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BE BOUNDLESS

# **BENGALURU CITY UNIVERSITY**

**CHOICE BASED CREDIT SYSTEM**

**(Semester Scheme with Multiple Entry and Exit Options for  
Under Graduate Course)**

**Syllabus for BCA Computer Science  
(I & II Semester)**

**2021-22 onwards**

## BANGALORE CITY UNIVERISTY

Proceeding of the meeting of the Board of Studies in Computer Science, held in the Board Room of Canara Bank School of Management Studies, Central College Campus, Bangalore City University, Bangalore on 04-10-2021 at 11.00 am

The Following Members were present:

1. Dr. Susesha, Professor, PG Department of Computer Science, Mysore Univeristy
2. Dr. Chandrakanth Naikodi, Associate Professor, PG Department of Computer Science, Davanagere University
3. Dr. H.K. Gundurao, Associate Professor, Vijaya College, Bangalore
4. Dr. Prathibha V Kalburgi, Ramajiah College of Arts Science, and Commerce, Bangalore
5. Mrs. Amalorpavam, Sambram Academi of Management Studies, Bangalore
6. Dr. Muralidhara B L, Professor, Department of Computer Science, Bangalore University

The Following Member was present online

1. Dr. Guru D.S, Professor, PG Department of Computer Science, Mysore Univeristy

The Following member is diseased

1. Late. Malathi Palani. A

The Following Members did not attend the meeting:

1. Dr. Prabhakar C.J, Professor, Kuvempu University, Shimogga
2. Dr. Bhagyawana S Mudigowda, Associate Professor, Maharani Cluster University
3. Smt. Nagarathamma S.M, Associate Professor, Maharani Cluster Univeristy

The Chairperson welcomed the members and briefed the members on the proposed syllabus. The Committee discussed the syllabus in detail and approved the following syllabus:

1. III and IV semester syllabus for the MCA CBCS Scheme
2. The syllabus for I to IV semesters syllabus for M.Sc (Computer Science) - CBCS Scheme
3. Syllabus Structure for the NEP BCA, and I, and II semester syllabus for the same
4. Syllabus Structure for the NEP B.Sc Computer Science, and I and II semester syllabus for the same
5. Electives for the CBCS BCA Syllabus

The Chairperson thanked all the members for their active participation.

(Dr. Susesha)

(Dr. Chandrakanth Naikodi)

(Dr. H.K. Gundurao)

(Mrs. Prathibha V Kalburgi)

(Mrs. Amalorpavam)

(Dr. Muralidhara B L)

04.10.2021

Chairperson

## MEMBERS OF THE BoS IN COMPUTER SCIENCE

1	Dr. Muralidhara B L Professor Department of Computer Science Bangalore University	CHAIRPERSON
2	Dr. Guru D.S Professor PG Department of Computer Science Mysore Univeristy	Member
3	Dr. Susesha Professor, PG Department of Computer Science Mysore Univeristy	Member
4	Dr. Prabhakar C.J Professor Kuvempu University, Shimogga	Member
5	Dr. Chandrakanth Naikodi Associate Professor Department of Computer Science Davanagere University	Member
6	Dr. Prathibha V Kalburgi Ramaiah College of Arts Science, and Commerce Bangalore	Member
7	Mrs. Amalorpavam Sambram Academi of Management Studies Bangalore	Member
8	Dr. H.K. Gundurao Associate Professor Vijaya College, Bangalore	Member
9	Dr. Bhagyawana S Mudigowda Associate Professor Maharani Cluster University, Bangalore	Member
10	Smt. Nagarathnamma S.M Associate Professor Maharani Cluster Univeristy, Bangalore	Member

**BANGALORE CITY UNIVERSITY**  
**BCA SYLLABUS (NEP)**  
**[Based on I-C. Model of Karnataka State Higher Education Council]**

Semester	Course Code	Title of the Paper	Credits	Languages, Skill Enhancement (SEC), and Ability Enhancement Courses (AECC)	Credits	Total Credits
I	CA-C1T	Discrete Structure	3	OE1: Open Elective	3	26
	CA-C2T	Problem solving Techniques	3	Language L1	3	
	CA-C3T	Data Structure	3	Language L2	3	
	CA-C4L	Problem solving Lab	2	SEC I : Office Management Tools	2	
	CA-C5L	Data Structure Lab	2	Physical Education	1	
				Health & Willingness	1	
II	CA-C6T	Computer Architecture	3	OE2: Open Elective	3	26
	CA-C7T	Object Oriented Programming using Java	3	Language L1	3	
	CA-C8T	Database Management System	3	Language L2	3	
	CA-C9L	Java Lab	2	Environmental Science	2	
	CA-C10L	Database Management System Lab	2	Physical Education	1	
				NCC/NSS/CL/R&R	1	
III	CA-C11T	Operating Systems	3	OE3: Open Elective	3	26
	CA-C12T	Computer Networks	3	Language L1	3	
	CA-C13T	Python Programming	3	Language L2	3	
	CA-C14L	Computer Networks Lab	2	SEC II : Computer Assembly and Repair	2	
	CA-C15L	Python Programming Lab	2	Physical Education	1	
				NCC/NSS/CL/R&R	1	
IV	CA-C16T	Software Engineering	3	OE4: Open Elective	3	26
	CA-C17T	Artificial Intelligence	3	Language L1	3	
	CA-C18T	Internet Technologies	3	Language L2	3	
	CA-C19L	Artificial Intelligence Lab	2	The Constitution of India	2	
	CA-C20L	Internet Technologies Lab	2	Physical Education	1	
				NCC/NSS/CL/R&R	1	
V	CA-C21T	Design and Analysis of Algorithm	3	CA-V1 Vocation Course I : Quantitative Techniques	3	23
	CA-C22T	Data Analytics	3	CA-E1 Elective I : a. Data Mining b. Computer Graphics	3	
	CA-C23T	Web Programming	3	SEC III : Cyber Crime, Cyber Law, and Intellectual Property Right	2	
	CA-C24L	Data Analytics Lab	2	Physical Education	1	
	CA-C25L	Web Programming Lab	2	NCC/NSS/CL/R&R	1	

Semester	Course Code	Title of the Paper	Credits	Languages, Skill Enhancement (SEC), and Ability Enhancement Courses (AECC)	Credits	Total Credits
VI	CA-C26T	Theory of Computation	3	CA-V2 Vocation Course II : Electronic Content Design	3	23
	CA-C27T	Machine Learning	3	CA-E2 Elective II : a. Operations Research b. Software Testing	3	
	CA-C28T	Mobile Application Development	3	Professional Communication	2	
	CA-C29L	Machine Learning Lab	2	Physical Education	1	
	CA-C30L	Mobile Application Development Lab	2	NCC/NSS/CL/R&R	1	
VII	CA-C31T	Cloud Computing	3	CA-V3 Vocation Course III : Technical Writing	3	21
	CA-C32T	Internet of Things	3	CA-E3 Elective III : a. Modeling and Simulation b. Compiler Design	3	
	CA-C33T	Internship	2	Research Methodology	3	
	CA-C34L	Cloud Computing Lab	2			
	CA-C35L	Internet of Things Lab	2			
VIII	CA-C36T	Block Chain Technologies	3	CA-V4 Vocation Course IV : Project Management	3	20
	CA-C37T	Cryptography and System Security	3	CA-E4 Elective IV : a. Human Computer Interface b. Parallel Algorithms	3	
	CA-C38T	Block Chain Technologies Lab	2	Research Project	6	

**CA-C1T: DISCRETE STRUCTURES**

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.

**UNIT - II**

[12 Hours]

Counting and Relations: Basics of counting, Pigeonhole Principle, Permutation and Combinations, Binomial coefficients. Recurrence relations, Modeling 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]

Matrices: Definition, order of a matrix, types of matrices, operations on matrices, determinant of a matrix, inverse of a matrix, rank of a matrix, linear transformations, applications of matrices to solve system of linear equations.

**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 Kruskal's Algorithms. Connectivity, Euler and Hamilton Paths, Planar Graphs. Directed graphs: Fundamentals of Digraphs, Computer Recognition - Zero-One Matrices and Directed Graphs, Out-degree, in-degree, connectivity, orientation, Eulerian and Hamilton directed graphs, tournaments.

**Text Books:**

1. Ralph P. Grimaldi: Discrete and Combinatorial Mathematics, 5th Edition, Pearson Education, 2004.
2. C. L. Liu: Elements of Discrete Mathematics, Tata McGraw-Hill, 2000.
3. F. Harary: Graph Theory, Addition Wesley, 1969.
4. Richard Bronson, Schaum's Outline of Matrix Operations, McGraw-Hill publications, 2nd Edition, 2011

**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. Charles G Cullen. Matrices and Linear Transformations, Dover Publications Inc., Second Edition, 1990

**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/>

**CA-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 greatest common 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", 3<sup>rd</sup> Edition, The MIT Press Cambridge, Massachusetts London, England, 2008
3. Brain M. Kernighan, and Dennis M. Ritchie, "The C Programming Language", 2<sup>nd</sup> edition, Princeton Hall Software Series, 2012.

**Reference Books:**

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

**Web Resources:**

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



**CA-C3T: 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 out Lines, Tata Mc Graw Hill, 2011.
2. Robert Kruse, C.L.Tondo, Bruce Leung, Shashi Mogalla, "Data Structures and Program Design using C", Pearson Education, 2009.

**ReferenceBooks:**

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education, 2013.
2. Forouzan, "A Structured Programming Approach using C", 2<sup>nd</sup> Edition, Cengage Learning India, 2008.



**CA-C4P: Problem Solving Lab using C**

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 of only positive numbers
6. to read percentage of marks and to display appropriate message  
(Demonstration of else-if ladder)
7. to find the roots of quadratic equation
8. to read marks scored by n students and find the average of marks  
(Demonstration of single dimensional 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 and special 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.

**CA-C5P: 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 its first occurrence.
2. Given {5,3,1,6,0,2,4} order the numbers in ascending order using Bubble Sort Algorithm
3. Perform the Insertion and Selection Sort on the input {75,8,1,16,48,3,7,0} and display the output in descending order.
4. Write a program to insert the elements {61,16,8,27} into singly linked list and delete 8,61,27 from the list. Display your list after each insertion and deletion.
5. Write a program to insert the elements {61,16,8,27} into linear queue and delete three elements from the list. Display your list after each insertion and deletion.
6. Write a program to insert the elements {61,16,8,27} into circular queue and delete 4 elements from the list. Display your list after each insertion and deletion.
7. Write a program to insert the elements {61,16,8,27} into ordered singly linked list and delete 8,61,27 from the list. Display your list after each insertion and deletion.
8. Write a program to add  $6x^3+10x^2+0x+5$  and  $4x^2+2x+1$  using linked list.
9. Write a program to push 5,9,34,17,32 into stack and pop 3 times from the stack, also display the popped numbers.
10. Write a recursive program to find GCD of 4,6,8.
11. Write a program to insert the elements {5,7,0,6,3,9} into circular queue and delete 6,9&5 from it(using linked list implementation)..
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 on each insertion and deletion operation
15. Write a program to create binary search tree with the elements {2,5,1,3,9,0,6} and perform inorder, preorder and post order traversal.
16. Write a program to Sort the following elements using heap sort {9,16,32,8,4,1,5,8,0}
17. Given  $S1=\{\text{"Flowers"}\}$  ;  $S2=\{\text{"are beautiful"}\}$  I. Find the length of S1 II. Concatenate S1 and S2 III. Extract the substring "low" from S1 IV. Find "are" in S2 and replace it with "is"

**CA-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 and Floating 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", 10th edition, Pearson(2016)

**REFERENCE BOOKS**

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

**CA67T: 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, Abstract class, 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/>

**CA-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 McGraw Hill, 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

**CA-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 to the 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, A or a the window displays Good After Noon E or e the window displays Good Evening, N or n the window displays Good Night
23. Demonstrate the various mouse handling events using suitable example.
24. Write a program to create menu bar and pull-down menus.

**CA- C10P: DATABASE MANAGEMENT SYSTEMS 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 the Company 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 and having clause).
5. Execute the following queries
  - a. How the resulting salaries if every employee working on the 'Research' Departments is given a 10% raise.
  - b. Find the sum of the salaries of all employees of the 'Accounts' department, as well as the maximum salary, the minimum salary, and the average salary in this department
6. Execute the following queries
  - a. Retrieve the name of each employee Controlled by Department number 5 (use EXISTS operator).
  - b. Retrieve the name of each dept and number of employees working in each Department which has at least 2 employees
7. Execute the following queries
  - a. For each project, retrieve the project number, the project name, and the number of employee 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 and number of employees who are making salary more than 40000.
9. For each project on which more than two employees work, retrieve the project number, project name 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 check option), Dropping views, Selecting from a view

### PART B

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

BRANCH (Branchid, Branchname, HOD)  
 STUDENT (USN, Name, Address, Branchid, sem)  
 BOOK (Bookid, Bookname, Authorid, Publisher, Branchid)  
 AUTHOR (Authorid, Authername, 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 same publisher.

Consider the following schema:

STUDENT (USN, name, date\_of\_birth, branch, mark1, mark2, mark3, total, GPA)

6. Perform the following:
  - a. Creating Tables (With and Without Constraints), Inserting/Updating/Deleting Records in a Table, 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.
  - a. List the students who are studying in a particular branch of study.
  - b. Find the maximum GPA score of the student branch-wise.