

MANGALORE UNIVERSITY



State Education Policy – 2024 [SEP-2024]

CURRICULUM STRUCTURE FOR

BACHELOR OF COMPUTER APPLICATIONS BCA-DATA ANALYTICS

Suggested Programme Structure for the Under Graduate Programmes

[BCA, BCA (A.I & M.I), BCA (D.A)]

Semester	Course 1	Course 2	Course 3	Elective / Optional	Course	Language	Compulsory	Total Credit	Total Working hour
I	5 (3T+2P)	5 (3T+2P)	5 T			3+3	2	23	4+4+4+4+5+4+4+2=31
II	5 (3T+2P)	5 (3T+2P)	5T			3+3	2	23	4+4+4+4+5+4+4+2=31
III	5 (3T+2P)	5 (3T+2P)	5T	2		3+3		23	4+4+4+4+5+4+4+2=31
IV	5 (3T+2P)	5 (3T+2P)	5T	2		3+3	2	25	4+4+4+4+5+2+4+4+2=33
V	8[(2x3T)+2P]	8[(2x3T)+2P]	8[(2x3T)+2P]				2	26	3+3+4+3+3+4+3+3+4+2=32
VI	3T	3T	3T	3T	Research Methodology +Project work 12			24	3+3+3+3+24=36
									144

Note:

- Course1 and Course2: I to IV Semester: Theory 3 credit=4 contact hours & Practical 2 credit=4 contact hours
- Course3: I to IV Semester: Theory 5 credit=5 contact hours
- Course1, Course2 and Course3: V and VI Semester: Theory 3 credit=3 contact hours & Practical 2 credit=4 contact hours
- Elective/Optional: 2 credit=2 contact hours
- Languages: 3 credit=4 contact hours
- Compulsory: 2 credit=2 contact hours

CURRICULUM STRUCTURE FOR ITO VI SEMETER BCA-DATA ANALYTICS

Semester I

Sl. No	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week	SE E	IA	Total Marks	Credits
1		LANGUAGE-I	Lang	4	80	20	100	3
2		LANGUAGE-II	Lang	4	80	20	100	3
3	BCA –DA-1.1	Fundamentals of Information Technology	Core	4	80	20	100	3
4	BCA –DA-1.2	Programming in C	Core	4	80	20	100	3
5	BCA –DA-1.3	Computational Mathematics	Core	5	80	20	100	5
6	BCA –DA-1.4	Office Automation Lab	Practical	4	40	10	50	2
7	BCA –DA-1.5	C Programming Lab	Practical	4	40	10	50	2
8		Constitution Values	Compulsory	2	40	10	50	2
Sub – Total				31	520	130	650	23

Semester II

Sl. No	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week	SE E	IA	Total Marks	Credits
1		LANGUAGE-I	Lang	4	80	20	100	3
2		LANGUAGE-II	Lang	4	80	20	100	3
3	BCA –DA-2.1	Data Structure using C	Core	4	80	20	100	3
4	BCA –DA-2.2	Database Management System	Core	4	80	20	100	3
5	BCA –DA-2.3	Computer Organization and Architecture	Core	5	80	20	100	5
6	BCA –DA-2.4	Data Structures Lab	Practical	4	40	10	50	2
7	BCA –DA-2.5	Database Management System Lab	Practical	4	40	10	50	2
8		Constitution Values	Compulsory	2	40	10	50	2
Sub – Total				31	520	130	650	23

Semester III								
Sl. No	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week	SEE	IA	Total Marks	Credits
1		LANGUAGE-I	Lang	4	80	20	100	3
2		LANGUAGE-II	Lang	4	80	20	100	3
3	BCA – DA-3.1	Operating System	Core	4	80	20	100	3
4	BCA – DA-3.2	Object Oriented Programming using Java	Core	4	80	20	100	3
5	BCA – DA-3.3	Computer Networks	Core	5	80	20	100	5
6	BCA – DA-3.4	Operating System Lab	Practical	4	40	10	50	2
7	BCA – DA-3.5	Object Oriented Programming Lab	Practical	4	40	10	50	2
8	BCA – DA-3.6	A) Digital Marketing B) Web Content Management System C) DEVOPS	Elective	2	40	10	50	2
Sub – Total				31	520	130	650	23

Semester IV

Sl. No	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week	SEE	IA	Total Marks	Credits
1		LANGUAGE-I	Lang	4	80	20	100	3
2		LANGUAGE-II	Lang	4	80	20	100	3
3	BCA – DA-4.1	Python Programming	Core	4	80	20	100	3
4	BCA – DA-4.2	Statistical Computing using R	Core	4	80	20	100	3
5	BCA – DA-4.3	Data Warehousing and Data Mining	Core	5	80	20	100	5
6	BCA – DA-4.4	Python Programming Lab	Practical	4	40	10	50	2
7	BCA – DA-4.5	Data Analytics Lab	Practical	4	40	10	50	2
8	BCA – DA-4.6	A) Cloud Computing B) Internet Basics C) Object Oriented Analysis and Design	Elective	2	40	10	50	2
9	BCA – DA-4.7	Data Analytics using Excel	Compulsory	2	40	10	50	2
Sub – Total				33	620	180	800	25

Sl. No	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week	SEE	IA	Total Marks	Credits
1	BCA –DA-5.1	Software Engineering	Core	3	80	20	100	3
2	BCA –DA-5.2	Artificial Intelligence	Core	3	80	20	100	3
3	BCA –DA-5.3	Business Intelligence and Analytics	Core	3	80	20	100	3
4	BCA –DA-5.4	Web Development	Core	3	80	20	100	3
5	BCA –DA-5.5	Machine Learning	Core	3	80	20	100	3
6	BCA –DA-5.6	Design Analysis and Algorithm	Core	3	80	20	100	3
7	BCA –DA-5.7	Artificial Intelligence and Machine Learning-LAB	Practical	4	40	10	50	2
8	BCA –DA-5.8	Web DevelopmentLab	Practical	4	40	10	50	2
9	BCA –DA-5.9	Algorithms Lab	Practical	4	40	10	50	2
10	BCA –DA-5.10	Data Visualization with Power BI and Tableau	Compulsory	2	40	10	50	2
Sub – Total				32	640	160	800	26

Semester VI

Sl No	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week	SEE	IA	Total Marks	Credits
1	BCA-DA-6.1	Natural Language Processing	Core	3	80	20	100	3
2	BCA-DA-6.2	Big Data Analytics	Core	3	80	20	100	3
3	BCA-DA-6.3	Multivariate Data Analysis	Core	3	80	20	100	3
4	BCA-DA-6.4	Principles of Cyber Security	Core	3	80	20	100	3
5	BCA-DA-6.5	Research Methodology Project Work	Project Work	24	300	100	400	12
Sub – Total				36	640	160	800	24

SEMESTER III

Program Name	BCA-DATA ANALYTICS	Semester	III
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Course Title	Operating System (THE ORY)		
Course Code:	BCABDAS301	No. of Credits	03
Contact hours	52 Hours	Duration of SEE/Exam	3 Hours
Formative Assessment Marks	20	Summative Assessment Marks	80

Course Outcomes (COs):

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

- Understand the fundamentals of the operating system.
- Comprehend multithreaded programming, process management, process synchronization, memory management and storage management.
- Compare the performance of Scheduling Algorithms.
- Identify the features of I/O and File handling methods.

Unit	Description	Hours
1	Introduction: Operating System, Simple Batch Systems, Multi programmed Batched Systems, Time Sharing Systems, Real-Time Systems, Multi-processor Systems. System Components, Operating System Services. Process: Process Concept, Process Scheduling, Cooperating Process, Threads (Thread Concept, Single and Multiple Threads, Benefits): CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms.	13
2	Process Synchronization: Introduction Race Condition, Critical Section, Semaphores; Classic Problems of Synchronization-Readers and Writers Problem, Dining Philosophers Problem. Deadlocks: Deadlock Characterization, Methods of Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock	13

3	Memory Management. Logical versus Physical Address Space, Swapping, Contiguous Allocation (Memory Allocation, Fragmentation), Paging (Basic Method), Segmentation (Basic Method). Virtual Memor - Demand Paging, Page Replacement, Page Replacement Algorithms, Thrashing (concept). File System. File Concept, Access Methods	13
	Disk Scheduling (I/O Management): Introduction and Scheduling Algorithm	
4	Linux files system, login and logout. Linux commands: Command format, Directory oriented command, wild card characters, File oriented commands, File Access Permissions, Process oriented commands, Background processing, Communication oriented commands, General purpose commands. Pipe and Filters related commands, Vi editor, Shell programming,	13
Text Books: 1. Abraham Silberschartz and Peter Galvin, Operating System Concepts, 6 th edition, TMH 2. K.L. James, Linux: Learning the Essentials, PHI Learning Private Limited, 2011 3. B Mohammed Ibrahim, Linux: A Practical Approach, FireWall Media, 2009 Reference Books: 1. Andrew S Tanenbaum, Operating System Design and Implementation, PHI 2. Milan Milenkovic, Operating Systems, TMH 3. Cristopher Negus, Dreamtech, RedHat Linux9 Bible,Wiley Publication		

Pedagogy: Lecture/ PPT/ Videos/ Demonstration/ Concept mapping/ Case Studies examples/ Tutorial/ Self Directed Learning /Problem solving etc.

Program Name	BCA-DATA ANALYTICS	Semester	III
Course Title	Object Oriented Progra mming using Java (THEORY)		
Course Code:	BCABDAS302	No. of Credits	03
Contact hours	52 Hours	Duration of SEE/Exam	3 Hours
Formative Assessment Marks	20	Summative Assessment Marks	80

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

Unit	Description	Hours
1	Fundamentals of Object Oriented Programming: Introduction, Object Oriented Paradigm, Basic Concepts of OOP, Benefits and Applications of OOP. Introduction to Java: Java Features, Java Environment, Simple Java Program, Java Program Structure, Java Tokens, Java Statements, Java Virtual Machine. Java Programming Basics: Constants, Variables, Data Types, Declaration of variables, Giving values to the variable, Scope of variables, Symbolic constants, Type casting. Operators and Expressions: Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operator, Increment and Decrement Operators, Conditional Operator, Special Operators, Mathematical functions. Using I/O: Byte streams and character streams, predefined streams, reading console input, reading characters, strings, writing console output. Decision	13
	Making & Branching: Simple if statement, if..else statement, nesting of if..else statement, the else..if ladder, the Switch statement.	

2	Decision making & Looping -The while statement, the do statement, the for statement. Jumps in loops, Labelled loops. Class & Objects - Class Fundamentals, Declaring Objects, Assigning Object Reference Variables, Introducing Methods, Constructors, The 'this' keyword, Overloading Methods, Using Objects as Parameters, Returning Objects, Recursion, Understanding 'static', Introducing 'final', Using Command-Line Arguments, Varargs: Variable-Length Arguments Arrays and Strings: One dimensional arrays, Creating an arrays, Two dimensional arrays, Strings, Vectors, Wrapper classes.	13
3	Inheritance - Inheritance Basics, Using 'super', Creating Multilevel hierarchy, Method Overriding, Using Abstract Classes, Using final with Inheritance. Packages & Interfaces - Packages, Access protection in packages, Importing Packages, Interfaces. Exception Handling - Exception Handling Fundamentals – Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch clauses, Nested try statements, throw, throws, finally, Java's built-in Exceptions	13
4	Multithreaded Programming- Introduction, Creating threads, Extending the thread class, stopping & blocking thread, Life cycle of a thread, Using thread methods, Implementing the runnable interface. Event and GUI programming: The Applet Class, Types of Applets, Applet Basics, Applet Architecture, An Applet Skeleton, Simple Applet Display Methods, Requesting Repaint, The HTML APPLET tag. Event Handling - The delegation event model, Event Classes ActionEvent, KeyEvent & MouseEvent Classes, Event Listener Interfaces –ActionListener, KeyListener & MouseListener interfaces. Using the Delegation Event Model. Window Fundamentals, Working with Frame Windows, Creating a Frame Window in an Applet. Creating a Windowed Program, Displaying information within a window. Introducing swing – two key swing features, components and containers, the swing packages, a simple swing application, event handling. Exploring Swing- JLabel, JTextField, JButton, Checkboxes, JRadioButton, JList, JComboBox. JDBC Objects - The Concept of JDBC, JDBC Driver Types, JDBC Packages, A Brief Overview of the JDBC process, Database Connection, Associating the JDBC/ODBC Bridge with the Database, Statement Objects, Result Set, Metadata, Data types. JDBC & Embedded SQL – Tables, Inserting Data into Tables, Selecting Data from Table, Updating Tables, Deleting Data from a Table.	13
Text Books:		

1. E Balagurusamy, Programming with Java –A Primer, Fourth Edition, Tata McGrawHill Education Private Limited.
2. Herbert Schildt, Java: The Complete Reference, Seventh Edition, McGrawHill Publication.

Reference Books:

1. Herbert Schildt, Java 2-TheCompleteReference,Fifth Edition, McGrawHill publication.
2. CayS. Horstmann, Core Java Volumel–Fundamentals, Prentice Hall.
3. Somashekara, M.T., Guru, D.S., Manjunatha, K.S, Object Oriented Programming with Java, EEE Edition, PHI.

Pedagogy: Lecture/ PPT/ Videos/ Demonstration/ Concept mapping/ Case Studies examples/Problem solving / Self Directed Learning etc.

Program Name	BCA-DATA ANALYTICS	Semester	III
Course Title	Computer Networks (TH EORY)		
Course Code:	BCABDAS303	No. of Credits	05
Contact hours	5 Hours per week	Duration of SEE/Exam	3 Hours
Formative Assessment Marks	20	Summative Assessment Marks	80

Course Outcomes (COs):

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

- Explain the transmission technique of digital data between two or more Computers and a computer network that allows computers to exchange data.
- Apply the basics of data communication and various types of computer networks in real world applications.
- Compare the different layers of protocols.
- Compare the key networking protocols and their hierarchical relationship in the conceptual model like TCP/IP and OSI.

Unit	Description	Hours
1	Introduction: Uses of Computer Networks and its Applications- Business Applications, Home Applications, Mobile Users, Social Issues. Network Hardware-Local Area Networks, Metropolitan Area Networks, Wide Area Networks, Internetworks, Network software Reference Models-The OSI Reference Model, The TCP/IP Reference Model, A Comparison of the OSI and TCP Reference Models.	13
2	The Physical Layer: Transmission Media-Twisted Pair, Coaxial Cable, and Fiber Optics. Wireless Transmission-Radio Transmission, Microwave Transmission, Infrared, Light Transmission. Multiplexing- Frequency division, time division, code division, Switching. The Data Link Layer: Data link layer design issues - Services Provided to the Network Layer, Framing, Error Control, and Flow Control. Error Detection and Correction-Error-Correcting Codes, Error-Detecting codes. Sliding Window Protocols – A One Bit Sliding Window Protocol, A Protocol Using Go back n, A Protocol using Selective Repeat.	13

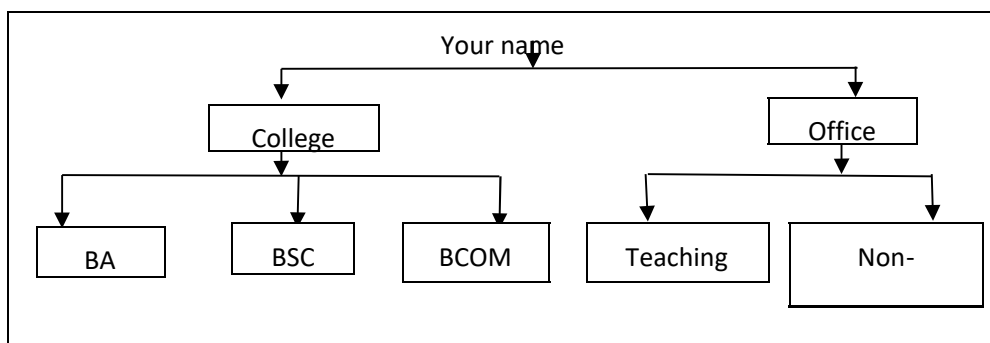
3	The Network Layer: Network layer design issues-Store- and-Forward Packet Switching, Services Provided to the Transport Layer, Implementation of Connectionless Service, Implementation of Connection-Oriented Service, Comparison of Virtual Circuit and Datagram Networks. Routing	13
	Algorithms-Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing, Approaches to Congestion Control, The IP Version4 Protocol, IP Address, IP Version 6,Internet Control Protocol, The Interior Gateway Routing Protocol: OSPF, The Exterior Gateway Routing Protocol: BGP	
4	The Transport Layer: The Transport Service-Services Provided to the Upper Layers. Elements of Transport Protocols-Addressing, Connection Establishment, connection Release. The Internet Transport Protocols-(TCP and UDP)-UDP-Introduction to UDP, Remote Procedure Call, Real-Time Transport Protocols, TCP- Introduction to TCP, The TCP Service Model, The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release. The Application Layer: DNS-Domain Name System-The DNS Name Space, Domain Resource Records, Name Servers. Electronic MailArchitecture and Services, The User Agent, Message Formats, Message Transfer, Final Delivery, The Word Wide Web - Architectural Overview, Static Web Pages, Dynamic Web Pages and Web Applications, HTTP - The Hyper Text Transfer Protocol.	13
Text Book: 1. Computer Networks, Andrew S.Tanenbaum, 5 th Edition , Pearson Education, 2010. Reference Books: 1. Data Communication & Networking, Behrouza A Forouzan, 3 rd Edition, TataMcGrawHill, 2001. 2. Data and Computer Communications, William Stallings 10 th Edition, Pearson Education, 2017. 3. Data Communication and Computer Networks, Brijendra Singh, 3 rd Edition, PHI, 2012. 4. Data Communication & Network, Dr.Prasad, Wiley Dreamtech.		

Pedagogy: Lecture/ PPT/ Videos/ Demonstration/ Case Studies examples/Group Discussion/ Self Directed Learning etc.

Program Name	BCA-DATA ANALYTICS	Semester	III
Course Title	Operating System Lab		
Course Code:	BCABDAPS301	No. of Credits	02
Contact hours	52 Hours	Duration of SEE/Exam	3 Hours
Formative Assessment Marks	10	Summative Assessment Marks	40

PART-A

1. Create the directory structure.



- Put a file under BA, B.Com, Teaching and Non Teaching with meaningful content.
 - Go to BA directory and then move its file to non teaching directory.
 - Change the directory to nonteaching from root directory using only single command.
 - From BA copy the content to B.Com. Delete BA directory recursively
2. Consider the above directory structure.
 - List the files in long format. Starting from root directory including sub directory contents
 - Count how many files exist in office directory.
 - Display the present path.
 - Display current date in the form MM/DD/YY HH:MM:SS
 3. Create a file which contains students information such as Rollno, Name, Gender, class (BCA, Bsc, B.com), Total marks.
 - Append the 2 more records.
 - Display the contents.

- c. Display the records of only BSc course and sort on reverse order of name and store in BSCnew.txt.
 - d. Display the contents of BSCnew.txt
 - e. Rename the student.dat to stud.dat
4. Using the above stud.dat file
- a. Add the following permission
 - i. Execute for user. ii. Remove write permission for group
 - iii. Check the changes in the permission by listing the file.
 - b. Select only the female names and store in female.dat and male names to male.dat
 - c. Combine these names from both the files .Show the new file.
 - d. Change the case of alphabets of the contents in male.dat.
 - e. List all the files that start with "B" in the current directory.
5. Accept 'n' and check whether the number is a prime or not.
6. Accept 'n' and find the sum of the series $1!+3!+5!+.....+n!$.
7. Display all natural numbers between two integers, and also find their sum.

PART-B

1. Write a shell script to accept 'n' integers and count +ves, -ves and zeros separately. Also find the sum of +ves and -ves.
2. Write a shell script to accept many characters and count individual vowels, digits, spaces, special characters and consonants.
3. Write a shell script to accept student name and marks in 3 subjects through command line arguments. Find total marks, average, and grade (depending on average marks).
4. Accept a word and check whether it begins with lowercase vowel or uppercase vowel, ends with a digit or whether it is a three letter word.
5. Write a menu driven shell script for the following.
 - i) Display the current working directory. ii) Rename a file(check for the existence of the source file) iii) List the users logged in.
 - iv) Append the contents of a file to another file(display the message if the file doesn't exist in the directory).
6. Write a menu driven shell script for the following.
 - i) Rename a file (check for the existence of the source file)

- ii) List all file names/ directory names in the present working directory which has the specified pattern
 - iii) List of directory having all the permission iv) List only files names in long format.
7. Write a shell script to accept many filenames through command line. Do the following for each filename
- i) If it is an ordinary file, display its content and also check whether it has execute permission.
 - ii) If it is directory, display the number of files in it.
 - iii) If the file/directory does not exist, display a message

Evaluation Scheme for Lab Examination:

Assessment Criteria		
Program-1	PART-A Writing: 7 Marks Execution: 8 Marks	15 Marks
Program-2	PART-B Writing: 10 Marks Execution: 10 Marks	20 Marks
Practical Record		05 Marks
Total		40 Marks

Program Name	BCA-DATA ANALYTICS	Semester	III
Course Title	Object Oriented Programming Lab		
Course Code:	BCABDAPS302	No.of Credits	02
Contact hours	52 Hours	Duration of SEE/Exam	3 Hours
Formative Assessment Marks	20	Summative Assessment Marks	80

PART-A

1. Program to accept student name and marks in three subjects. Find the total marks, average and grade (depending on the average marks).
2. Program, which reads two numbers having same number of digits. The program outputs the sum of product of corresponding digits. (Hint Input 327 and 539 output $3 \times 5 + 2 \times 3 + 7 \times 9 = 84$)
3. Program to input Start and End limits and print all Fibonacci numbers between the ranges. (Use for loop)
4. Define a class named Pay with data members String name, double salary, double da, double hra, double pf, double grossSal, double netSal and methods: Pay (String n, double s) - Parameterized constructor to initialize the data members, void calculate() - to calculate the following salary components, and void display() - to display the employee name, salary and all salary components.

Dearness Allowance = 15% of salary

House Rent Allowance = 10% of salary

Provident Fund = 12% of salary

Gross Salary = Salary + Dearness Allowance + House Rent Allowance Net

Salary = Gross Salary - Provident Fund

Write a main method to create object of the class and call the methods to compute and display the salary details. [class basics]
5. Program to create a class DISTANCE with the data members feet and inches. Use a constructor to read the data and a member function Sum () to add two distances by using objects as method arguments and show the result. (Input and output of inches should be less than 12).

6. Program to extract portion of character string and print extracted string. Assume that 'n' characters extracted starting from mth character position.
7. Program to add, remove and display elements of a Vector

PART-B

1. Create a class named 'Member' having data members: Name, Age, PhoneNumber, Place and Salary. It also has a method named 'printSalary' which prints the salary of the members. Two classes 'Employee' and 'Manager' inherit the 'Member' class. The 'Employee' and 'Manager' classes have data members 'specialization' and 'department' respectively. Now, assign name, age, phone number, address and salary to an employee and a manager by making an object of both of these classes and print the same. [inheritance]
2. Write a Program to calculate marks of a student using multiple inheritance implemented through interface. Class Student with data members rollNo, name, Stringcls and methods to set and put data. Create another class test extended by class Student with data members mark1, mark2, mark3 and methods to set and put data.
Create interface sports with members sportsWt = 5 and putWt().
Now let the class results extends class test and implements interface sports. Write a Java program to read required data and display details in a neat format.
3. Write a Program to create an abstract class named shape that contains two integers and an empty method named print Area().
Provide three classes named Rectangle, Triangle and Ellipse such that each one of the classes extends the class shape. Each one of the class contains only the method print Area() that print the area of the given shape.[Abstract class]
4. Create a package to convert temperature in centigrade into Fahrenheit, and one more package to calculate the simple Interest. Implement both package in the Main () by accepting the required inputs for each application.
5. Write a Program that implements a multi-threaded program has three threads. First thread generates a random integer every second, and if the value is even, second thread computes the square of the number and prints. If the value is odd the third thread will print the value of cube of the number.[Multithreading]
6. Using the swing components, design the frame for shopping a book that accepts book code, book name, and Price. Calculate the discount on code as follows.

Code	Discount rate
101	15%
102	20%
103	25%
Any other	5%

Find the discount amount and Net bill amount. Display the bill.

7. Write a menu driven JDBC program to perform basic operations with Student Table. Operations to performed are insert student details, delete a specific student details and search for a student's details. [JDBC]

Evaluation Scheme for Lab Examination:

Assessment Criteria		
Program-1	PART-A Writing: 7 Marks Execution: 8 Marks	15 Marks
Program-2	PART-B Writing: 10 Marks Execution: 10 Marks	20 Marks
Practical Record		05 Marks
Total		40 Marks

Program Name	BCA-DATA ANALYTICS	Semester	III
Course Title	Digital Marketing (ELE CTIVE)		
Course Code:	BCABDAES301	No. of Credits	02
Contact hours	26Hours	Duration of SEE/Exam	2 Hours
Formative Assessment Marks	10	Summative Assessment Marks	40

Course Outcomes (COs):

After the successful completion of the course, the student will be able to:

- Understand the fundamental concepts and principles of digital marketing.
- Develop practical skills to implement various digital marketing strategies and techniques
- Analyze and evaluate the effectiveness of digital marketing campaigns.
- Apply critical thinking and problem-solving skills to real-world digital marketing scenarios.
- Create comprehensive digital marketing plans and strategies.

Unit	Description	Hours
1	Introduction to Digital Marketing: Overview of digital marketing, Evolution of digital marketing, Importance and benefits of digital marketing, Digital marketing channels and platforms Digital Marketing Strategy and Planning: Developing a digital marketing strategy, Setting goals and objectives, Budgeting and resource allocation. Campaign planning and execution, Monitoring and adjusting digital marketing campaigns.	8
2	Social Media Marketing: Overview of social media marketing, Social media platforms and their features, Creating and optimizing social media profiles, Social media content strategy, Social media advertising and analytics Email Marketing: Introduction to email marketing, Building an email list, Creating effective email campaigns, Email automation and segmentation, Email marketing metrics and analytics.	8

3	Mobile Marketing: Mobile marketing overview, Mobile advertising strategies, Mobile app marketing, Location-based marketing, Mobile marketing analytics Analytics and Reporting: Importance of analytics in digital marketing, Setting up web analytics tools (e.g., Google Analytics), Tracking and measuring key performance indicators (KPIs), Conversion tracking and optimization, Reporting and data visualization	10
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Text Book:

1. "Digital Marketing Strategy: An Integrated Approach to Online Marketing" by Simon Kingsnorth.

Reference Books:

1. "Email Marketing Rules: How to Wear a White Hat, Shoot Straight, and Win Hearts" by Chad S. White
2. "Content Inc.: How Entrepreneurs Use Content to Build Massive Audiences and Create Radically Successful Businesses" by Joe Pulizzi
3. "Mobile Marketing: How Mobile Technology is Revolutionizing Marketing, Communications and Advertising" by Daniel Rowles
4. "Web Analytics 2.0: The Art of Online Accountability and Science of Customer Centricity" by Avinash Kaushik

Pedagogy: Lecture/ PPT/ Videos/ Animations/ Self Directed Learning etc.

Program Name	BCA-DATA ANALYTICS	Semester	III
Course Title	Web Content Management System (ELECTIVE)		
Course Code:	BCABDAES302	No. of Credits	02
Contact hours	26 Hours	Duration of SEE/Exam	2 Hours
Formative Assessment Marks	10	Summative Assessment Marks	40

Course Outcomes (COs):

After the successful completion of the course, the student will be able to:

- Understand content development basics.
- Gain Knowledge of tools for multimedia content development for audio/ video, graphics, animations, presentations, screen casting.
- Host websites and develop content for social media platforms such as wiki and blog.
- Understand e-publications and virtual reality.
- Use of e-learning platform Moodle and CMS applications Drupal and Joomla

Unit	Description	Hours
1	Web Content Development and Management, Content Types and Formats, Norms and Guidelines of Content Development, Creating Digital Graphics, Audio Production and Editing.	8
2	Web Hosting and Managing Multimedia Content, Creating and Maintaining a Wiki Site. Presentation Software Part, Screen casting Tools and Techniques, Multilingual Content Development.	8
3	Planning and Developing Dynamic Web Content Sites, Website Design Using CSS Creating and Maintaining a WIKI Site, Creating and Managing a Blog Site.Content Management System: Joomla, Content Management System: Drupal	10
Text Books: 1. Web Content Management: Systems, Features, and Best Practices 1st Edition by Deane Barker. 2. Content Management Bible (2nd Edition) 2nd Edition by Bob Boiko. 3. Using Joomla!: Efficiently Build and Manage Custom Websites 2nd Edition by Ron Severdia		

Pedagogy: Lecture/ PPT/ Videos/ Animations/ Group Discussion/ Self Directed Learning etc.

Program Name	BCA-DATA ANALYTICS	Semester	III
Course Title	DEVOPS (ELECTIVE)		
Course Code:	BCABDAPS303	No. of Credits	02
Contact hours	26 Hours	Duration of SEE/Exam	2 Hours
Formative Assessment Marks	10	Summative Assessment Marks	40

Course Outcomes (COs):

After the successful completion of the course, the student will be able to:

- Design and manage a scalable VDI environment, addressing challenges such as boot storms and hardware limitations.
- Apply various DevOps tools to streamline and automate the software development lifecycle, including infrastructure as code and deployment automation. ? Utilize cloud services (IaaS, PaaS, Hybrid Cloud) to enhance DevOps practices, enabling full-stack deployments and efficient resource management.
- Integrate DevOps with ALM processes to improve the development, deployment, and management of mobile and multi-tier applications, scaling Agile methodologies across the enterprise.
- Define the roles of executives and teams in setting DevOps goals, expanding Agile practices, leveraging test automation, and building efficient delivery pipelines.
- Critically analyze and debunk common myths about DevOps, highlighting its applicability across various industries, including ITIL shops, regulated industries, and large, complex systems.

Unit	Description	Hours
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1	Introduction to DevOps: Business needs for DevOps, Business values for DevOps, How DevOps works. DevOps Capabilities: Paths to DevOps Adoption, Plan, Develop/Test, Deploy, Operate Adopting DevOps: Where to Begin, People in DevOps, Process in DevOps, Technology in DevOps	8
2	Using Cloud in DevOps: Cloud as DevOps enabler, Full Stack Deployments, cloud service model for DevOps, Hybrid Cloud Using DevOps to solve Challenges: Mobile applications, ALM processes, Scaling Agile, Multiple Tier Applications, DevOps in the enterprise, Supply	8
	Chains, IOT. DevOps Case Study: Executive's Role, putting together a team, setting DevOps Goals, Learning from the DevOps transformation, looking at the DevOps results. DevOps Myths.	
3	Basics of DevOps tools: Git, Jenkins, Git lab, Docker, Kubernetes, Ansible, Terraform, Grafana, Sonar Qube	10
Text Books: 1. "DevOps For Dummies" by Sanjeev Sharma & Bernie Coyne. 2nd IBM Limited edition. Reference Books: 1. "The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology" by Gene Kim, Jez Humble, Patrick Debois, John Willis 2. "The Phoenix Project: A Novel about IT, DevOps, and Helping Your Business Win" by Kim, Behr, Spafford		

SEMESTER IV

Program Name	BCA-DATA ANALYTICS	Semester	IV
Course Title	Python Programming (T HEORY)		
Course Code:	BCABDAS401	No. of Credits	03
Contact hours	52 Hours	Duration of SEE/Exam	3 Hours
Formative Assessment Marks	20	Summative Assessment Marks	80

Course Outcomes (COs):

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

- Explain the basic concepts of Python Programming.
- Demonstrate proficiency in the handling of loops and creation of functions.
- Identify the methods to create and manipulate tuples and dictionaries.
- Discover the commonly used operations involving file handling.
- Interpret the concepts of Object-Oriented Programming as used in Python.
- Develop the emerging applications of relevant fields using Python.

Unit	Description	Hours
1	Introduction to Features and Applications of Python; Python Versions; Installation of Python; Python Command Line mode and Python IDEs; Simple	

	Python Program. Python Basics: Identifiers; Keywords; Statements and Expressions; Variables; Operators; Precedence and Association; Data Types; Indentation; Comments; Built-in Functions- Console Input and Console Output, Type Conversions; Python Libraries; Importing Libraries with Examples. Python Control Flow: Types of Control Flow; Control Flow Statements- if, else, elif, while loop, break, continue statements, for loop Statement; range () and exit () functions. Exception Handling: Types of Errors; Exceptions; Exception Handling using try, except and finally. Python Functions: Types of Functions; Function Definition- Syntax, Function Calling, Passing Parameters/arguments, the return statement; Default Parameters; Command line Arguments; KeyWord Arguments; Recursive Functions; Scope and Lifetime of Variables in Functions	13
2	Strings: Creating and Storing Strings; Accessing String Characters; the str() function; Operations on Strings- Concatenation, Comparison, Slicing and Joining, Traversing; Format Specifies; Escape Sequences; Raw and Unicode Strings; Python String Methods. Lists: Creating Lists; Operations on Lists; Built-in Functions on Lists; Implementation of Stacks and Queues using Lists; Nested Lists. Dictionaries: Creating Dictionaries; Operations on Dictionaries; Built-in Functions on Dictionaries; Dictionary Methods; Populating and Traversing Dictionaries. Tuples and Sets: Creating Tuples; Operations on Tuples; Built-in Functions on Tuples; Tuple Methods; Creating Sets; Operations on Sets; Built- in Functions on Sets; Set Methods.	13
3	File Handling: File Types; Operations on Files– Create, Open, Read, Write, Close Files; File Names and Paths; Format Operator. Object Oriented Programming: Classes and Objects; Creating Classes and Objects; Constructor Method; Classes with Multiple Objects; Objects as Arguments; Objects as Return Values; Inheritance- Single and Multiple Inheritance, Multilevel and Multipath Inheritance; Encapsulation- Definition, PrivateInstanceVariables;Polymorphism-Definition,OperatorOverloading. GU Interface: The tkinter Module; Window and Widgets; Layout Management- pack, grid and place	13
4	Python SQLite: The SQLite3 module; SQLite Methods- connect, cursor, execute, close; Connect to Database; Create Table; Operations on Tables Insert, Select, Update. Delete and Drop Records.	

	Data Analysis: NumPy- Introduction to NumPy, Array Creation using NumPy, Operations on Arrays; Pandas- Introduction to Pandas, Series and DataFrames, Creating DataFrames from Excel Sheet and .csv file, Dictionary and Tuples. Operations on DataFrames. Data Visualization: Introduction to Data Visualization; Matplotlib Library; Different Types of Charts using Pyplot Linechart, Barchart and Histogram and Piechart. Advanced data visualization with Seaborn.	13
Text Books: 1. Introduction to python programming by Gowrishankar S. and Veena A., CRC Press. 2. Core python programming by Dr. R. Nageswara Rao, Dreamtech. Reference Books: 1. Think Python How to Think Like a Computer Scientist, Allen Downey et al., 2nd Edition, Green Tea Press. 2. Introduction to Python Programming, Gowrishankar S et al., CRC Press, 2019. 3. Python Data Analytics: Data Analysis and Science Using Pandas, matplotlib, and the Python Programming Language, Fabio Nelli, Apress®, 2015 4. Advance Core Python Programming, Meenu Kohli, BPB Publications, 2021. 5. Core PYTHON Applications Programming, Wesley J. Chun, 3rd Edition, Prentice Hall, 2012. 6. Automate the Boring Stuff, Al Sweigart, No Starch Press, Inc, 2015. 7. Data Structures and Program Design Using Python, D Malhotra et al., Mercury Learning and Information LLC, 2021.		

Program Name	BCA-DATA ANALYTICS	Semester	IV
Course Title	Statistical Computing using R (THEORY)		
Course Code:	BCABDAS402	No. of Credits	03
Contact hours	52 Hours	Duration of SEE/Exam	3 Hours
Formative Assessment Marks	20	Summative Assessment Marks	80

Course Outcomes (COs):

After the successful completion of the course, the student will be able to:

- Explore fundamentals of statistical analysis in R environment.
- Describe key terminologies, concepts and techniques employed in Statistical Analysis.
- Define Calculate, Implement Probability and Probability Distributions to solve a wide variety of problems.
- Conduct and interpret a variety of Hypothesis Tests to aid Decision Making.
- Understand, Analyse, and Interpret Correlation Probability and Regression to analyse the underlying relationships between different variables.

Unit	Description	Hours
1	Introduction of the language, numeric, arithmetic, assignment, and vectors, Matrices and Arrays, Non-numeric Values, Lists and Data Frames, Special Values, Classes, and Coercion, Basic Plotting.	13
2	Reading and writing files, Programming, Calling Functions, Conditions and Loops: stand-alone statement with illustrations in exercise, stacking statements, coding loops, Writing Functions, Exceptions, Timings, and Visibility. Basic Data Visualization.	13
3	Descriptive Statistics: Types of Data, Nominal, Ordinal, Scale and Ratio, Measures of Central Tendency, Mean, Mode and Median, Percentiles, Quartiles, Measures of Variability, Mean Absolute Deviation, Range, Inter-Quartile-Range, Standard Deviation, Z-Scores, Coefficient of Variation, Measure of Shapes, Bar Chart, Pie Chart and Box Plot, Histogram, Frequency Polygon, Stem and Leaf Diagram. Probability, Probability and Sampling Distribution: Methods of assigning probability, Structure of probability, Marginal, union, joint and conditional probabilities. Discrete Probability Distributions: Binomial, Poisson, Continuous Probability Distribution, Normal Distribution, Uniform Distribution, Estimating the population mean using t-distribution.	13

4	Statistical Inference and Hypothesis Testing: Types of Hypothesis, and Sample, Null and Alternate Hypothesis, Level of Significance, Type I and Type II Errors, One Sample t-Test, Paired Sample t-Test, Independent Samples t-Test, One Way Analysis of Variance and Chi Square Test. Correlation and Regression: Analysis of Relationship, Positive and Negative Correlation, Perfect Correlation, Karl Pearson Coefficient of Correlation, Correlation Matrix, Scatter Plots, Simple Regression Analysis.	13
Text Books: 1. Tilman M. Davies, "The book of R: A first course in programming and statistics", San Francisco, 2016. 2. Ken Black, Business Statistics, New Delhi, Wiley, 2013. Reference Books: 1. Vishwas R. Pawgi, "Statistical computing using R software", Nirali Prakashan publisher, e1 edition, 2022.		

Pedagogy: Lecture/ PPT/ Videos/ Animations/ Problem Based Learning/ Group Discussion/ Collaborative Learning/ Self Directed Learning etc.

Program Name	BCA-DATA ANALYTICS	Semester	IV
Course Title	Data Warehousing and Data Mining (THEORY)		
Course Code:	BCABDAS403	No. of Credits	05
Contact hours	5 Hours per week	Duration of SEE/Exam	3 Hours
Formative Assessment Marks	20	Summative Assessment Marks	80

Course Outcomes (COs):

After the successful completion of the course, the student will be able to:

- On Successful completion of subject students will learn.
- Various Data Mining concepts, Association rules and Clustering techniques, Web mining Concepts & Decision tree.
- Ability to select and implement data mining techniques suitable for the applications under consideration.

Unit	Description	Hours
1	Data Warehousing: Introduction, What is Data Warehouse, Definition, Multidimensional Data Model, OLAP operations, Warehouse Schema, Data Warehouse Architecture, Warehouse Server, Meta Data, Data Warehouse backend process. Data Mining: Introduction, What is data mining, Data Mining Definitions, KDD Vs Data Mining, DBMS Vs Data Mining, Other related areas, DM techniques, Other Mining Problems, Issues and Challenges in DM, DM application areas, DM applications.	15
2	Association Rules: Introduction, Association Rule, Methods to discover association rules, a priori algorithm, partition algorithm, pincer-search algorithm(only concept), Decision Trees: Introduction, Decision Tree, Tree Construction Principle, Best Split, Splitting Indices (only definitions of Entropy, Information For A Partition on X, Gain, Gain Ratio) CART, ID3, C4.5. Rough Set Theory :Introduction, Definition, Rough Sets and Fuzzy Sets (concept, definition of rough set member function)	15
3	Other Techniques: Introduction, Neural Network, Learning in NN, Unsupervised Learning, Genetic Algorithm. Clustering Techniques: Introduction, Clustering Paradigms, Partitioning, Algorithms, k-Medoid Algorithms (PAM concept, Partitioning concepts.), CLARA, Hierarchical Clustering, DBSCAN (concept Only), Categorical Clustering Algorithms, STIRR (concept).	15

4	Web Mining: Introduction, Web Mining, Web Content Mining, Web Structure Mining (exclude example), Web Usage Mining, Text Mining, Unstructured Text, Episode Rule Discovery for Texts. Temporal and Spatial Advanced Data Mining: Introduction, Temporal Data Mining, Temporal Association Rules, Sequence Mining, The GSP Algorithm, Episode Discovery, Spatial Mining, Spatial Mining Task	15
Text Books: 1. Arun K. Pujari, Data Mining Techniques, , Universities Press India, 3rd Edition 2016 2. Paul Teetor, R Cookbook: Proven Recipes for Data Analysis, Statistics, and Graphics, O'reilly Cookbooks, 2011 Reference Books: 1. M Ramakrishna Murthy, Introduction to Data Mining and Soft Computing Techniques, Laxmi Publications Pvt Ltd, 2017. 2. Paul Teetor, R Cookbook: Proven Recipes for Data Analysis, Statistics, and Graphics, O'reilly Cookbooks, 2011		

Pedagogy: Lecture/ PPT/ Videos/ Animations/ Group Discussion/ Experiential Learning / Self Directed Learning etc.

Program Name	BCA-DATA ANALYTICS	Semester	IV
Course Title	Python Programming La b		
Course Code:	BCABDAPS404	No. of Credits	02
Contact hours	52 Hours	Duration of SEE/Exam	3 Hours
Formative Assessment Marks	10	Summative Assessment Marks	40

PART-A

- Write a program that generates a list of 20 random numbers between 1 and 100. And perform the following operations:
 - Print the list.
 - Print the average of the elements in the list.
 - Print the largest and smallest values in the list.
 - Print the second largest and second smallest entries in the list
 - Print how many even numbers are in the list
- Program, using user-defined functions to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user.
- Consider a tuple t1= (1,2,5,7,9,2,4,6,8,10). Write a program to perform following operations:
 - Print square of the numbers present in the tuple
 - Print another tuple whose values are even numbers in the above resultant tuple.
 - Concatenate a tuple t2= (11,13,15) with t1 and display maximum and minimum value from this tuple.
- Write a function that accepts a sentence from the user and perform following operations:
 - To find the frequency of each word in the sentence.
 - Search for a given word in the sentence and find the frequency of each letter in the given word.
- Write a function to test whether two strings are nearly equal. Two strings a and b are nearly equal if one-character change in b results in string a.
- Write a program to create a text file and compute the number of characters, words and lines in a file.
- Write a Pandas program to join the two given data frames along rows. Sample Data frame may contain details of student like roll no, name, Total Marks.

PART-B

- Program to create a class employee with Empno, Name, DeptName, Designation, Age and salary and perform the following operations.

- i) Accept details of N employees.
 - ii) Display a list of employees belongs to specific department.
 - iii) Display employee details in neat format.
2. Write a menu driven program to create a Bank Account class. class should support the following methods for
 1. Deposit
 2. Withdraw 3.
 - Get
 - Balanace .

Create a subclass Savings Account that behaves just like a BankAccount, but also has an interest rate and a method that increases the balance by the appropriate amount of interest.
3. Create a GUI program to input an integer and perform binary, octal, and hexadecimal conversion of the given number without using built-in function. When the 'Submit' button is pressed, the binary, octal, and hexadecimal values should be displayed in three different textboxes. When the 'Clear' button is pressed, all contents should be cleared.
- Proper validation should be applied if the input is not an integer.
4. Write a GUI program to implement Simple Calculator.
5. Create a table Book (BookId, name, Author, edition, price) using MySQL and perform the followings
 - a. To accept the details of Books and store it in database.
 - b. To display the details of all the Book whose title starts with the letter 'A'.
 - c. Delete particular record from the table where book price <1000.

(Proper validation should be applied)
6. Create a table employee (empno, name and salary) using MySQL and perform the followings
 - a. To accept the details of employees and store it in database.
 - b. To display the details of a specific employee
 - c. To display employee details whose salary lies within a certain range (Proper validation should be applied)
7. Create a GUI program to read student information for 5 students which includes Roll No, Name, Class, and Marks in three subjects. Calculate the total marks, average, and grade. Determine the grade for Distinction, first class, second class, Pass, and Fail, and store the records in either a CSV or Excel file. Use matplotlib or seaborn to draw a Bar Chart showing the RollNo versus the Average score.

Evaluation Scheme for Lab Examination:

Assessment Criteria		
Program-1	PART-A Writing:7 Marks Execution: 8Marks	15 Marks
Program-2	PART-B Writing:10 Marks Execution:10 Marks	20 Marks
Practical Record		05 Marks
Total		40Marks

Program Name	BCA-DATA ANALYTICS	Semester	IV
Course Title	Data Analytics Lab		
Course Code:	BCABDAPS405	No. of Credits	02
Contact hours	52 Hours	Duration of SEE/Exam	3 Hours
Formative Assessment Marks	10	Summative Assessment Marks	40

PART-A

- Write a program to create a 3 X 3 matrices A and B and perform the following operations
 - $A^T \cdot B$
 - $B^T \cdot (A \cdot A^T)$
 - $(A \cdot A^T) \cdot B^T$
 - $[(B \cdot B^T) + (A \cdot A^T) - 100I_3]^{-1}$
- Write R script to generate prime numbers between two numbers using loops
- Write an R program to create a list containing strings, numbers, vectors and logical values and do the following manipulations over the list
 - Access the first element in the list
 - Give the names to the elements in the list
 - Add element at some positions in the list
 - Remove the element
 - print the first and third element
 - Update the third element
- The following table shows the time taken (in minutes) by 100 students to travel to school on a particular day.

Time	0-5	5-10	10-15	15-20	20-25
No. of students	5	25	40	17	13

- Draw the histogram
 - Draw frequency polygon
- Write an R program to create a Data Frame with following details and do the following operations.

ItemCode	ItemCategory	ItemPrice
1001	Electronics	700
1002	Desktop Supplies	300
1003	Office Supplies	350
1004	USB	400
1005	CD Drive	800

- Subset the Data frame and display the details of only those items whose price is greater than or equal to 350.
 - Subset the Data frame and display only the items where the category is either "Office Supplies" or "Desktop Supplies"
 - Subset the Data frame and display the items where the Itemprice between 300 and 700
 - Compute the sum of all Item Price
 - Create another Data Frame called "item-details" with three different fields item Code, Item Qty on Hand and Item Reorder Lvl and merge the two frames.
- Create a factor marital_status with levels Married, single, divorced. Perform the following operations on this factor
 - Check the variable is a factor
 - Access the 2nd and 4th element in the factor
 - Remove third element from the factor
 - Modify the second element of the factor
 - Add new level widowed to the factor and add the same level to the factor marital_status
 - Write a R language Script for following operation on Iris Data Set
 - Load the Iris Dataset
 - View first six rows of iris dataset
 - Summarize iris dataset
 - Display number of rows and columns
 - Display column names of dataset.
 - Create histogram of values for sepal length
 - Create scatter plot of sepal width vs. sepal length
 - Create box plot of sepal width vs. sepal length
 - Find Pearson correlation between Sepal.Length and Petal.Length
 - Create correlation matrix for dataset

PART-B

[Note: Problems are solved using R Script and Manual solution also]

- Write a R program to create a Vector containing following 8 values and perform the following operations.
 4 3 0 5 2 9 4 5
 - Find mean, median, mode.
 - Find the range.
 - Find the 35th and 78th percentile.

- d. Find the standard variance and standard deviation
 - e. Find the inter quartile range.
 - f. Find the z-score for each value.
2. Write R script to find the correlation coefficient and type of correlation between advertisement expenses and sales volume using Karl Pearson's coefficient of correlation method (Direct Method).

Firm	1	2	3	4	5	6	7	8	9	10
Advertisement Exp. (Rs. In Lakhs)	11	13	14	16	16	15	15	14	13	13
Sales Volume (Rs. In Lakhs)	50	50	55	60	65	65	65	60	60	50

3. Write R script to compute the regression equation of y on x from the following data. Predict the value of y when x=7

X	2	4	5	6	8	11
Y	18	12	10	8	7	5

4. The times taken by a large group of students to complete a piece of homework, T minutes, are Normally distributed with a mean of 57 minutes and standard deviation of 6.5. Find the probability that the time taken by a random student from the group to complete this homework will be less than 60 minutes.

Write R script to Find the probability that the time taken by a random student from the group to complete this homework

- a. Will be less than 60 minutes
 - b. Between 50 and 80 minutes
5. Write R script to perform the following using binomial distribution
- i. If $n=4$ and $p=0.10$, find $P(x=3)$ ii. If $n=12$ and $p=0.45$, find $P(5 \leq x \leq 7)$
6. Perform the following using uniform distribution between 200 and 240
- i. $P(x > 230)$ ii. $P(205 \leq x \leq 220)$
7. Following are the scores of max vertical jumps before and after the training program. Test whether the training program is helpful to the students (Use Paired t-test). Use $\alpha=0.01$. Write R script for the above problem.

Player	Max Vertical Jump Before Training Program	Max Vertical Jump After Training Program
Player 1	22	24
Player 2	20	22
Player 3	19	19
Player 4	24	22
Player 5	25	28
Player 6	25	26
Player 7	28	28
Player 8	22	24
Player 9	30	30
Player 10	27	29
Player 11	24	25
Player 12	18	20
Player 13	16	17
Player 14	19	18
Player 15	19	18
Player 16	28	28
Player 17	24	26
Player 18	25	27
Player 19	25	27
Player 20	23	24

Evaluation Scheme for Lab Examination:

Assessment Criteria		
Program-1	PART-A Writing:7 Marks Execution: 8Marks	15 Marks
Program-2	PART-B Writing:10 Marks Execution:10 Marks	20 Marks
Practical Record		05 Marks
Total		40Marks

Program Name	BCA-DATA ANALYTICS	Semester	IV
Course Title	Cloud Computing (ELE CTIVE)		
Course Code:	BCABDAES401	No. of Credits	02
Contact hours	26 Hours	Duration of SEE/Exam	2 Hours
Formative Assessment Marks	10	Summative Assessment Marks	40

Course Outcomes (COs):

After the successful completion of the course, the student will be able to:

- Explain the core concepts of the cloud computing paradigm such as how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.
- Apply the fundamental concepts in data centres to understand the trade-offs in power, efficiency and cost.
- Identify resource management fundamentals like resource abstraction, sharing and sandboxing and outline their role in managing infrastructure in cloud computing. ? Analyze various cloud programming models and apply them to solve problems on the cloud.

Unit	Description	Hours
1	Introduction: Different Computing Paradigms- Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing etc., Comparison of various Computing Technologies; Cloud Computing Basics- What is Cloud Computing? History, Characteristic Features, Advantages and Disadvantages, and Applications of Cloud Computing; Trends in Cloud Computing; Leading Cloud Platform Service Providers.	8

2	Cloud Architecture: Cloud Service Models- Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS), Comparison of different Service Models; Cloud Deployment Models- Public Cloud; Private Cloud, Hybrid Cloud, Community Cloud; Cloud Computing Architecture- Layered Architecture of Cloud. Virtualization-Definition, Features of Virtualization; Types Of Virtualizations-Hardware Virtualization, Server Virtualization, Application Virtualization, Storage Virtualization, Operating System Virtualization; Pros and Cons of Virtualization, Technology Example-Microsoft Hyper-V	8
3	Cloud Application Programming and the Aneka Platform: Aneka Cloud Application Platform- Framework Overview, Anatomy of the Aneka Container. Cloud Applications: Scientific Applications- Healthcare (ECG Analysis in the Cloud) Biology (Protein Structure Prediction and Gene Expression Data Analysis for Cancer Diagnosis), Geoscience (Satellite Image Processing).	10
Text Books: 1. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi: "Mastering Cloud Computing Foundations and Applications Programming", Elsevier, 2013 Reference Books: 1. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi: "Mastering Cloud Computing- Foundations and Applications Programming", Elsevier, 2013 2. Barrie Sosinsky: "Cloud Computing Bible", Wiley- India, 2010 3. K Chandrashekar: "Essentials of Cloud Computing", CRC Press, 2015 4. Derrick Rountree, Ileana Castrillo: "The Basics of Cloud Computing", Elsevier, 2014		

Pedagogy: Lecture/ PPT/ Videos/ Demonstration/ Case Studies examples/ Problem Based Learning/ Self Directed Learning etc.

Program Name	BCA-DATA ANALYTICS	Semester	IV
Course Title	Internet Basics (ELECT IVE)		
Course Code:	BCABDAES402	No. of Credits	02
Contact hours	26 Hours	Duration of SEE/Exam	2 Hours
Formative Assessment Marks	10	Summative Assessment Marks	40

Course Outcomes (COs):

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

- Understand the fundamentals of HTML5 and its evolution from previous versions.
- Identify the structure and components of an HTML5 document.
- Utilize HTML5 semantic elements to create well-structured web pages.
- Implement multimedia elements such as audio and video using HTML5.
- Demonstrate the use of HTML5 forms and input types for user data collection.
- Apply best practices for web accessibility and SEO in HTML5 documents

Unit	Description	Hours
1	Introduction to Computers and the Internet-Introduction, The Internet in Industry and Research, HTML5, CSS3, Demos, Evolution of the Internet and World Wide Web, Web Basics. Introduction to HTML5: Introduction, Editing HTML5, First HTML5 Example, W3C HTML5 Validation Service, Headings, Linking, Images, Special Characters and Horizontal Rules, Lists, Tables, Forms, Internal Linking, meta Elements. New HTML5 Form input Types, input and data list Elements and auto complete Attribute, Page-Structure Elements.	8
2	Cascading Style Sheets-Introducing CSS, CSS Rules, CSS Properties, Controlling Fonts, Text Formatting, Pseudo-Classes Selectors ,Lengths, Percentages.	8
3	More Cascading Style Sheets: Links, Backgrounds, Lists, Tables, Outlines: focus and active Pseudo-Classes.	10

Text Books:

1. Deitel, Paul_Deitel, Harvey_Deitel, Abbey - Internet and World Wide Web How to Program- Pearson Education (US) (2011)
 2. Jon Duckett - Beginning Web Programming with HTML, XHTML, and CSS (Wrox Beginning Guides) - Wrox (2004)
- Reference Books:
1. The Complete Reference HTML and CSS, 5th Edition, Thomas A Powell, 2017.
 2. Animation in HTML, CSS, and JavaScript, Kirupa Chinnathambi, 1st Edition, Create space Independent Pub, 2013
 3. Web Programming with HTML5, CSS, and JavaScript-John Dean

Pedagogy: Lecture/ PPT/ Videos/ / Case Studies examples/ Tutorial/ Activity/ Problem Based Learning / Self Directed Learning etc.

Program Name	BCA-DATA ANALYTICS	Semester	IV
Course Title	Object Oriented Analysis and Design (ELECT IVE)		
Course Code:	BCABDAES403	No. of Credits	02
Contact hours	26 Hours	Duration of SEE/Exam	2 Hours
Formative Assessment Marks	10	Summative Assessment Marks	40

Course Outcomes (COs):

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

- Explain the principles and requirements of OOA and Design
- Describe the object-oriented approach to system development, modeling objects, relationships and interactions.
- Analyze Objects and Classes of the software system.
- Construct object model using object types, attributes, structures and associations.
- Analyze Functional and Dynamic Modeling

Unit	Description	Hours
1	Introduction Object orientation concept, OO development concept - Modelling concept, OO methodology, three methods, OO Themes - Abstraction, Encapsulation, combining	

	data & behavior, sharing, Emphasis on the essence of an Object, Synergy Modeling as a design Technique Modeling, Abstraction, The three models Class modeling Object and class concepts - Objects, Classes, Class diagram, Values & attributes, Operation and methods, Link and Association Concepts - Link and association, Multiplicity, Association and names, Ordering, Bags & Sequences, Association Class, Qualified Association, Generalization and Inheritance- Definition, Use of generalization, Overriding features Advanced Class Modeling Multiplicity, Association Ends, Aggregation, Aggregation versus Association, Aggregation versus Composition.	8
2	State Modeling Events - Signal event, change event, Time event, States, Transistors and conditions State Diagrams - Sample State Diagram, one shot state Diagrams, Summary of Basic state diagram notations, State Diagram Behavior - Activity Effects, Do Activities, Entry and Exit Activities, Completion Transition, Sending Signals Interaction Modelling:	8
	Use Case Models Actors, Use Cases, Use case Diagram, Guidelines for use case models Sequence Model: Scenarios, Sequence Diagram, Communication Diagram, Activity Model - Activities, Branches, Introduction & termination, Concurrent Activities, Executable Activity diagram, Guidelines for Activity models, Deployment Diagram Advanced Interaction modeling Use Case relationships- Include Relationships, Extend Relationship, Generalization, Combinations of use case relationships, Guidelines for use case relationships Procedural Sequence Models- Sequence Diagrams with Passive Objects, Sequence Diagrams with Transient Objects, Guidelines for Procedural Sequence Models	
3	Class Design Overview of Class Design, Bridging the Gap, Realizing Use Cases, Designing Algorithms - Choosing Algorithms, Choosing Data structures, Defining Internal classes and Operations, Assigning Operations to Classes, Recursing Downward - Functionality Layers, Mechanism Layers, Refactoring, Design Optimization - Adding Redundant associations for Efficient Access, Saving derived values to avoid Re-computation, Rectification of Behavior, Adjustment of Inheritance - Rearranging Classes and Operations, Abstracting out Common Behavior, Using Delegation to share Behavior Case Study – ATM, Library Management System (Class Diagram, Object Diagram, Use case Diagram, Sequence Diagram, State Diagram, Activity Diagram)	10

Text Book:

1. Object Oriented Modeling and Design with UML Michael R. Blaha James R. Rumbaugh, Second Edition, Pearson Reference Books:

1. UML™ 2 Tool Kit – Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado, WILEY Publishing
2. Object Oriented Analysis and Design with Applications Grady Booch Second Edition (Pearson Education)
3. Object Oriented Software Engineering Bernd Brügge and Allen H. Dutoit Pearson Education

Pedagogy: Lecture/ PPT/ Videos/ Animations/ Demonstration/ Concept mapping/ Case Studies examples/ Problem Based Learning etc.,

Program Name	BCA(DATA ANALYTICS)	Semester	IV
Course Title	Data Analytics using Excel(Compulsory) Practical Knowledge /Skill Course		
Course Code:	BCADASS401	No. of Credits	02
Contact hours	02 Hours/Week		
Formative Assessment Marks	10	Summative Assessment Marks	40

Work to be carried out by the students

1. Prepare a worksheet containing a **Student Information** list with the following fields: **Student ID, Student Name, Class, Course, Marks Obtained, Attendance (%)**, **Fees**. While creating and working with the data, apply appropriate **data validation, range names**, and **constant range names** wherever required. **Perform the following operations:**

a) Apply **data validation** while entering data:

- Student ID should allow only whole numbers.
- Class should be selected from a drop-down list (for example: FY, SY, TY).
- Marks Obtained should be between 0 and 100.
- Attendance (%) should be between 0 and 100.
- Fees should allow only positive numbers.

b) Create **Range Names** for:

- Student Name column
- Marks Obtained column
- Fees column

c) Create **Constant Range Names** such as:

- PASS_MARK = 40
- MAX_MARK = 100
- BONUS = 5

d) Use the **range names and constant names in formulas** to:

- Calculate the total Marks Obtained.
- Add BONUS marks to each student's Marks Obtained.
- Check whether each student has reached PASS_MARK.

e) Remove Duplicate Values

2. Prepare a worksheet containing sales data with the columns: *Date, Product Name, Category, Quantity, and Unit Price*. Perform the following tasks:

- a) **Subtotal**
 - i. Sort the data by *Category*. ii. Insert subtotals to calculate the **total Unit Price for each Category**.
 - b) **Advanced Filter**
 - i. Use Advanced Filter to display only the records where Category is "Electronics" and Unit Price is greater than 1000. ii. Copy the filtered result to another location in the worksheet.
 - c) Use VLOOKUP to find the Unit Price of a product when the Product Name is entered in a cell.
 - d) Use HLOOKUP to retrieve the Unit Price for a given Product Name.
3. Prepare a worksheet containing product and order details with the following fields:**Product ID, Product Name, Category, Units in Stock, Units on Order, Discontinued, Ship Via**. Using Microsoft Excel, perform the following operations:
- a) Convert the given list into a **Table** so that drop-down arrows appear in the header row.
 - b) Filter only those records that satisfy all the following conditions:

Category = Dairy Products Discontinued = FALSE
Units in Stock > 0
 - c) Arrange the displayed records in **alphabetical order** based on the **Product Name** column.
4. You are given a worksheet containing an **Orders** table with the following fields:**Order ID, Order Date, Country, Ship Via, Freight**. Using Microsoft Excel, perform the following operations:
- a) Create a summary from the given data to display the **total Freight for each Country**.
 - b) Represent this summary using a **bar chart**.
 - c) Modify the chart by removing the **chart title, legend, and field buttons**, and then resize and position the chart neatly in the space provided.
 - d) Add a **time-based filter** based on the *Order Date* field and change its display to show **Years**. Resize and place it appropriately.
5. Prepare a worksheet and use any FIVE statistical formulae. 6 Prepare a worksheet containing following records:

Order No	Order Date	Order Item	Order Qty	Order Price	Client Code	Delivery Type	Order Status
1011	12/02/2015	LED Monitors	100	750000	1025	Road	Delivered
1012	12/03/2015	CPU	12	500000	1026	SHIP	Not Delivered
1005	15/02/2014	Keyboard	80	48000	1027	Road	Delivered
1010	02/02/2016	LED Monitors	30	64000	1028	Flight	Delivered
1016	19/4/2015	Scanner	40	35000	1029	Road	Delivered
1009	9/05/2018	LED Monitors	25	125000	1030	Flight	Not Delivered
1008	13/8/2017	CPU	25	450000	1031	SHIP	Delivered
1014	1/7/2018	Printer	50	90000	1032	Road	Not Delivered

Execute following Query using Advanced Query

- Display all the Order No. which have not been yet Delivered.
- Display all the Orders of LED Monitor and CPU.

7 Prepare a worksheet containing following records:

Item Code	Item Name	Opening Stock(Qty)	Purchase(Qty)	Sale (Qty)	Closing Stock(Qty)	Remark
101	MONITOR	100	25	35		
102	PRINTER	75	40	15		
103	SCANNER	120	30	20		
104	CPU	50	35	10		
105	KEYBOARD	105	45	55		

Execute following Query

- Calculate the closing stock of each item (Closing Stock = Opening Stock + Purchase – Sales)
- Display all the Items which has closing stock < 100

Scheme of Evaluation

Internal Assessment	10 Marks (C1) Basis for Internal Assessment Continuous Evaluation: 10 Marks
Evaluation of Report	40 Marks (C2) i) Preparation and presentation: 25 Marks ii) Viva-Voce: 10 Marks iii) Record Book: 05 Marks

Pedagogy: Lecture/ PPT/ Videos/ Demonstration/ Concept mapping/ Case Studies examples/ Problem Based Learning/ Game Based Learning/ Group Discussion/ Self Directed Learning etc.

Questions Paper for Pattern Core Subjects

Duration: 3 Hours

Max.Marks: 80

Note: Answer any ten Questions from Part-A. And one full Questions from each unit in Part-B Part-A

1.

$10 \times 2 = 20$ a.

b.

c.

d.

e.

f.

g.

h.

i.

j.

k.

l.

Part-B

UNIT-I, II, III, and IV

Each unit contain main questions and it carry 15 Marks.

Each main questions contain 2 or more sub question.

$4 \times 15 = 60$

UNIT-I

2.

a.

b.

c.

3.

a.

b.

c.

Questions Paper Pattern for Elective and Compulsory Subjects

Duration: 2 Hours

Max. Marks: 40

Note: Answer any 5 Questions from Part-A. And one full Questions from each unit in Part-B Part-A

1. 5

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2

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a
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- b.
- c.
- d.
- e.
- f.
- g.
- h.

Part-B

Answer any six questions out of Nine questions.

6*5=30

2. 3
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4
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5
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6
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7
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8
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9.
10.