File No.MU/REG/ACC(A8)/55/2023-Registrar - Academic Section-MANGALORE UNIVERSITY

ಮಂಗಳೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ
MANGALORE UNIVERSITY

ಕ್ರಮಾಂಕ/ No. : MU/ACC/CR.4/2022-23/A8

ಕುಲಸಚಿವರ ಕಛೇರಿ
ಮಂಗಳಗಂಗೋತ್ರಿ – 574 199
Office of the Registrar
Mangalagangothri – 574 199

ದಿನಾಂಕ/Date: 13/06/2023

NOTIFICATION

Sub: Syllabus of I & II Semester BCA Programme in Data Analytics under NEP 2020
Ref: Decision of the Academic Council meeting held on 22.05.2023

Pursuant to the above, the syllabus of I & II Semester BCA Programme in Data Analytics under NEP 2020 which was approved by the Academic Council in its meeting held on 22.05.2023 is hereby notified for implementation with effect from the academic year 2023-24

Copy of the Syllabus should be downloaded from the Mangalore University website. www.mangaloreuniversity.ac.in

REGISTRAR.

To:

1) The Principals of the colleges concerned .
2) The Registrar (Evaluation), Mangalore University.
3) Prof. B.H Shekar, UG combined BOS in computer Science & Computer Applications , PG Dept. of computer science,Mangalore University.
4) The Assistant Registrar/The Superintendent, Academic Section, O/o the Registrar, Mangalore University.
5) The Director, DUIMS, Mangalore University – with a request to publish in the Website.
6) Guard File

BCA Programme in Data Analytics

Preamble:

In the recent days, we have witnessed the digital technology enabled solutions for many of the products which are useful in our daily life. To provide safe and secure digital solutions, there is an increasing need for intelligent and accurate decision-making systems across industries. This has led to an exponential growth in the adoption of Data analysis technologies, and they are expected to remain relevant in the years to come. As industries open up their shores for algorithms to automate their operations, there is an increasing demand for software engineers, and the creative force behind computer programs increased demand for software developers as skilled with data analysis.

Data Analytics is a specialized field of AI that enables a system to learn from data rather than through explicit programming. This program provides a machine learning-powered content analytics and cognitive search platform that provides students with access to actionable insights from all the data and will help achieve better learning and outcomes.

About the BCA Data Analytics Course

BCA Data Analytics aims to help students equip the knowledge and skills pertaining to a combined study of business with analytics and quantitative systems.

During the course, students are supplemented by analytical modules that help students develop a solid range of abilities in data statistics and analytics.

BCA Data Analytics is designed to prepare business people and directors with an understanding of factual standards which in turn help them to handle the suggestions and confinements of the outcomes presented to them.

Program Outcomes: BCA (3 Years) Degree

1. **Discipline knowledge:** Acquiring knowledge on basics of Computer Science and ability to apply to design principles in the development of solutions for problems of varying complexity
2. **Problem Solving:** Improved reasoning with strong mathematical ability to Identify, formulate and analyse problems related to computer science and exhibiting a sound knowledge on data structures and algorithms.
3. **Design and Development of Solutions:** Ability to design and development of algorithmic solutions to real world problems and acquiring a minimum knowledge on statistics and

optimization problems. Establishing excellent skills in applying various design strategies for solving complex problems.

4. **Programming a computer:** Exhibiting strong skills required to program a computer for various issues and problems of day-to-day applications with thorough knowledge on programming languages of various levels.
5. **Application Systems Knowledge:** Possessing a sound knowledge on computer application software and ability to design and develop app for applicative problems.
6. **Modern Tool Usage:** Identify, select and use a modern scientific and IT tool or technique for modelling, prediction, data analysis and solving problems in the area of Computer Science and making them mobile based application software.
7. **Communication:** Must have a reasonably good communication knowledge both in oral and writing.
8. **Project Management:** Practicing of existing projects and becoming independent to launch own project by identifying a gap in solutions.
9. **Ethics on Profession, Environment and Society:** Exhibiting professional ethics to maintain the integrity in a working environment and also have concern on societal impacts due to computer-based solutions for problems.
10. **Lifelong Learning:** Should become an independent learner. So, learn to learn ability.
11. **Motivation to take up Higher Studies:** Inspiration to continue educations towards advanced studies on Computer Science.

Additional outcomes:

- Utilize concepts of statistics and data analysis along with suitable programming languages to gain insights from vast amounts of data for reliable business intelligence solutions.
- Develop suitable techniques using artificial intelligence algorithms, based on relevant findings within production environments.
- Evaluate appropriate solutions in areas of machine learning, deep learning, and natural language processing to solve real-time problems.

Eligibility

Applicants should have completed Class 12th / Pre-university / HSC / Intermediate from a recognized board with a minimum of 50% aggregate marks.

Note: Relaxation of 5% marks in minimum eligibility criteria shall be given to the candidate who belongs to SC/ ST/ Women category.

Duration: 3-Years (BCA Degree); 4-Years (BCA-Honours Degree)

Semester	Course Code	Title of the Paper	Credits	Languages, Skill Enhancement Course (SEC), and Ability Enhancement Course (AEC)	Credits	Total Credits
I	BCA-DA-C1T	Mathematical Foundations	3	OE1: Open Elective	3	26
	BCA-DA-C2T	Problem Solving Techniques	3	Language- L1	3	
	BCA-DA-C3T	Algorithms and Data Structures	3	Language- L2	3	
	BCA-DA-C4P	C Programming Lab	2	SEC-1: Office Automation Tools/ Environmental Studies	2	
	BCA-DA-C5P	Algorithms and Data Structures Lab	2	Physical Education	1	
				Health and Wellness	1	
II	BCA-DA-C6T	Computer Architecture	3	OE2: Open Elective	3	26
	BCA-DA-C7T	Object Oriented Programming using Java	3	Language- L1	3	
	BCA-DA-C8T	Database Management Systems	3	Language- L2	3	
	BCA-DA-C9P	Java Programming Lab	2	Environmental Studies / SEC-1: Office Automation Tools	2	
	BCA-DA-C10P	DBMS Lab	2	Physical Education	1	
				NCC/NSS/CL/R&R	1	
III	BCA-DA-C11T	Computer Networks	3	OE3: Open Elective/ Constitution of India	3	26
	BCA-DA-C12T	Operating Systems	3	Language- L1	3	
	BCA-DA-C13T	Python Programming	3	Language- L2	3	
	BCA-DA-C14P	Operating Systems Lab	2	SEC-2: Data Analysis Tools/ Financial Education and Investment Awareness	2	
	BCA-DA-C15P	Python Programming Lab	2	Physical Education	1	
				NCC/NSS/CL/R&R	1	
IV	BCA-DA-C16T	Software Engineering	3	Constitution of India/ OE3: Open Elective	3	26
	BCA-DA-C17T	Introduction to Data Science	3	Language- L1	3	
	BCA-DA-C18T	Basics of Artificial Intelligence	3	Language- L2	3	
	BCA-DA-C19P	Artificial Intelligence Lab	2	Financial Education and Investment Awareness/ SEC-2: Data Analysis Tools	2	
	BCA-DA-C20P	Data Science Lab	2	Physical Education	1	
				NCC/NSS/CL/R&R	1	
V	BCA-DA-C21T	Data Analytics with R	3	BCA-V1: Vocational Course: Accounting and Financial Management	3	23
	BCA-DA-C22T	Machine Learning	3	BCA-E1: Elective-1: Web Technologies	3	
	BCA-DA-C23T	Software verification and Validation	3	SEC-III: Cyber Crime and Cyber Law	2	
	BCA-DA-C24P	R programming Lab	2	Physical Education	1	
	BCA-DA-C25P	Machine Learning Lab	2	NCC/NSS/CL/R&R	1	

VI	BCA-DA-C26T	Neural Networks	3	BCA-V2: Vocational Course: Digital Marketing	3	23
	BCA-DA-C27T	Natural Language Processing	3	BCA-E2: Elective-2: Exploratory Data Analysis	3	
	BCA-DA-C28T	.NET Technologies	3	Professional Communication	2	
	BCA-DA-C29P	Neural Networks Lab	2	Physical Education	1	
	BCA-DA-C30P	.NET Technologies Lab	2	NCC/NSS/CL/R&R	1	
VII	BCA-DA-C31T	Data Analytics Tools	3	BCA-V3: Vocational Course: Technical Writing	3	22
	BCA-DA-C32T	Cloud Computing	3	BCA-E3: Elective-3: Basics of E-Commerce	3	
	BCA-DA-C33T	Deep Learning	3	Research Methodology	3	
	BCA-DA-C34P	Internship	2			
	BCA-DA-C35P	Deep Learning Lab	2			
VIII	BCA-DA-C36T	Principles of Cyber Security	3	BCA-V4: Vocational Course: Project Management	3	20
	BCA-DA-C37T	Data Science Industry Use Cases	3	BCA-E4: Elective-4: HCI Technologies/ Block Chain Technologies	3	
	BCA-DA-C38T	Cyber Security Lab	2	Research Project	6	

Exit Options:

I. After II Semester - Exit option with Certificate in Computer Applications (with a minimum of 52 credits)

II. After IV Semester - Exit option with Diploma in Computer Applications (with a minimum of 104 credits)

III. After VI Semester - Exit Option with Bachelor of Computer Applications Degree (with a minimum of 150credits)

IV. After VII Semester - Award of Bachelor of Computer Applications Honours Degree (with a minimum of192 credits)

BCA-DA-C1T: Mathematical Foundations

Total Teaching Hours: 48 No. of Hours / Week: 03

UNIT – I [12 Hours]

Set Theory and Logic: Fundamentals of Set theory, Set Operations and the Laws of Set Theory, Counting and Venn Diagrams, Cartesian Products and Relations, Functions– One-to-One, Onto Functions, Function Composition and Inverse Functions. Mathematical Induction, The well ordering principle, Recursive Definitions, Structural Induction, Recursive algorithms. Fundamentals of Logic, Propositional Logic, Logical Connectives and Truth Tables, Logic Equivalence, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs. Proof Methods and strategy.

UNIT - II [12 Hours]

Counting and Relations: Basics of counting, Pigeonhole Principle, Permutation and Combinations, Binomial coefficients. Recurrence relations, Modelling with recurrence relations with examples of Fibonacci numbers and the tower of Hanoi problem. Divide and Conquer relations with examples (no theorems). Definition and types of relations, Representing relations using matrices and digraphs

UNIT – III [12 Hours]

Probability: The Concept of Probability-Sample Spaces, Probability as Relative Frequency, Axiomatic Definition of Probability, Properties of Probability, Additive Property, Conditional Probability, Multiplicative Law of Probability, Law of Total Probability, Bayes' Formula, Independent Events. Random Variables, Distribution Functions, Discrete Random Variables, Continuous Random Variables, Probability Mass Function and Probability Density Function, Expectation and Variance, Functions of Random Variables, Some important Probability Distributions: Discrete - Bernoulli Trials and Binomial distribution, Geometric distribution and Poisson distribution, Continuous - Uniform distribution, Normal distribution and Exponential distribution.

UNIT - IV [12 Hours]

Graph Theory: Graphs: Introduction, Representing Graphs, Graph Isomorphism, Operations on graphs. Trees: Introduction, Applications of Trees, Tree Traversal, Spanning Trees, Minimum Spanning Trees, Prim' s and Kruskul' s Algorithms. Connectivity, Euler and Hamilton Paths, Planar Graphs. Directed graphs: Fundamentals

of Digraphs, Out-degree, in-degree, connectivity, orientation, Eulerian and Hamilton directed graphs

Text Books:

1. *Ralph P. Grimaldi: Discrete and Combinatorial Mathematics, 5thEdition, Pearson Education, 2004.*
2. *C. L. Liu: Elements of Discrete Mathematics, Tata McGraw-Hill, 2000.*
3. *Sheldon M Ross: Introduction to Probability Models, 12th edition, Academic Press, 2019.*
4. *F. Harary: Graph Theory, Addition Wesley, 1969.*

Reference Books:

1. *Kenneth H Rosen: "Discrete Mathematics and its Applications", McGraw Hill publications, 7th edition, 2007.*
2. *J. P. Tremblay and R.P. Manohar: Discrete Mathematical Structures with applications to Computer Science, Mc Graw Hill Ed. Inc. 1975.*
3. *Sheldon M Ross: Introduction to Probability and Statistics for Engineers and Scientists, 6th edition, Academic Press, 2020.*
4. *Michael Baron: Probability and Statistics for Computer Scientists, 3rd Edition, CRC, 2019*

Web Resources:

1. *https://www.my-mooc.com/en/categorie/mathematics*
2. *http://www.nptelvideos.in/2012/11/discrete-mathematical-structures.html* 3. *https://ocw.mit.edu/courses/mathematics/*

BCA-DA-C2T: Problem Solving Techniques

Total Teaching Hours: 48 No. of Hours / Week: 03

UNIT - I [12 Hours]

Introduction: The Role of Algorithms in Computing, Algorithms as a technology, Analyzing algorithms, Designing algorithms, Growth of Functions, Asymptotic notation, Standard notations and common functions. Fundamental Algorithms: Exchanging the values of two variables, Counting, Summation of a set of numbers, Factorial Computation, Generating of the Fibonacci sequence, Reversing the digits of an integer, Character to number conversion.

UNIT - II [12 Hours]

C Programming: Getting Started, Variables and Arithmetic expressions. Input and Output: Standard input and output, formatted output- printf, variable length argument list, formatted input-scanf. Control Flow: Statements and Blocks, If-else, else-if, switch, loops: while loop, for loop, do while, break and continue, goto and labels. Pointers and Arrays: pointers and address, pointers and function arguments, multidimensional array, initialization of pointer arrays, command line arguments.

UNIT - III [12 Hours]

Factoring Methods: Finding the square root of a number, the smallest Divisor of an integer, the greatestcommon divisor of two integers, computing the prime factors of an integer, generation of pseudo random numbers, raising a number to a large power. Array Techniques: Array order Reversal, Array counting or Histogramming, Finding the maximum number in a set, removal of duplicates from an ordered array, partitioning an array, Finding the kth smallest element, multiplication of two matrices.

UNIT - IV [12 Hours]

Merging: the two-way merge. Sorting: Sorting by selection, sorting by exchange, sorting by insertion, sorting by diminishing increment, sorting by partitioning. Searching: binary search, hash search. Text processing and Pattern searching: text line length adjustment, keyword searching in text, text line editing, linear pattern search

Text Books:

1. R.G.Dromey, "How to Solve it by Computer", Pearson Education India, 2008.
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", 3rd Edition, The MIT Press Cambridge, Massachusetts London, England, 2008
3. Brain M. Kernighan, and Dennis M. Ritchie, "The C Programming

Language", 2nd edition,Princeton Hall Software Series, 2012.

Reference Books:

1. Steven S. Skiena, "The Algorithm Design Module", 2nd Edition, Springer-Verlag LondonLimited, 2008.
2. Donald E. Knuth, The Art of Computer Programming", Volume 1: Fundamental Algorithms,3rd Edition, Addison Wesley Longman, 1997.
3. Donald E. Knuth, The Art of Computer Programming", Volume 2: Semi numerical Algorithms,3rd Edition, Addison Wesley Longman, 1998.
4. Greg Perry and Dean Miller, "C programming Absolute Beginner's Guide", 3rd edition,Pearson Education, Inc, 2014.

Web Resources:

1. http://algorithmsforinterviews.com "Algorithms for Interviews"

BCA-DA-C3T: Algorithms and Data Structures

Total Teaching Hours: 48 No. of Hours / Week: 03

UNIT-I [12 Hours]

Introduction and Overview: Definition, Elementary data organization, Data Structures, Data Structures operations, Abstract data types, algorithms complexity, time-space trade off. Preliminaries: Mathematical notations and functions, Algorithmic notations, control structures, Complexity of algorithms, asymptotic notations for complexity of algorithms. Arrays: Definition, Linear arrays, arrays as ADT, Representation of Linear Arrays in Memory, Traversing Linear arrays, Inserting and deleting, Multi-dimensional arrays, Matrices and Sparse matrices.

UNIT-II [12 Hours]

Linked list: Definition, Representation of Singly Linked List in memory, Traversing a Singly linked list, Searching in a Singly linked list, Memory allocation, Garbage collection, Insertion into a singly linked list, Deletion from a singly linked list; Doubly linked list, Header linked list, Circular linked list. Stacks: Definition, Array representation of stacks, Linked representation of stacks, Stack as ADT, Arithmetic Expressions: Polish Notation, Conversion of infix expression to postfix expression, Evaluation of Post fix expression, Application of Stacks, Recursion, Towers of Hanoi, Implementation of recursive procedures by stack. Queues: Definition, Array representation of queue, Linked list representation of queues. Types of queue: Simple queue, Circular queue, Double-ended queue, Priority queue, Operations on Queues, Applications of queues.

UNIT-III [12 Hours]

Binary Trees: Definitions, Tree Search, Traversal of Binary Tree, Tree Sort, Building a Binary Search Tree, Height Balance: AVL Trees, Contiguous Representation of Binary Trees: Heaps, Lexicographic Search Trees: Tries, External Searching: B-Trees, Applications of Trees. Graphs: Mathematical Back ground, Computer Representation, Graph Traversal, Topological Sorting

UNIT-IV [12 Hours]

Searching: Introduction and Notation, Sequential Search, Binary Search, Comparison of Methods. Sorting: Introduction and Notation, Insertion Sort, Selection Sort, Shell Sort, Divide and Conquer, Merge sort for Linked List, Quick sort for Contiguous List. Hashing: Sparse Tables, Choosing a Hash function, Collision Resolution with Open Addressing, Collision Resolution by Chaining.

Text Books:

1. Seymour Lipschutz, "Data Structures with C", Schaum' s outLines, Tata Mc Graw Hill, 2011.

2. Robert Kruse, C.L.Tondo, Bruce Leung,Shashi Mogalla, "Data Structures and Program Designusing C", Pearson Education, 2009.

Reference Books:

1. Mark Allen Weiss, " Data Structures and Algorithm Analysis in C", Second Edition, PearsonEducation, 2013.
2. Forouzan, "A Structured Programming Approach using C",2nd Edition, CengageLearningIndia,2008.

BCA-DA-C4P: C Programming Lab

Write, and execute C program for the following:

1. to read radius of a circle and to find area and circumference
2. to read three numbers and find the biggest of three
3. to check whether the number is prime or not
4. to read a number, find the sum of the digits, reverse the number and check it for palindrome
5. to read numbers from keyboard continuously till the user presses 999 and to find the sum ofonly positive numbers
6. to read percentage of marks and to display appropriate message (Demonstration of else-ifladder)
7. to find the roots of quadratic equation
8. to read marks scored by n students and find the average of marks (Demonstration of singledimensional array)
9. to remove Duplicate Element in a single dimensional Array
10. to perform addition and subtraction of Matrices
11. to find factorial of a number
12. to generate Fibonacci series
13. to remove Duplicate Element in a single dimensional Array
14. to find the length of a string without using built in function
15. to demonstrate string functions
16. to read, display and add two m x n matrices using functions
17. to read a string and to find the number of alphabets, digits, vowels, consonants, spaces andspecial characters.
18. to Swap Two Numbers using Pointers
19. to demonstrate student structure to read & display records of n students
20. to demonstrate the difference between structure & union.

BCA-DA-C5P: Algorithms and Data Structures Lab

NOTE: For all the programs write the output, flowchart and number of basic operations performed.

1. Given {4,7,3,2,1,7,9,0} find the location of 7 using Linear and Binary search and also display itsfirst occurrence.
2. Given {5,3,1,6,0,2,4} order the numbers in ascending order using Bubble Sort Algorithm
3. Perform the Insertion and Selection Sort on the input {75,8,1,16,48,3,7,0} and display theoutput in descending order.
4. Write a program to insert the elements {61,16,8,27} into singly linked list and delete 8,61,27from the list. Display your list after each insertion and deletion.
5. Write a program to insert the elements {61,16,8,27} into linear queue and delete threeelements from the list. Display your list after each insertion and deletion.
6. Write a program to insert the elements {61,16,8,27} into circular queue and delete 4elements from the list. Display your list after each insertion and deletion.
7. Write a program to insert the elements {61,16,8,27} into ordered singly linked list and delete8,61,27 from the list. Display your list after each insertion and deletion.
8. Write a program to add 6x3+10x2+0x+5 and 4x2+2x+1 using linked list.
9. Write a program to push 5,9,34,17,32 into stack and pop 3 times from the stack, also displaythe popped numbers.
10. Write a recursive program to find GCD of 4,6,8.
11. Write a program to inert the elements {5,7,0,6,3,9} into circular queue and delete 6,9&5 fromit(using linked list implementation)..
12. Write a program to convert an infix expression x^y/(5*z)+2 to its postfix expression
13. Write a program to evaluate a postfix expression 5 3+8 2 - *.
14. Write a program to create a binary tree with the elements {18,15,40,50,30,17,41} after creation insert 45 and 19 into tree and delete 15,17 and 41 from tree. Display the tree oneach insertion and deletion operation
15. Write a program to create binary search tree with the elements {2,5,1,3,9,0,6} and performinorder, preorder and post order traversal.
16. Write a program to Sort the following elements using heap sort {9.16,32,8,4,1,5,8,0}
17. Given S1={ "Flowers" } ; S2={ "are beautiful" }

a. Find the length of S1
b. Concatenate S1 and S2
c. Extract the substring “low” from S1
d. Find “are” in S2 and replace it with “is”

BCA-DA-C6T: Computer Architecture

Total Teaching Hours: 48 No. of Hours / Week: 03

UNIT - I [12 Hours]

Number Systems: Binary, Octal, Hexa decimal numbers, base conversion, addition, subtraction of binary numbers, one's and two's complements, positive and negative numbers, character codes ASCII, EBCDIC. Computer Arithmetic: Addition and Subtraction, Multiplication and Division algorithms, Floating-point Arithmetic Operations, Decimal arithmetic operations. Structure of Computers: Computer types, Functional units, Basic operational concepts, Von-Neumann Architecture, Bus Structures, Software, Performance, Multiprocessors and Multicomputer, Digital Logic Circuits: Logic gates, Boolean algebra, Map simplification, Combinational circuits: Half adder, full adder, flip flops. Sequential circuits: Shift registers, Counters, Integrated Circuits, Mux, Demux, Encoder, Decoder. Data representation: Fixed andFloating point.

UNIT - II [12 Hours]

Basic Computer Organization and Design: Instruction codes, Computer Registers, Computer Instructions and Instruction cycle. Timing and Control, Memory-Reference Instructions, Input-Output and interrupt. Central processing unit: Stack organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Complex Instruction Set Computer (CISC) Reduced Instruction Set Computer (RISC), CISC vs RISC

UNIT - III [12 Hours]

Register Transfer and Micro-operations: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro-Operations, Logic Micro-Operations, Shift Micro-Operations, Arithmetic logic shift unit. Micro-programmed Control: Control Memory, Address Sequencing, Micro- Program example, Design of Control Unit. Input Output: I/O interface, Programmed IO, Memory Mapped IO, Interrupt Driven IO, DMA. Instruction level parallelism: Instruction level parallelism (ILP)- over coming data hazards, limitations of ILP

UNIT - IV [12 Hours]

Memory System: Memory Hierarchy, Semiconductor Memories, RAM(Random Access Memory), Read Only Memory (ROM), Types of ROM, Cache Memory, Performance considerations, Virtual memory, Paging, Secondary Storage, RAID. Multiprocessors And Thread level Parallelism: Characteristics of multiprocessors, Multi-Threaded Architecture, Distributed Memory MIMD Architectures, Interconnection structures,

TEXT BOOKS:

1. Mano M Morris, " Computer System Architecture", 3rd edition Pearson India(2019).
2. William Stallings, "Computer Organization and Architecture designing for performance", 10thedition, Pearson(2016)

REFERENCE BOOKS

1. Subrata Ghoshal, "Computer Architecture And Organization", Pearson India (2011).
2. Andrew S. Tanenbaum "Structured Computer Organization", 5th edition, Pearson EducationInc(2006).
3. Carl Hamacher, Zvonks Vranesic, Safea Zaky, "Computer Architecture And Organization", 5thedition McGraw Hill New Delhi, India (2002).
4. Kai Hwang, "Advanced Computer Architecture - Parallelism, Scalability, Programmability",Tata Mcgraw-Hill (2008).

BCA-DA-C7T: Object Oriented Programming using Java

Total Teaching Hours: 48 No. of Hours / Week: 03

UNIT-I [12 Hours]

Introduction to Java: Basics of Java programming, Data types, Variables, Operators, Control structures including selection, Looping, Java methods, Overloading, Math class, Arrays in java. Objects and Classes: Basics of objects and classes in java, Constructors, Finalizer, Visibility modifiers, Methods and objects, Inbuilt classes like String, Character, String Buffer, File, this reference

UNIT-II [12 Hours]

Inheritance and Polymorphism: Inheritance in java, Super and sub class, Overriding, Object class, Polymorphism, Dynamic binding, Generic programming, Casting objects, Instance of operator, Abstractclass, Interface in java, Package in java, UTIL package.

UNIT-III [12 Hours]

Event and GUI programming: Event handling in java, Event types, Mouse and key events, GUI Basics, Panels, Frames, Layout Managers: Flow Layout, Border Layout, Grid Layout, GUI components like Buttons, Check Boxes, Radio Buttons, Labels, Text Fields, Text Areas, Combo Boxes, Lists, Scroll Bars, Sliders, Windows, Menus, Dialog Box, Applet and its life cycle, Introduction to swing, Exceptional handling mechanism. I/O programming: Text and Binary I/O, Binary I/O classes, Object I/O, Random Access Files.

UNIT-IV [12 Hours]

Multithreading in java: Thread life cycle and methods, Runnable interface, Thread synchronization, Exception handling with try-catch-finally, Collections in java, Introduction to JavaBeans and Network Programming.

Textbooks:

1. E. Balagurusamy, Programming with JAVA, McGraw Hill, New Delhi, 2007

Reference Books:

1. Raj Kumar Buyya, Object Oriented Programming with JAVA, McGraw Hill, 2009
2. Herbert Schildt, Java A Beginner' s Guide – Create, Compile, and Run Java Programs Today,Sixth Edition, Oracle Press, 2014
3. Ken Arnold, James Gosling, "The Java Programming Language, Fourth Edition, Addison Wisely,2005
4. Herbert Schildt, 'The Complete Reference Java, 7th Edition, McGraw Hill, 2007

Web Resources

1. https://docs.oracle.com/javase/tutorial/
2. https://javabeginnerstutorial.com/core-java-tutorial/

BCA-DA-C8T Database Management Systems

Total Teaching Hours: 48 No. of Hours / Week: 03

UNIT - 1 [12 Hours]

Databases and Database Users: Introduction, An example, Characteristics of the Database Approach, Actors on the Scene, Workers behind the Scene, Advantages of Using DBMS Approach, A Brief History of Database Applications, When Not to Use a DBMS. Database System Concepts and Architecture: Data Models, Schemas, and Instances, Three-schema Architecture and Data Independence, Database Languages and Interfaces, The Database System Environment, Centralized and Client-Server Architectures, Classification of Database Management Systems.

UNIT - 2 [12 Hours]

Data Modeling Using Entity-Relationship Model: Using High-Level Conceptual Data Models for Database Design, An Example Database Application, Entity Types, Entity Sets, Attributes and Keys, Relationship Types, Relationship Sets, Roles and Structural Constraints, Weak Entity Types, Refining the ER Design Company Database Diagrams, Naming Conventions and Design. Issues, File organization and storage, secondary storage devices, type of single level ordered index, multi-level indexes, indexes on multiple keys, other types of indexes.

UNIT – 3 [12 Hours]

Relational Model and Relational Algebra: Relational Model Concepts, Relational Model Constraints and Relational Database Schemas, Update Operations, Transactions and Dealing with Constraint Violations, Unary Relational Operations: SELECT and PROJECT, Relational Algebra Operations from SET Theory, Binary Relational Operations: JOIN and DIVISION, Additional Relational Operations, Examples of Queries in Relational Algebra. Relational Database Design: Anomalies in a database, functional dependency, normal forms, lossless join and dependency, BCNF, normalization through synthesis, higher order normal forms. SQL- SQL Data Definition and Data Types, Specifying Constraints in SQL, Schema Change Statements in SQL, Basic Queries in SQL, More Complex SQL Queries, Insert, Delete and Update Statements in SQL, Specifying Constraints as Assertion and Trigger, Views(Virtual Tables) in SQL, Embedded SQL, Dynamic SQL,

UNIT – 4 [12 Hours]

Introduction to transaction processing, transaction and system concepts, desirable properties of transactions, transaction support in SQL. Concurrency control techniques: two-phase locking techniques, concurrency control based on timestamp ordering. Recovery techniques: recovery concepts, recovery in multi-database systems, database

backup and recovery from catastrophic failures.

Text Books:

1. Elmasri and Navathe: Fundamentals of Database Systems, 7th Edition, Addison - Wesley, 2016.
2. Silberschatz, Korth and Sudharshan Data base System Concepts, 7th Edition, Tata McGrawHill, 2019.

References:

1. C.J. Date, A. Kannan, S. Swamynatham: An Introduction to Database Systems, 8th Edition,Pearson education, 2009
2. Database Management Systems: Raghu Ramakrishnan and Johannes Gehrke: , 3rd Edition,McGraw Hill, 2003

BCA-DA-C9P: Java Programming Lab

1. Write a simple java application, to print the message, "Welcome to java"
2. Write a program to display the month of a year. Months of the year should be held in an array.
3. Write a program to demonstrate a division by zero exception
4. Write a program to create a user defined exception say Pay Out of Bounds. .
5. Write a java program to add two integers and two float numbers. When no arguments are supplied, give a default value to calculate the sum. Use function overloading.
6. Write a program to perform mathematical operations. Create a class called AddSub with methods to add and subtract. Create another class called MulDiv that extends from AddSub class to use the member data of the super class. MulDiv should have methods to multiply and divide A main function should access the methods and perform the mathematical operations.
7. Write a program with class variable that is available for all instances of a class. Use static variable declaration. Observe the changes that occur in the object's member variable values.
8. Write a java program to create a student class with following attributes: Enrollment_id: Name, Mark of sub1, Mark of sub2, mark of sub3, Total Marks. Total of the three marks must be calculated only when the student passes in all three subjects. The pass mark for each subject is 50. If a candidate fails in any one of the subjects his total mark must be declared as zero. Using this condition write a constructor for this class. Write separate functions for accepting and displaying student details. In the main method create an array of three student objects and display the details.
9. In a college first year class are having the following attributes Name of the class (BCA, BCom, BSc), Name of the staff No of the students in the class, Array of students in the class
10. Define a class called first year with above attributes and define a suitable constructor. Also write a method called best Student () which process a first-year object and return the student with the highest total mark. In the main method define a first-year object and find the best student of this class
11. Write a Java program to define a class called employee with the name and date of appointment. Create ten employee objects as an array and sort them as per their date of appointment. ie, print them as per their seniority.
12. Create a package 'student.Fulltime.BCA' in your current working directory
    a. Create a default class student in the above package with the following attributes: Name, age, sex. b. Have methods for storing as well as displaying
13. Write a small program to catch Negative Array Size Exception. This exception is caused when the array is initialized to negative values.
14. Write a program to handle Null Pointer Exception and use the "finally" method to

display a message tothe user.

15. Write a program which create and displays a message on the window
16. Write a program to draw several shapes in the created window
17. Write a program to create an applet and draw grid lines
18. Write a program which creates a frame with two buttons father and mother. When we click the father button the name of the father, his age and designation must appear. When we click mother similar details of mother also appear.
19. Create a frame which displays your personal details with respect to a button click
20. Create a simple applet which reveals the personal information of yours.
21. Write a program to move different shapes according to the arrow key pressed.
22. Write a java Program to create a window when we press M or m the window displays Good Morning, Aor a the window displays Good After Noon E or e the window displays Good Evening, N or n the windowdisplays Good Night.
23. Demonstrate the various mouse handling events using suitable example.
24. Write a program to create menu bar and pull-down menus.

BCA-DA-C10P: DBMS Lab

PART – A

1. Draw E-R diagram and convert entities and relationships to relation table for a given scenario. Two assignments shall be carried out i.e. consider two different scenarios (eg. bank, college) Consider theCompany database with following Schema

EMPLOYEE (FNAME, MINIT, LNAME, SSN, BDATE, ADDRESS, SEX, SALARY, SUPERSSN DNO)DEPARTMENT (DNAME, DNUMBER, MGRSSN, MSRSTARTDATE)
DEPT_LOCATIONS (DNUMBER, DLOCATION)
PROJECT (PNAME, PNUMBER, PLOCATION, DNUM)
WORKS_ON (ESSN, PNO<HOURS)
DEPENDENT (ESSN, DEPENDENT_NAME, SEX, BDATE, RELATIONSHIP)

2. Perform the following:
   a. Viewing all databases, creating a Database, Viewing all Tables in a Database, Creating Tables (With and Without Constraints), Inserting/Updating/Deleting Records in a Table, Saving (Commit) and Undoing (rollback)
3. Perform the following:
   a. Altering a Table, Dropping/Truncating/Renaming Tables, Backing up / Restoring a Database.

4. For a given set of relation schemes, create tables and perform the following Simple Queries, Simple Queries with Aggregate functions, Queries with Aggregate functions (group by andhaving clause).
5. Execute the fallowing queries
   a. How the resulting salaries if every employee working on the 'Research' Departments isgiven a 10% raise.
   b. Find the sum of the salaries of all employees of the 'Accounts' department, as well as themaximum salary, the minimum salary, and the average salary in this department
6. Execute the fallowing queries
   a. Retrieve the name of each employee Controlled by Department number 5 (use EXISTSoperator).
   b. Retrieve the name of each dept and number of employees working in each Departmentwhich has at least 2 employees
7. Execute the fallowing queries
   a. For each project, retrieve the project number, the project name, and the number ofemployee who work on that project.(use GROUP BY)
   b. Retrieve the name of employees who born in the year 1990's
8. For each Department that has more than five employees, retrieve the department number andnumber of employees who are making salary more than 40000.

9. For each project on which more than two employees work, retrieve the project number,

projectname and the number of employees who work on that project.

10. For a given set of relation tables perform the following: Creating Views (with and without checkoption), Dropping views, Selecting from a view

PART B

Create the following tables with properly specifying Primary keys, Foreign keys and solve the followingqueries.

BRANCH (Branchid, Branchname, HOD) STUDENT
(USN, Name, Address, Branchid, sem)
BOOK (Bookid, Bookname, Authorid, Publisher, Branchid)
AUTHOR (Authorid, Authorname, Country, age) BORROW
(USN, Bookid, Borrowed_Date)

1. Perform the following:

a. Viewing all databases, Creating a Database, Viewing all Tables in a Database, Creating Tables (With and Without Constraints), Inserting/Updating/Deleting Records in a Table, Saving(Commit) and Undoing (rollback) Execute the following Queries:

2. a. List the details of Students who are all studying in 2nd sem BCA.
b. List the students who are not borrowed any books.

3. a. Display the USN, Student name, Branch_name, Book_name, Author_name, Books_Borrowed_Date of 2nd sem BCA Students who borrowed books.
b. Display the number of books written by each Author.

4. a. Display the student details who borrowed more than two books.
b .Display the student details who borrowed books of more than one Author.

5. a. Display the Book names in descending order of their names.
b. List the details of students who borrowed the books which are all published by the samepublisher.

6. Consider the following schema:
STUDENT (USN, name, date_of_birth, branch, mark1, mark2, mark3, total, GPA)Perform the following:

a. Creating Tables (With and Without Constraints), Inserting/Updating/Deleting Records in aTable, Saving (Commit) and Undoing (rollback)

7. Execute the following queries:

a. Find the GPA score of all the students.

b. Find the students who born on a particular year of birth from the date_of_birth column

8. Execute the following queries:
    a. List the students who are studying in a particular branch of study.
    b. Find the maximum GPA score of the student branch-wise.