - Technical, Economical and Operational
- **Introduction to SRS** (Software Requirement Specifications)
- Need of SRS

4. Systems Design and modelling **10 L 15 M**

- **Computer Aided Software Engineering (CASE)**
  - Systems Flowcharts
  - Data Flow Diagrams
  - Entity Relationship Diagram

- **Tools for Structured Analysis :**
  - Decision Tree
  - Decision Tables
  - Structured English

5. User Interface of System & Software Testing **10 L 15 M**

- User - Interface Design
- Graphical interfaces
- Elements of Good Interface Design
- Introduction to Software Testing
- Introduction to Black-Box and White Box Testing

Designing business application system using DFD, ERD **10 L 15 M**

- Library Management System
- Inventory Management System
- Hospital Management System
- Sales/Purchase System

Exam Pattern :

Internal (40 Marks)	**External (60 Marks)**

Reference Books -

1. Roger S. Pressman, "Software Engineering a Practitioners Approach", ISBN 13: 9780071267823, 7thedition, McGraw Hill International Edition.
2. Fairly, Richard, "Software Engineering Concepts" ISBN 13: 9780074631218, McGraw Hill Education New Delhi-2001.
3. Rajib Mall, "Fundamental of Software Engineering", ISBN- 978-81-203- 3819-7 RD Edition, , PHI Learning Private Limited.

Kavayitri Bahinabai Chaudhari
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Faculty of Science and Technology
BACHELOR OF COMPUTER APPLICATIONS (BCA)
BCA 402 Data Structure
W.E.F. 2023-24
[Total Marks: External 60 + Internal 40 =100 Marks]

Semester	**IV**	CIE Marks :	**40**
Course Code	**BCA 402**	SEE Marks :	**60**
Contact Hours (L.T.P)	**4:0:0**	Exam Hours :	**02**

Course Outcomes –

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

1) To analyse algorithms and algorithm correctness.
2) To summarize searching and sorting techniques.
3) To describe stack, queue and linked list operation.
4) To have knowledge of tree and graphs concepts.

Unit - 1 : Introduction **10 L 15 M**

Meaning of Data, Data item, Elementary and Group Data items, Meaning of Data Structure, Linear and Non, Linear Data Structure, Meaning of Algorithm, Algorithm development.

Unit - 2 :Array **10 L 15 M**

Introduction to Arrays, Definition, One Dimensional Array and Multidimensional Arrays, Representation of linear array in memory, Traversing linear array, Inserting and Deleting, Sorting (Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort), Searching (Linear Search, Binary Search)

Unit - 3 :Stack **10 L 15 M**

Introduction to Stack, Definition, Stack Implementation, Operations of Stack, Applications of Stack , Polish notation, Arithmetic expression, Recursion

Unit - 4 :Queues **10 L 15 M**

Introduction to Queue, Definition, Queue Implementation, Operations of Queue, Circular Queue, De-queue and Priority Queue, Queue Applications

Unit - 5 :Linked List **10 L 15 M**

Introduction, Representation and Operations of Linked Lists- Traversing, Searching, Insert and Delete, Singly Linked List, Doubly Linked List, Circular Linked List, And Circular Doubly Linked List

Unit - 6 : Trees and Graphs **10 L 15 M**

Introduction to Tree, Binary tree, representing binary trees in memory, traversing binary trees, Threaded Binary Tree. Graph: - Types, representation in memory.

Exam Pattern :	
Internal (40 Marks)	**External (60 Marks)**

Reference Books -

1. Horowitz, Sahani, Data Structures:Galgotia publication
2. Aho, Hopcroft, Ulman, Data Structures and Algorithms
3. Schaum's Outline of Data Structures with C++ ISBN-10: 0071353453
4. Data Structure and Algorithms:Concept, Techniques and Application,G.A.V.Pai ISBN 10: 0070667268
5. Data Structure:Balucha ISBN: 978-93-833-0383-0
6. An Introduction to Data Structures with Application, Jean-Paul Tremblay, Paul Sorenson.

Kavayitri Bahinabai Chaudhari
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Faculty of Science and Technology
BACHELOR OF COMPUTER APPLICATIONS (BCA)
BCA 403 Java Programming W.E.F. 2023-24
[Total Marks: External 60 + Internal 40 =100 Marks]

Semester	**IV**	CIE Marks :	**40**
Course Code	**BCA 403**	SEE Marks :	**60**
Contact Hours (L.T.P)	**4:0:0**	Exam Hours :	**02**

Course Outcomes –

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

1) To apply object oriented programming features and concepts for solving given problem.
2) Develop reusable programs using the concepts of inheritance, polymorphism, interfaces and packages.
3) To develop simple interactive applications.

Unit - 1 : Introduction to JAVA **10 L 10 M**

History and Features of Java ,JDK,JRE,JIT,Data Types, Variables,Types of Comments ,Operators ,Control Structures and Loops , Compiling and running Java programs using command line and Editors, command line arguments Accepting Input from Console (Using Buffered Reader, Scanner Classes), Arrays.

Unit - 2 :Objects and Classes **12 L 20 M**

Introduction to classes and Objects, Defining Your Own Classes, Access Specifies, Data members and Methods, Constructors and its types, Overloading, Creating Packages, String functions, Date and Time functions.

Unit - 3 :Inheritance and Interface in JAVA **10 L 15 M**

Inheritance Basics ,Function Overriding and Polymorphism ,Use of super and this keywords ,final keyword with respect to functions and classes ,Interfaces, Abstract class and abstract method, Wrapper class.

Unit - 4 :Exception handling in JAVA **08 L 15 M**

Exception handling fundamentals, Types of Exceptions, Use of try-catch-finally, Creating user defined exceptions.

Unit - 5 : User Interface using AWT and Swing **10 L 15 M**

What is AWT, Swing, difference between AWT and Swing, Layout managers, Event Handling, Event sources, Listeners, Mouse and Keyboard event handling Components – JButton, JLabel, JText, JTextArea, JCheckBox, JRadioButton

Unit - 6 : Streams and Files in JAVA **10 L 15 M**

Using the File Class, Stream classes, Byte Stream Class, Character Stream Class, and Create/Read/Write File.
Exam Pattern :

Internal (40 Marks)	**External (60 Marks)**

Reference Books -

1. Complete reference Java by Herbert Scheldt.
2. Programming with Java, A primer by E. Balagurusamy.
3. Core Java Volume-I-Fundamentals, Cay S. Horstmann, Gary Cornell, Prentice Hall, Sun Microsystems Press.

Kavayitri Bahinabai Chaudhari
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Faculty of Science and Technology
BACHELOR OF COMPUTER APPLICATIONS (BCA)
BCA 404 (A) –Web Development Technologies - II
W.E.F. 2023-24
[Total Marks: External 60 + Internal 40 =100 Marks]

Semester	**IV**	CIE Marks :	**40**
Course Code	**BCA 404(A)**	SEE Marks :	**60**
Contact Hours (L.T.P)	**4:0:0**	Exam Hours :	**02**

Course Outcomes –

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

1) Design Web application / Website using ASP.NET and .NET Framework.
2) Use ASP.NET controls in web applications
3) Create event driven ASP.NET web application.
4) State Management for user and application data.
5) Create web application to manage data from data base using ADO.NET.

Unit - 1 :.NET Framework **10 L 15 M**

Introduction to .NET framework,Origin of .Net Technology, Features of .NET framework: CTS, CLS, CLR, MSIL, IL, JIT.

Unit - 2 :Introduction to C#.Net **10 L 15 M**

Introduction to C #, Advantages & Disadvantages of C#, Programming Structure of C#, Basic Constructs – Variables, Data types, Operators, arrays, functions, Control Statements (if statement, if....else statement, nesting of if....else statement, the else if ladder, switch statement), Looping Construct(while statement, do statement, for statement)

Unit - 3 Introduction to ASP.NET web **10 L 20 M**

History of Asp.Net, Introduction to Asp.Net, Features of Asp.Net, Structure of Asp.Net Page, ASP.NET Web Pages Model (Single Page Model, Two Page Model)

Unit - 4 :ASP.NET Controls **10 L 20 M**

Working with Web Server Controls (Label, Textbox, Button, Checkbox, Radio button, ListBox, Dropdown etc, Navigation controls (Tree view, Menu navigation),ASP.Net Rich Controls(Adrotator, Calender), Validation Controls (Required Field Validator, Range Validator, Compare Validator),

Unit - 5 : ASP.Net Intrinsic Objects and State Management **10 L 20 M**

HTTP Request Object, HTTP Responce Object, HTTP Server, HTTP Application State Object, HTTP SessionState Object, State Management (View State, Session, Application, Cookies) Global Application Class (global.asax),WebConfig File

Unit - 6 : Master Page & ADO .NET **15 L 20 M**

Master pages and content Pages Basic, Architecture of ADO.NET, Create and retrieve data from Database Connections, SqlDataSource Controls, ASP.NET Data-Bound Controls (GridView, Repeater, DataList, Details View, Form View)

Exam Pattern :

Internal (40 Marks)	**External (60 Marks)**

Reference Books -

1. Richard Anderson, Brian Francis, Alex Homer, Rob Howard, David Sussman, Karli Watson (2002), Professional ASP.NET 1.0, Special Edition, Wrox Press Ltd., 2002, ISBN 1- 861007-0-3-5.
2. Chris Hart, John Kauffman, Dave Sussman, and Chris Ullman (2006), Beginning ASP.NET 2.0, Wiley Publishing, Inc., 2006, ISBN-13: 978-0-7645-8850-1, ISBN-10: 0-7645-8850-8.
3. Beginning ASP.NET 4: in C# and VB, ImarSpaanjaars, Wiley Publishing, Inc 2010., ISBN: 978-0-470-50221-1
4. Bill Evjen, Scott Hanselman, Devin Rader (2008), Professional ASP .NET 3.5 in C# and VB, Wiley Publishing Inc., 2008 ISBN: 978-0-470-18757-9. 47
5. Dino Esposito (2008), Programming Microsoft ASP.NET 3.5, Second Edition, Microsoft Press, 2008, ISBN-10: 0735625271, ISBN-13: 978-0735625273

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Faculty of Science and Technology
BACHELOR OF COMPUTER APPLICATIONS (BCA)
BCA 404 (B) Data Analytics-II W.E.F. 2023-24
[Total Marks: External 60 + Internal 40 =100 Marks]

Semester	**IV**	CIE Marks :	**40**
Course Code	**BCA 404(B)**	SEE Marks :	**60**
Contact Hours (L.T.P)	**4:0:0**	Exam Hours :	**02**

Course Outcomes –

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

1) To introduce the software R and how to write elementary programs
2) To demonstrate how statistical models are implemented and applied.
3) To import, manage and structure data files.
4) To write simple program scripts for data analysis produce illustrative data plots and carry out statistical tests.

Unit - 1 : Introduction to R Language **10 L 15 M**

What is R? – Why R? – Advantages of R over Other Programming Languages, SAS versus R - R, S, and S-plus, R Packages, Types of R Packages, Basic Syntax of R, Introduction to functions

Unit - 2 :Working With R **10 L 20 M**

Variables, Data types, Operators: Arithmetic Operators, Relational Operators, Logical Operator, R Decision Making: if statement, if – else statement, if– else if statement, switch statement – R Loops: repeat loop, while loop, for loop – Loop, Control statement: break statement, next statement, Classes, creating and accessing objects.

Unit - 3 :Descriptive statistics in R **10 L 15 M**

Measures of central tendency, Measures of variability, Statistics- Quartiles, Quantiles, Interquartile, Mean, median, and mode, Summary functions, describe functions, and descriptive statistics by group Correlations.

Unit - 4 :Graphics Charts and Plots **10 L 15 M**

Basic plotting – Box plot, Histogram, Pareto charts, Pie graph, Line chart, Scatter plot etc. Manipulating the plotting window.

Unit - 5 : Statistics with R **10 L 20 M**

Random Forest, Decision Tree, Normal and Binomial distributions, Time Series Analysis, Survival Analysis.

Unit - 6 : Data Manipulation & Visualization using R **10 L 15 M**

The dplyr package- select (),filter(),mutate(),group_by(), summarize() functions andarrange() The tidyr package- gather(), spread(), Etract(),Visualization- ggplot2
Exam Pattern :

Internal (40 Marks)	**External (60 Marks)**

Reference Books -

1. Peter Dalgaard. Introductory Statistics with R (Paperback) 1st Edition Springer-Verlag New York, Inc. ISBN 0-387-95475-9
2. W. N. Venables and B. D. Ripley. 2002. Modern Applied Statistics with S. 4th Edition. Springer. ISBN 0-387-95457-0
3. Andreas Krause, Melvin Olson. 2005. The Basics of S-PLUS. 4th edition. Springer-Verlag, New York. ISBN 0-387-26109-5
4. Jose Pinheiro, Douglas Bates. 2000. Mixed-effects models in S and S-PLUS Springer-Verlag, Berlin. ISBN 0-387-98957-9
5. An Introduction to R. Online manual at the R website at http://cran.r-project.org/manuals.html

Kavayitri Bahinabai Chaudhari
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Faculty of Science and Technology
BACHELOR OF COMPUTER APPLICATIONS (BCA)
BCA 404 (C) Artificial Intelligence
W.E.F. 2023-24
[Total Marks: External 60 + Internal 40 =100 Marks]

Semester	**IV**	CIE Marks :	**40**
Course Code	**BCA 404(C)**	SEE Marks :	**60**
Contact Hours (L.T.P)	**4:0:0**	Exam Hours :	**02**

Course Outcomes –

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

1) Gain a historical perspective of AI and its foundations.
2) Study the concepts of Artificial Intelligence.
3) Investigate applications of AI techniques in intelligent agents
4) Learn the methods of solving problems using Artificial Intelligence.
5) Learn various peculiar search strategies for AI.

Unit - 1 : Introduction **10 L 15 M**

What is Artificial Intelligence? The AI Problems, The Underlying Assumption, What is an AI Technique, The Level of the Model, Criteria for Success, Some General References, One Final Word.

Unit - 2 :Problems, Problem Spaces, and Search **10 L 15 M**

Defining the Problem as a State Space Search, Production systems, Problem Characteristics, Production System Characteristics, Uninformed Search techniques - DFS and BFS Issues in the Design of Search Programs, Additional Problems.

UNIT - 3. Heuristic Search Techniques: **[L-10][M-12]**

Generate-and- Test, Hill Climbing, Best-First Search, Problem Reduction

Unit - 4 : Knowledge Representation : **10 L 15 M**

Knowledge Representation Issues, Representations and Mappings, Approaches to knowledge Representation, Issues in Knowledge Representation

Unit - 5 : Representing Knowledge Using Rules **10 L 15 M**

Predicate Logic- Representing Instance and Isa Relationships, Computable Functions and Predicates. Procedural Versus Declarative knowledge, Logic Programming, Forward versus Backward Reasoning

Unit - 6 : Fundamental Use Cases for AI : **10 L 15 M**

AI Use Cases, Digital Personal Assistant and Chatbots, Shipping and Warehouse Management, Human Health, Knowledge Search, Recommender Systems, The Smart Home, Gaming, Movie

Making, Data Cleansing and Transformation	
Exam Pattern :	
Internal (40 Marks)	**External (60 Marks)**
Reference Books -	

1. Elaine Rich, Kevin Knight, “Artificial Intelligence”, 2nd Edition, 1991, ISBN: 9780071008945, Tata McGrawHill.
2. Stuart Jonathan Russell, Peter Norvig, “Artificial Intelligence – A modern approach”, illustrated, 2010, ISBN:9780136042594, Prentice Hall.
3. Deepak Khemani (2013). A First Course in Artificial Intelligence, McGraw Hill Education (India), ISBN 9781259029981

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BACHELOR OF COMPUTER APPLICATIONS (BCA)
BCA 405 Lab on Data Structure
W.E.F. 2023-24
[Total Marks: External 60 + Internal 40 =100 Marks]

Semester	**IV**	CIE Marks :	**40**
Course Code	**BCA 405**	SEE Marks :	**60**
Contact Hours (L.T.P)	**0:0:4**	Exam Hours :	**02**

Course Outcomes –

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

1) Be capable to identity the appropriate data structure for given problem.
2) Have practical knowledge on the applications of data structures
3) Analyse the various sorting and searching algorithms.
4) Apply the different linear data structures like stack, queue and link list to various computing problems.

Assignments

Note: Implement all practical's using 'C++' Language

1. Write a program to implement Bubble sort.
2. Write a program to implement Quick sort
3. Write a program to implement Selection sort.
4. Write a program to implement Insertion sort.
5. Write a program to implement Linear search.
6. Write a program to implement Binary search.
7. Write a program to implement Stack operations: push, pop, display.
8. Write a program to implement Linear Queue operations: Insert, Delete, Display.
9. Write a program to implement singly linked list with operations. i)create ii) insert iii) delete

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BACHELOR OF COMPUTER APPLICATIONS (BCA)
BCA 406 Lab on Java Programming
W.E.F. 2023-24
[Total Marks: External 60 + Internal 40 =100 Marks]

Semester	**IV**	CIE Marks :	**40**
Course Code	**BCA 406**	SEE Marks :	**60**
Contact Hours (L.T.P)	**0:0:4**	Exam Hours :	**02**

Course Outcomes –

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

1) To understand basics of Java Programming.
2) Implement different applications using Java.

Assignments

1. Write a program in Java to print Fibonacci series.
2. Write a program in Java to print Factorial of a number.
3. Write a program in Java to demonstrate command line arguments.
4. Write a program in Java to create student information using array.
5. Write a program in Java to implement user defined package.
6. Write a program in Java to implement default & parameterized constructor.
7. Write a program in Java to demonstrate various operations on string functions.
8. Write a program in Java to demonstrate wrapper classes.
9. Write a program in Java to implement inheritance.
10. Write a program in Java to demonstrate exception handling.
11. Write awt/Swing program in java to create students' registration form
12. Write awt/Swing program in java to demonstrate different events
13. Write a program in Java to demonstrate text stream object that take input from user & write it into text file.

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BACHELOR OF COMPUTER APPLICATIONS (BCA)
BCA 407(A) Lab on Web Development Technology-II
W.E.F. 2023-24
[Total Marks: External 60 + Internal 40 =100 Marks]

Semester	**IV**	CIE Marks :	**40**
Course Code	**BCA 407(A)**	SEE Marks :	**60**
Contact Hours (L.T.P)	**0:0:4**	Exam Hours :	**02**

Course Outcomes –

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

1) Use .NET IDE for ASP.NET web application development and form development using standard .NET Controls.
2) Develop web application handling different events.
3) Use validation controls for validating page data.
4) Create and use master page, apply theme and skin for web pages.
5) Develop web applications using data from database.

Assignments

1. Create an ASP .NET web application demonstrating Code behind and ASP.NET Page events.
2. Create an ASP .NET web application to demonstrate use of Web Server Controls.
3. Create an ASP .NET web application to demonstrate use of Validation Controls.
4. Create an ASP .NET Web application to demonstrate AdRotator Control.
5. Create an ASP .NET web application to demonstrate use of global.asax file.
6. Create a Master Page and ASP.NET Content pages using Master Page.
7. Write an ASP .net program that demonstrates use of Intrinsic Objects.
8. Create an ASP .NET web application to demonstrate use of session and cookies.
9. Create an ASP .NET Web application to retrieve data from database using wizard.
10. Create an ASP .NET application to demonstrate ADO.NET objects (Connection, Command, DataReader, DataSet, DataAdaptor)
11. Create an ASP .NET application to demonstrate Data Bounds Controls.
12. Create an ASP .NET application to demonstrate Navigation Controls.

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BACHELOR OF COMPUTER APPLICATIONS (BCA)
BCA 407(B) Lab on Data Analytics-II
W.E.F. 2023-24
[Total Marks: External 60 + Internal 40 =100 Marks]

Semester	**IV**	CIE Marks :	**40**
Course Code	**BCA 407(B)**	SEE Marks :	**60**
Contact Hours (L.T.P)	**0:0:4**	Exam Hours :	**02**

Course Outcomes –

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

1) To provide basic knowledge of R Syntax.
2) To provide practical experience of Data analysis using R.
3) To provide practical insight of using R to calculate descriptive statistics

Assignments

1. Learn the basics of R Syntax.
2. Write R program to check given number is Armstrong or not.
3. Write R program to print factorial of given number.
4. Write R program to check given number is Palindrome or not.
5. Learn to use R calculate the mean, median, and mode of real-world datasets
6. Learn how to calculate three important descriptive statistics- Quartiles, Quantiles, and Interquartile range that describe the spread of the data.
7. Write R program to demonstrate binomial distribution.
8. Learn how to display histogram in R using any sample data.
9. Learn how to organize and modify data in R using data frames and dplyr
10. Learn how to prepare data for analysis in R using dplyr and tidyr.
11. Learn the basics of how to create visualizations using the popular R package ggplot2
12. Learn how to quantify the spread of the dataset by calculating the variance and standard deviation in R.

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BACHELOR OF COMPUTER APPLICATIONS (BCA)
BCA 407(C) Lab on Artificial Intelligence
W.E.F. 2023-24
[Total Marks: External 60 + Internal 40 =100 Marks]

Semester	**IV**	CIE Marks :	**40**
Course Code	**BCA 407(C)**	SEE Marks :	**60**
Contact Hours (L.T.P)	**0:0:4**	Exam Hours :	**02**

Course Outcomes –

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

1) Implement different applications in Artificial Intelligence.

Assignments

Note: Following practical should be implemented in C++/Python

1. Implementation of uninformed search techniques like,
   i) Breadth first Search
   ii) Depth First Search
2. Implementation of informed (Heuristic) search techniques like
   i) Best first Search
   ii) Branch and Bound Search.
   iii) A* Search
   iv) Hill Climbing search
   v) AO* Search