BANGALORE UNIVERSITY
ಬ'ೆಂಗಳೂರು ವಿಶ್ವವಿದ್ಯಾಲಯ
Jnanabharathi, Bengaluru, Karnataka – 560 056

SCHEME AND SYLLABUS

For the Course

BACHELOR OF SCIENCE

(Computer Science as an Optional)

State Education Policy 2024 SCHEME

Academic Year 2024- 2025 and onwards

Members of the BoS in Computer Science

Sl. No.	Name	Designation
1.	Dr. Muralidhara B. L Senior Professor & Co-ordinator, Dept. of Computer Science, Bangalore University, Bangalore.	Chairperson
2.	Dr. Guru D.S Senior Professor, Dept. of Computer Science, University of Mysore, Mysore.	Member
3.	Dr. Ravikumar M Professor, Dept. of Computer Science, Kuvempu University, Shimoga.	Member
4.	Dr. Hanumanthappa M Senior Professor, Dept. of Computer Science, Bangalore University,Bangalore.	Member
5.	Dr. Somashekara M.T Associate Professor, Dept. of Computer Science, Bangalore University,Bangalore.	Member
6.	Dr. Suresh R Assistant Professor, Dept. of Statistics, Bangalore University,Bangalore.	Member
7.	Mr. Hemanth Uppal Assistant Professor, Dept. of Master of Computer Science Application, Dayananda Sagar College of Arts, Science and Commerce, Bangalore.	Member
8.	Ms. Jayalaxmi R Assistant Professor, Dept. of Computer Science, St. Claret College,Bangalore.	Member
9.	Mr. Dadavali S.P Assistant Professor, Government First Grade College, Kengeri.	Member
10.	Ms. Ranjana Assistant Professor, Dept. of Computer Science,Global Institute of Management Science, Bangalore.	Member
11.	Mr. Praveen Kumar V Assistant Professor, Dept. of Computer Science, Acharya B School, Bangalore.	Member
12.	Mr. Shashidhara K.G Project Manager, IBM India, Bangalore.	Member
13.	Mr. Raveesha T.C CEO, Pearl Arc Systems Pvt. Ltd., Bangalore.	Member

BANGALORE UNIVERSITY
Department of Computer Science and Applications
B.Sc. (Computer Science as an Optional)
AS PER STATE EDUCATION POLICY

Sem	Course/ Paper Code	Title of the Paper	Teaching Hours/ week	Semester End Exam	Internal Assessment	Total Marks	Credits
1	24BSC-CS-1	Problem Solving Technique	3	80	20	100	3
	24BSC-CS-1P	Problem Solving Technique Lab	4	40	10	50	2
2	24BSC-CS-2	Data Structures	3	80	20	100	3
	24BSC-CS-2P	Data Structures Lab	4	40	10	50	2
3	24BSC-CS-3	Database Management System	3	80	20	100	3
	24BSC-CS-3P	Database Management System Lab	4	40	10	50	2
4	24BSC-CS-4	Object Oriented Programming using Java	3	80	20	100	3
	24BSC-CS-4P	Object Oriented Programming using Java Lab	4	40	10	50	2
5	24BSC-CS-5	Computer Networks	3	80	20	100	3
	24BSC-CS-6	Operating Systems	3	80	20	100	3
	24BSC-CS-5P	Computer Networks and Operating System Lab	4	80	20	100	2
6	24BSC-CS-7	Artificial Intelligence	4	80	20	100	4
	24BSC-CS-8	Project Work	8	80	20	100	4

Department of Computer Science and Applications

BANGALORE UNIVERSITY, BANGALORE

Program Outcome

PO1	Computational Knowledge	Acquire in-depth computational and mathematical knowledge with an ability to abstract and conceptualise from defined problems and requirements.
PO2	Dynamic Problem-Solving Skill	Identify, formulate, and exhibit strong analytical and dynamic problem-solving skills to address evolving computational challenges.
PO3	Innovative System Analysis and Design/ Development	Design and evaluate solutions for complex problems in Data Science, AI & ML, and Full Stack Development, considering societal, cultural, and environmental factors.
PO4	Investigate complex computing problem	Conduct literature surveys, analyze information, and design experiments using appropriate research methods to derive valid conclusions in relevant domains.
PO5	Use of modern tools/ Adaptive programming proficiency	Select, adapt, and apply modern IT tools and programming languages effectively in Data Science, AI & ML, and Full Stack Development to solve diverse computing challenges.
PO6	Knowledge Optimization	Modify algorithms or software systems to improve efficiency or resource utilization.
PO7	Life Long Continuous learning and Technology Adaptability	Pursue lifelong learning to stay updated with emerging technologies in Data Science, AI & ML, and Full Stack Development for sustained employability.
PO8	Soft skills and collaborative teamwork	Communicate effectively, enhance interpersonal skills, and collaborate in multidisciplinary teams essential for success in professional environments.
PO9	Cyber Security Proficiency	Understand cyber threats, develop secure software, and protect sensitive data in Data Science, AI & ML, and Full Stack Development applications.
PO10	Ethical and Professional Conduct	Adhere to ethical standards and professional practices in Data Science, AI & ML, and Full Stack Development roles and responsibilities.
PO11	Employability	Identify market trends, upgrade skills accordingly, and enhance employability in Data Science, AI & ML, and Full Stack Development careers.
PO12	Innovation and Entrepreneurship	Identify opportunities, innovate, and create value through Data Science, AI & ML, and Full Stack Development projects for personal growth and societal impact.

PROBLEM-SOLVING TECHNIQUE

Course Outcomes

Upon successful completion of the course, the student will be able:

CO1 To understand algorithmic strategies for enhancing problem-solving proficiency

CO2 Demonstrate problem-solving tools and techniques using C.

CO3 To analyze the given problems and use appropriate algorithms.

CO4 To implement sorting and searching techniques to develop programs.

UNIT –1 12 Hours

Introduction: The Role of Algorithms in computing, Algorithms as a technology, analyzing algorithms, Designing algorithms, Flow charts. Fundamental Algorithms: Exchanging the values of two variables, Counting, Summation of a set of numbers, Factorial Computation, Generating of Fibonacci sequence, Reversing the digits of an integer, Character to number conversion.

UNIT-II 11 Hours

C Programming: Getting Started, Variables, Operators and Arithmetic expressions. Input and Output: Standard input and output, formatted input and output. Selection statements: Statements and Blocks, If, If-else, if-else-if ladder, nested if, switch. Control Structure: while loop, for loop, do-while loop, break and continue, goto and labels. Pointers and Arrays: Pointers and address, Pointers and function arguments, One Dimensional array, Two-Dimensional array, Structures and Union, Command line arguments.

UNIT - III 11 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 factor of an integer, raising a number to a large power. Array Techniques: Array order reversal, Array counting, Finding the maximum number in a set, removal of duplicates from an ordered array, partitioning an array, finding the k^{th} smallest element, multiplication of two matrices.

UNIT - IV 11 Hours

Sorting: Sorting by selection, sorting by exchange, sorting by insertion, sorting by diminishing increment, sorting by partitioning. Searching: Linear Search, Binary search. Text processing and Pattern searching: Text line length adjustment, keyboard searching in text, text line editing, linear pattern searching.

Text Book

1 R. G. Dromey, “How to Solve it by Computer”, Person Education India, 2008.

2 Brain M. Kernighan and Dennis M. Ritchie, “ The C Programming Language”, 2nd edition, Princeton Hall Software Series, 2012.

3 Thomas H Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, “Introduction to Algorithms”, 3rd Edition, The MIT Press Cambridge, Massachusetts London, England, 2008.

Reference Books

1 E. Balaguruswamy, "Programming In ANSI C", 4th edition, TMH Publications, 2007

2 Greg Perry and Dean Miller, "C programming Absolute Beginner's Guide", 3rd edition, Pearson Education, Inc, 2014.

3 Donald E. Knuth, The Art of Computer Programming", Volume 2: Seminumerical Algorithms, 3rd Edition, Addison Wesley Longman, 1998.

Course Articulation Matrix: Mapping of Course Outcomes(COs) with Program Outcomes(POs1-12)

Course Outcome(COs)	**Program Outcomes(POs)**											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	3	1	1	1	1	2	1	1	1	2	1
CO2	3	3	3	2	1	1	1	1	1	1	2	1
CO3	3	3	1	1	1	1	1	1	1	1	2	1
CO4	3	3	2	2	1	1	1	1	1	1	2	1

Pedagogy: Lecture with the use of ICT/ Field Study / Assignment

Formative Assessment for Theory	
Assessment Occasion Type	**Marks**
C-1 Sessional Tests	5
C-1 Seminars/ Presentations	5
C-2 Sessional Tests	5
Case Study / Assignment / Project work etc.	5
Total	**20 Marks**
Formative Assessments as per SEP guidelines are compulsory	

PROBLEM SOLVING TECHNIQUE LAB

Write, and execute C Program for the following:

1. To read the radius of the circle and to find area and circumference.
2. To read the numbers and find the biggest of three.
3. To check whether the number is prime or not.
4. To find the root of quadratic equation.
5. To read a number, find the sum of the digits, reverse the number and check it for palindrome.
6. To read the numbers from keyboard continuously till the user presses 999 and to find the sum of only positive numbers.
7. To read percentage of marks and to display appropriate message. If a percentage is 70 and above- Distinction, 60-69 – First Class, 50-59 – Second Class, 40-49 Pass, below 40 – Fail. (Demonstrate of if-else ladder)

8. To simulate a simple calculator with addition, subtraction, multiplication, Division and it should display the error message for division of zero using switch case.
9. To read marks scored by n students and find the average of marks (Demonstration of single dimensional array)
10. To remove duplicate elements in a single dimensional array.
11. To find the factorial of a number.
12. To generate Fibonacci series.
13. To design the following pattern using nested for loop:

```
        *
      *   *
    *   *   *
  *   *   *   *
*   *   *   *   *
```

14. To find the length of the string without using built-in function.
15. To demonstrate string functions. (String Length, String Copy, String Concatenate, String Comparison)
16. To read, display and add two n x m matrices using function.
17. To read a string and to find the number of alphabets, digits, vowels, consonants, space 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 and union for the following Student name (String), Student roll no(integer), Student mark(float)

DATA STRUCTURES

Course Outcome

CO1	Understand basic concepts of data structures.
CO2	Analyzing and exploring various ways of storing data using Array and Linked list.
CO3	Demonstrate stack and queue data structures and their applications
CO4	Analyze and implement various non-linear data structures.

UNIT I 11 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.

UNIT II 11 Hours

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, searching and sorting techniques using array.
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.

UNIT III 11 Hours

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 Postfix 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 IV 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, External Searching: Applications of Trees. Graphs: Mathematical Back ground, Computer Representation, Graph Traversal. Hashing: Hash Table ADT, understanding Hashing, Components of Hashing, Hash Table, Hash Function, Hashing Techniques, collisions, collision resolution techniques.

Text Book

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 Design using C", Pearson Education, 2009

Reference Books

1 Mark Allen Weiss," Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education,2013

2 Forouzan,"A Structured Programming Approach using C",2nd Edition, Cengage LearningIndia,2008.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs12)

Course Outcome (COs)	**Program Outcomes (POs)**											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	4	3	4	4	4	3	2	3	1	4	4
CO2	5	5	4	4	4	4	3	2	3	1	4	4
CO3	5	5	4	4	4	4	3	2	3	1	4	5
CO4	5	5	4	4	4	4	3	2	2	1	4	4

Pedagogy: Lecture with the use of ICT/ Field Study / Assignment

Formative Assessment for Theory	
Assessment Occasion Type	**Marks**
C-1 Sessional Tests	5
C-1 Seminars/ Presentations	5
C-2 Sessional Tests	5
Case Study / Assignment / Project work etc.	5
Total	**20 Marks**
Formative Assessments as per SEP guidelines are compulsory	

DATA STRUCTURES LAB

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

1. Write a program to search for an element in an array using binary and linear search.
2. Write a program to sort list of n numbers using Bubble Sort algorithms.
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 {45, 34, 10, 63,3} into linear queue and delete three elements from the list. Display your list after each insertion and deletion.
6. Write a program to simulate the working of Circular queue using an array.
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 for Tower of Honoi problem using recursion.
9. Write recursive program to find GCD of 3 numbers.
10. Write a program to demonstrate working of stack using linked list.
11. Write a program to convert an infix expression x^y/(5*z)+2 to its postfix expression
12. Write a program to evaluate a postfix expression 5 3+8 2 - *.
13. 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.
14. 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.
15. Write a program to Sort the following elements using heap sort {9.16,32,8,4,1,5,8,0}.
16. Given S1={“Flowers”} ; S2={“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” .
17. Write a program to implement adjacency matrix of a graph.
18. Write a program to insert/retrieve an entry into hash/ from a hash table with open addressing using linear probing.

Semester III

CA-C9T: DATABASE MANAGEMENT SYSTEMS

Total Teaching Hours: 60 No. of Hours / Week: 04

UNIT - 1 [15 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 [15 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. 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

UNIT – 3 [15 Hours]

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 [15 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-C10T: ARTIFICIAL INTELLIGENCE

Total Teaching Hours : 60 No. of Hours / Week: 04

Course Outcomes:

CO 1. Understand the various characteristics of problem solving agents and apply problem solving through search for AI applications.
CO 2. Appreciate the concepts of knowledge representation using Propositional logic and Predicate calculus and apply them for inference/reasoning.
CO 3. Obtain insights about Planning and handling uncertainty through probabilistic reasoning and fuzzy systems.
CO 4. Understand basics of computer vision and Natural Language Processing and understand their relevance in AI applications.
CO 5. Obtain insights about machine learning, neural networks, deep learning networks and their significance.

UNIT I : [15 Hours]

Introduction to Al: Intelligent Agents: Agents and environment, the concept of Rationality, the nature of environment, the structure of agents; Problem solving: Problem-solving agents; Uninformed search strategies: DFS, BFS; Informed Search: Best First Search, A* search, AO* search; Adversarial Search & Games: Two-player zero-sum games, Minimax Search, Alpha-Beta pruning.

UNIT – II [15 Hours]

Knowledge-based Agents, The Wumpus world as an example world, Logic, Propositional logic, First-order predicate logic, Propositional versus first-order inference, Unification and lifting, Forward chaining, Backward chaining, Resolution, Truth maintenance systems.

UNIT - III [15 Hours]

Introduction to Planning: Blocks World problem, Strips; Handling Uncertainties: Non-monotonic reasoning, Probabilistic reasoning, Fuzzy logic: Theory of Fuzzy sets, Operations on Fuzzy sets and Fuzzy logic, Reasoning with Fuzzy logic; Robotics: Fundamentals of Robotics, Robot Kinematics; Computer Vision: Introduction to image processing and classification, object detection.

UNIT – IV [15 Hours]

Natural Language Processing: Introduction, Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing; Expert Systems: Architecture and role of expert systems, two case studies of Expert Systems; Introduction to Machine learning: Supervised learning, unsupervised learning, reinforcement learning; Neural Networks: Introduction, basics of ANN,

Text Book/References

1. Russell, S. and Norvig, P., "Artificial Intelligence - A Modern Approach", 3rd edition, Prentice Hall
2. Nilsson Nils J, "Artificial Intelligence: A new Synthesis, Morgan Kaufmann Publishers Inc. San Francisco, CA, ISBN: 978-1-55-860467-4.
3. Dan W Patterson, "Introduction to Artificial Intelligence & Expert Systems", PHI Learning 2010.

CA- C11P: 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 fallowing 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 fallowing 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 fallowing 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, 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 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.

ARTIFICIAL INTELLIGENCE LAB

Total Teaching Hours: **No. of Hours / Week:**

Course Outcomes:

CO 6. Solve search problems including heuristic search and constraint satisfaction search.
CO 7. Understand and apply image processing techniques for image enhancement, image detection and recognition.
CO 8. Understand and implement supervised machine learning and probabilistic machine learning algorithms.
CO 9. Implement unsupervised learning through clustering.
CO 10. Obtain insights about working of neural networks and neural network based learning.
CO 11. Perform NLP operations to gain understanding of text processing and analytics.

Please Note: Artificial Intelligence lab programs can be implemented in Python using the relevant Python libraries.

Lab Programs

1. Write a program to solve the Water Jug Problem using Breadth Frist Search (BFS).
2. Write a program to find the optimum path from Source to Destination using A* search technique.
3. Write a program to solve the 4 – Queens Problem.
4. Write a program to implement Minimax search for 2 Player games.
5. Using OpenCV python library capture an image and perform the following image processing operations:
   a) Image Resizing
   b) Blurring of Image
   c) Grayscaling of image
   d) Scaling and rotation
   e) Edge Detection
   f) Segmentation using thresholding
   g) Background subtraction
   h) Morphological operations
6. Write a program with two menu options 1) Capture Image and 2) Recognise Image. This program should capture pictures of five students and save them. The program should identify/recognise the student and display the student name.

Using Keras/any standard dataset write the programs for the following Machine learning tasks:

7. Use the Decision tree classifier to classify the dataset.
8. Use the Naïve Bayes classifier to classify the dataset.
9. Implement K-Means clustering Algorithm.
10. Using Python NLTK, perform the following Natural Language Processing (NLP) tasks for any textual content.
    a) Tokenizing
    b) Filtering Stop Words
    c) Stemming
    d) Part of Speech tagging
    e) Chunking
    f) Named Entity Recognition (NER)
11. Write a program that uses Neural networks for image classification using Keras Iris dataset.

CA-C13T: PYTHON PROGRAMMING

Total Teaching Hours : 60 No. of Hours / week: 04

UNIT - I [15 Hours]

Parts Python Programming Language: Python Interpreter/Shell, Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data types, Indentation, Comments, Reading Input, Print Output, Type Conversions, The type() function and Is operator, Dynamic and Strongly Typed Language.**Control Flow Statements:**The if Decision Control Flow Statement, The if…else DecisionControl FlowStatement, The if…elif…else Decision Control Statement, Nested if Statement, The while Loop, TheforLoop, The continue and break Statements. **Functions**: Built-In Functions, Commonly Used Modules, Function Definition and Calling the Function, The return Statement and void Function, Scope and Life time of Variables, Default Parameters, Command Line Arguments. **Strings:** Creating and Storing Strings, Basic String operations,Accessing Characters in StringbyIndexNumber, String Slicing and Joining, String methods

UNIT - II [15 Hours]

Lists: Creating Lists, BasicListOperations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, ThedelStatement, **Dictionaries:** Creating Dictionary, Accessing and modifying key:value pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary methods, ThedelStatement**. Tuples and Sets:** Creating Tuples, Basic Tuple Operations, Indexing and Slicing in Tuples,Built-In Functions Used onTuples, Relations between Tuples and Lists, Relations between Tuples and Dictionaries, Tuple Methods, Using zip() Function, Sets, Set Methods, Frozenset.

UNIT - III [15 Hours]

Files: Types of files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files,The Pickle module, Reading and writing CSV files, **Object-Oriented Programming:** Classes and Objects, Creating Classes in Python, Creating Objects in Python, The Constructor Method, Classes with Multiple Objects, Class Attributes versus Data attributes, Encapsulation, Inheritance, The Polymorphism.

UNIT - IV [15 Hours]

D**ata Visualization:** Generating Data-Installing Matplotlib, Plotting a Simple Line Graph, Random Walks, Rolling Dice with Plotly. Downloading Data- The CSV File Format, Mapping Global Data Sets: JSON Format, **Working with APIs:** Using a Web API, Visualizing Repositories Using Plotly.

Text Books:

1. Gowrishankar S, Veena A, "Introduction to Python Programming", 1st Edition, CRC Press/Taylor & Francis, 2018. ISBN-13: 978-0815394372. [Unit I&II- 2,3,4,5,6,7,8,9 Unit III-11,12].
2. Eric Matthes, "Python Crash Course- A Hands-On, Project-Based Introduction to Programming", 2nd Edition, No Starch Press, 2019.[Unit III-15, Unit IV-16]
3. Wesley J. Chun, "Core Python Applications Programming", 3rd Edition, Pearson Education, 2016. [Unit IV- 2,5].

Reference Books:

1. Kamthane, A. N., & Kamthane, A.A. , "Programming and Problem Solving with Python", McGraw Hill Education, 2017.
2. Mark Lutz, "Learning Python", 5th edition, Orelly Publication, 2013, ISBN 978- 1449355739.
3. Ljubomir Perkovic, "Introduction to Computing Using Python- An Application Development Focus",Wiley,2012.

CA-C14T: COMPUTER NETWORKS

Total Teaching Hours : 60 No. of Hours / Week: 04

UNIT - I [15 Hours]

Introduction: Data Communications, Networks, Network Types, Internet History, Network Models: Protocol Layering, The OSI Model, TCP/IP Protocol Suite, Introduction to Physical Layer: Transmission Impairments, Data Rate Limits, Performance, Introduction to Data-Link-Layer: Link-Layer Addressing, Error Detection and Correction: Block Coding, Cyclic Codes, Checksum

UNIT - II [15 Hours]

Data Link Control: Data-Link Layer Protocols, HDLC, Point-To-Point (PPP), Media Access Control (MAC): ALOHA, CSMA, CSMA/CD, CSMA/CA, Reservation, Polling, Token Passing, FDMA, TDMA, CDMA

UNIT - III [15 Hours]

Introduction to Network Layer: Network-Layer Services, Packet Switching, Network-Layer Performance, IPV4 Addresses, Network Layer Protocols: Internet Protocol (IP), ICMPv4, Mobile IP, Unicast Routing: Routing Algorithms, Unicast Routing Protocols, Next Generation IP: IPv6 Addressing

UNIT - IV [15 Hours]

Introduction to Transport Layer: Introduction, Transport-Layer Protocols, Transport-Layer Protocols: User Datagram Protocol, Transmission Control Protocol: TCP Services, TCP Features, Segment, A TCP Connection, TCP Congestion Control, Flow Control, Error Control, Application Layer: WWW, E-MAIL, Domain Name System (DNS), Quality of Service: Flow Control To Improves QoS, Integrated Services

Text Books:

1. Behrouz A. Forouzan, “Data Communications and Networking”, 5th Edition, McGraw Hill Education, 2013.

Reference Books:

1. Andrew S. Tanenbaum, David J. Wetherall, “Computer Networks”, 5th Edition, Prentice Hall, 2011.
2. Larry L. Peterson and Bruce S. Davie, “Computer Networks A System Approach”, 5th Edition, MKP, 2012.
3. James F. Kurose , Keith W. Ross, “ Computer Networking, A Top-Down Approach”, 5thEdition, Pearson, 2012.

Web Resources:

1. https://www.geeksforgeeks.org/computer-network-tutorials/
2. https://codescracker.com/networking/
3. https://youtube.com/playlist?list=PLxCzCOWd7aiGFBD2-2joCpWOLUrDLvVV_

CA-C15P: PYTHON PROGRAMMING LAB

1. Write a program to demonstrate basic data type in python
2. Create a list and perform the following methods
   1) insert() 2) remove() 3) append()
   4) len() 5) pop() 6) clear()
3. Create a tuple and perform the following methods
   1) Add items 2) len() 3) check for item in tuple 4)Access items
4. Create a dictionary and apply the following methods
   1) Print the dictionary items 2) access items 3) use get()
   4)change values 5) use len()
5. Write a program to create a menu with the following options
   1. TO PERFORM ADDITITON 2. TO PERFORM SUBTRACTION
   3. TO PERFORM MULTIPICATION 4. TO PERFORM DIVISION
   Accepts users input and perform the operation accordingly. Use functions with arguments.
6. Write a python program to print a number is positive/negative using if-else.
7. Write a program for filter() to filter only even numbers from a given list.
8. Write a python program to print date, time for today and now
9. Write a python program to add some days to your present date and print the date added.
10. Write a program to count the numbers of characters in the string and store them in a dictionary data structure
11. Write a program to count frequency of characters in a given file.
12. Using a numpy module create an array and check the following: 1. Type of array 2. Axes of array 3. Shape of array 4. Type of elements in array
13. Write a python program to concatenate the dataframes with two different objects
14. Write a python code to read a csv file using pandas module and print the first and last five lines of a file.
15. Write a python program which accepts the radius of a circle from user and computes the area (use math module)
16. Use the following data (load it as CSV file) for this exercise. Read this file using Pandas or Nu mPy or using in-built matplotlib function.

Months	Pen	Book	Marker	Chair	Table	Pen stand	Total units	Total profit
1	2500	1500	5200	9200	1200	1500	21100	211000
2	2630	1200	5100	6100	2100	1200	18330	183300
3	2140	1340	4550	9550	3550	1340	22470	224700
4	3400	1130	5870	8870	1870	1130	22270	222700
5	3600	1740	4560	7760	1560	1740	20960	209600
6	2760	1555	4890	7490	1890	1555	20140	201400
7	2980	1120	4780	8980	1780	1120	29550	295500

8	3700	1400	5860	9960	2860	1400	36140	361400
9	3540	1780	6100	8100	2100	1780	23400	234000
10	1990	1890	8300	10300	2300	1890	26670	266700
11	2340	2100	7300	13300	2400	2100	41280	412800
12	2900	1760	7400	14400	1800	1760	30020	300200

a. Get total profit of all months and show line plot with the following Style properties Generated line plot must include following Style properties: –
    - Line Style dotted and Line-color should be blue
    - Show legend at the lower right location.
    - X label name = Months
    - Y label name = Sold units
    - Line width should be 4
b. Display the number of units sold per month for each product using multiline plots. (i.e., Separate Plotline for each product.
c. Read chair and table product sales data and show it using the bar chart.
    - The bar chart should display the number of units sold per month for each product. Add a separate bar for each product in the same chart.
d. Read all product sales data and show it using the stack plot

CA-C16P: COMPUTER NETWORKS LAB

1. Execute the following commands:
   arp, ipconfig, hostname, netdiag, netstat, nslookup, pathping, ping route, tracert
2. Study of different types of network cables.
3. Practically implement the cross-wired cable and straight wired cable using crimping tool.
4. Study of network IP address configuration: (Classification of address, static and dynamic address)
5. Study of network IP address configuration: (IPv4 and IPv6 , Subnet, Supernet)
6. Study of network devices: (Switch, Router, Bridge)
7. Configure and connect the computer in LAN.
8. Block th e website using “Windows Defender Firewall” in windows 10.
9. Share the folder in a system, and access the files of that folder from other system using IP address .
10. Share the printer in Network, and take print from other PC.
11. Configuration of wifi hotspot, and connect other devices (mobile / laptop).
12. Configuration of switches.
13. Configuration of I/O box fixing.
14. Making your own patch cord.
15. Configuration of VLAN using Packet Tracer/ GNS3
16. Configuration of VPN using Packet Tracer/ GNS3

References:

1.Paul Browning, “101 CompTIA Networs+ LABS”, Reality Press Ltd, 2018.

Web References:

1.youtube.com/watch?v=rurs7cdT5cc
2.https://www.youtube.com/watch?v=_IOZ8_cPgu8
3.https://www.alphr.com/block-websites-windows/