**SYLLABUS FOR THE BATCH FROM THE YEAR 2024 TO YEAR 2025**

**Programme Code: DAI**

**Programme Name: Diploma in Artificial Intelligence**

**(Semester I-II)**

**Examinations: 2024-2025**

# P.G. Department of Computer Science & Applications

# Khalsa College, Amritsar

# DIPLOMA IN ARTIFICIAL INTELLIGENCE

## SEMESTER-I

| Sr. No. | Course Code | Course Name | Distribution of The Marks | | | | Lecture per week | | | Credit Distribution of The Course | | | Total Credit Per Course | Page No |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Theory | Practical | Internal Assessment | Total | L | T | P | L | T | P | | |
| 1 | DAI- 111 | Introduction to Artificial Intelligence | 75 | - | 25 | 100 | 5 | 1 | 0 | 3 | 1 | 0 | 4 | 2-3 |
| 2 | DAI- 112 | Database Management System | 75 | - | 25 | 100 | 5 | 1 | 0 | 3 | 1 | 0 | 4 | 4-5 |
| 3 | DAI- 113 | Programming Using Python | 75 | - | 25 | 100 | 5 | 1 | 0 | 3 | 1 | 0 | 4 | 6-7 |
| 4 | DAI- 114P | Lab I: - Programming Lab-Oracle | - | 37 | 13 | 50 | 0 | 0 | 6 | 0 | 0 | 2 | 2 | 8 |
| 5 | DAI- 115P | Lab II: - Programming Using Python | - | 37 | 13 | 50 | 0 | 0 | 6 | 0 | 0 | 2 | 2 | 9-10 |
| | | | | | | | | | | | | | | Total Credits=16 |

# DIPLOMA IN ARTIFICIAL INTELLIGENCE
## SEMESTER-I
### DAI-111: Introduction to Artificial Intelligence
### Discipline Specific Course (DSC)

**Time: 3 Hrs.**                                          **Total Marks: 100**

| Credits | | |
|---|---|---|
| **L** | **T** | **P** |
| 3 | 1 | 0 |

**Theory Marks: 75**

**Theory Internal Assessment Marks:25**

**Note for paper setter and students:**

1. **Medium of Examination is English Language.**
2. **There will be five sections.**
3. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 marks each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
4. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

**COURSE OBJECTIVES:**

| | |
|---|---|
| 1. | The primary objective of this course is to introduce the basic principles, techniques and applications of Artificial Intelligence. |
| 2. | To become familiar with basic principles of AI toward problem solving, inference, perception and knowledge representation. |
| 3. | To Investigate applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models. |
| 4. | To explore the current scope, potential, limitations, and implications of AI Based systems. |

## UNIT – I
Introduction–Definition – Future of Artificial Intelligence – Characteristics of Intelligent Agents–Typical Intelligent Agents – Problem Solving Approach to Typical AI problems.

## UNIT – II
Problem solving Methods – Search Strategies- Uninformed – Informed -Heuristic Search technologies: Introduction to heuristic search, Generate and test, Hill Climbing, Best First search, A*, Problem reduction, AO*, Constraint satisfaction.

## UNIT – III
Knowledge, Reasoning and Planning: Logical Agents – Classical Planning – A brief introduction to Knowledge representation and Reasoning.

## UNIT – IV

Applications AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing – Machine Translation – Speech Recognition – Robot – Hardware –Perception – Planning – Moving

**References:**

1. Artificial Intelligence: A Modern Approach, 4th Edition, Stuart Russell, peter Norvig University of California at Berkeley, Pearson education, 2020.
2. Gerhard Weiss, ―Multi Agent Systems‖, Second Edition, MIT Press, 2013.
3. I. Bratko, ―Prolog: Programming for Artificial Intelligence, Fourth edition, Addison-Wesley Educational Publishers Inc., 2011.
4. Stuart Russell, Peter Norvig, Artificial Intelligence: A Modern Approach, 3rd Edition, Pearson,2017.
5. Dan W Patterson, Introduction to Artificial Intelligence and Expert Systems, 1st Edition, PHI., 2015.

**Course Outcomes:**

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

| | |
|---|---|
| **CO-1.** | Understand basic principles of AI in solutions that require problem solving, inference and knowledge representation. |
| **CO-2.** | Understand knowledge representation using logic and rules. |
| **CO-3.** | Analyze various AI techniques in expert systems, artificial neural networks and other machine learning models. |
| **CO-4.** | Apply Min-Max Search procedures and iterative deepening. |

# DIPLOMA IN ARTIFICIAL INTELLIGENCE
## SEMESTER-I
### DAI-112: Database Management System
### Discipline Specific Course (DSC)

**Time: 3 Hrs.**                                                    **Total Marks: 100**

| Credits | | |
|---|---|---|
| **L** | **T** | **P** |
| 3 | 1 | 0 |

**Theory Marks: 75**

**Theory Internal Assessment Marks:25**

**Note for paper setter and students:**

1. Medium of Examination is English Language.
2. There will be five sections.
3. Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 marks each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.
4. Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.

**COURSE OBJECTIVES:**

| | |
|---|---|
| 1. | To get acquaint students with the basics of DBMS, different Architectural Models for DBMS, Normalization of data, Concurrency control problems and its management, Protection, Security and recovery aspects of databases along with practical knowledge of databases using SQL and PL/SQL. |
| 2. | The key goal is to prepare students for a professional career in the field of data administration and database design. |
| 3. | To get acquaint students with basics of database security and administration. |
| 4 | To get acquaint students with good knowledge of DBMS. During the course, students will learn about database design and database handling activities. |

## UNIT I
Introduction to Data, Field, Record, File, Database, Database management system. Structure of database system, Advantage and disadvantage, levels of database system, Relational model, hierarchical model, network model, comparison of these models, E–R diagram, different keys used in a relational system, SQL. DBA, responsibilities of DBA.

## UNIT II
Relational form like INF, 2NF, 3NF, BCNF, 4th NF, 5th NF, DBTG.
Concurrency control and its management, protection, security, recovery of database.

## UNIT III

Introduction to Oracle10g SQL–DQL, DML, DCL Join methods & Subquery, Union, Intersection, Minus, Tree Walking Built in Functions, Views, Security amongst users, Sequences, Indexing , Object Oriented Features of Oracle10g

## UNIT IV

Introduction to PL/SQL, Fundamentals of PL/SQL Language, Cursors–Implicit & Explicit Procedures-introduction, creating, modifying, executing and dropping procedures, Functions & Packages, Database Triggers, types of triggers.

**References:**

1. Introduction to Database System By C.J. Date.
2. Database Management System By B.C. Desai.
3. Database Concept by Korth.
4. Simplified Approach to DBMS– Kalyani Publishers
5. Oracle – Developer – 2000 by Ivan Bayross.
6. Database System concepts & Oracle (SQL/PLSQ) – AP Publishers.
7. https://www.mongodb.com/nosql-explained
8. Introduction to NoSQL (Ebook), NoSQL Seminar 2012 @ TUT, Arto Salminen

**Course Outcomes:**

On Completing the course, the students will be able to:

| CO-1. | Understand Databases , their design and development |
|---|---|
| CO-2. | Develop intellectual Cognitive/ analytical skills: Normalization of Databases. |
| CO-3. | Gain practical Skills Using SQL and PL/SQL. |
| CO-4. | Gain transferable skills: Usage of DBMS design and administration. |

## DAI-113: Programming-Using Python
### Discipline Specific Course (DSC)

**Time: 3 Hrs.**                                                    **Total Marks: 100**

| Credits | | |
|---|---|---|
| L | T | P |
| 3 | 1 | 0 |

**Theory Marks: 75**

**Theory Internal Assessment Marks:25**

**Note for paper setter and students:**

1. **Medium of Examination is English Language.**
2. **There will be five sections.**
3. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 marks each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
4. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

**Course Objectives:**

| 1. | Demonstrate the ability to solve problems using system approaches, critical and Innovative thinking, and technology to create solutions. |
|---|---|
| 2. | Understand the purpose and technology to create solutions. |
| 3. | Create scripts in Python. |
| 4. | Design and develop applications using Python. |

## UNIT I
**Python Introduction:** Installing and setting Python environment in Windows and Linux, basics of Python interpreter, Execution of python program, Editor for Python code, syntax, variable, types.

## UNIT II
**Flow control:** if, if-else, for, while, range function, continue, pass, break. Strings: Sequence operations, String Methods, Pattern Matching.

## UNIT III
**Lists:** Basic Operations, Iteration, Indexing, Slicing and Matrixes; Dictionaries: Basic dictionary operations; Tuples and Files.

## UNIT-IV

**Functions:** Definition, Call, Arguments, Scope rules and Name resolution; Modules: Module Coding Basics, Importing Programs as Modules, Executing Modules as Scripts, Compiled Python files(.pyc).

**References:**

1. Lutz Mark, (2009). Learning Python, Latest Edition., O'REILLY Media, Inc.
2. TJ. O'Connor, Violent Python A Cookbook for Hackers, Forensic Analysts, Penetration Testers and Security Engineers(2013), Elsevier.
3. Seitz Justin , (2009). Gray Hat Python: Python Programming with Hackers and Reverse Engineers, Latest Edition, No Starch Press, Inc.
4. Seitz Justin , (2015). Black Hat Python: Python Programming for Hackers and Pentesters, Latest Edition, No Starch Press, Inc
5. Berry Paul, (2011). Head First Python. Latest Edition, O'REILLY Media, Inc.

**Course Outcomes:**

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

| | |
|---|---|
| CO-1. | Describe the core syntax and semantics of Python programming language. |
| CO-2. | Discover the need for working with the strings and functions. |
| CO-3. | Illustrate the process of structuring the data using lists and dictionaries. |
| CO-4. | Infer the Object-oriented Programming concepts in Python. |
| CO-5. | To develop the ability to write database applications in Python. |

**SEMESTER-I**
**DAI-114P Lab I- Programming Lab – Oracle**
**Skill Enhancement Course (SEC)**

**Time: 3 Hrs.**  **Total Marks: 50**

| Credits | | |
|---|---|---|
| **L** | **T** | **P** |
| 0 | 0 | 2 |

**Practical Marks: 37**

**Internal Assessment Marks:13**

## Course Objectives:

| | |
|---|---|
| 1. | Enhance the knowledge and understanding of Database analysis and design. Enhance the knowledge of the processes of Database Development and Administration using SQL and PL/SQL. |
| 2. | Enhance Programming skills and techniques using SQL and PL/SQL. |
| 3. | Develop efficient PL/SQL programs to access Oracle databases. |
| 4. | Design modular applications using packages. |
| 5. | Invoke native dynamic SQL to build runtime SQL statements. |
| 6. | Manage data retrieval with cursors and cursor variables. |
| 7. | Enhance performance using collection data types and bulk operations. |
| 8. | Create triggers to solve business challenges and enforce business rules. |

## Lab – I: Practical in Oracle

## Course Outcomes:

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

| | |
|---|---|
| **CO-1.** | Use the Relational model and how it is supported by SQL and PL/SQL. |
| **CO-2.** | Use the PL/SQL code constructs of IF-THEN-ELSE and LOOP types as well as syntax and command functions. |
| **CO-3.** | Solve Database problems using Oracle: SQL and PL/SQL. This will include the use of Procedures, Functions, Packages, and Triggers. |

## DIPLOMA IN ARTIFICIAL INTELLIGENCE
### SEMESTER-I
### DAI-115P Lab II- Programming Using Python
### Skill Enhancement Course (SEC)

**Time: 3 Hrs.**                                    **Total Marks: 50**

| Credits | | |
|---|---|---|
| **L** | **T** | **P** |
| 0 | 0 | 2 |

**Practical Marks: 37**

**Theory Internal Assessment Marks:13**

**Course Objectives:**

Enable the student to

| | |
|---|---|
| 1. | Understand the basics of python programming concepts. |
| 2. | Develop programs using object-oriented features. |
| 3. | Understand the high-performance programs designed to build up the real proficiency. |
| 4. | To enhance logical thinking of students. |

**Practical Implementation based on Programming Using Python**

1. Python program to print "Hello World"
2. Python program to print area of rectangle
3. Python program to print area and perimeter of circle
4. Python program to print area of right angled triangle
5. Python program to find roots of quadratic equation
6. Python program to swap two variables
7. Python program to print grade of students according to marks
8. Python Program to Check Prime Number
9. Python Program to Print all Prime Numbers in an Interval
10. Python Program to Find the Factorial of a Number
11. Python Program to Check Armstrong Number
12. Python program to print all odd numbers and even numbers of given range
13. Python program to print largest digit of a given number
14. Python program to print reverse of a given number
15. Python program to print Fibonacci series
16. Python Program to Find LCM
17. Python Program to Find HCF

18. Python Program to Make a Simple Calculator

19. Python Program to Display Calendar

20. Python program of different patterns
For instance:
1
12
123
1234

21. Python programs related to functions

22. Python program related to lists, tuples and dictionaries


**Course Outcomes:**

Students will be able to

| | |
|---|---|
| **CO-1.** | Describe the Control statement, String, List, and Dictionaries in Python. |
| **CO-2.** | Understand the different types of function and File handling operations. |
| **CO-3.** | Interpret Object oriented programming in Python |
| **CO-4.** | Develop and understand patterns |
| **CO-5.** | Associate python programming with real life problems |

# DIPLOMA IN ARTIFICIAL INTELLIGENCE

## SEMESTER-II

| Sr. No. | Course Code | Course Name | Distribution of The Marks | | | | Lecture per week | | | Credit Distribution of The Course | | | Total Credit Per Course | Page No |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Theory | Practical | Internal Assessment | Total | L | T | P | L | T | P | | |
| 1 | DAI- 121 | Introduction to Machine Learning | 75 | - | 25 | 100 | 5 | 1 | 0 | 3 | 1 | 0 | 4 | 12-13 |
| 2 | DAI- 122 | R Programming | 75 | - | 25 | 100 | 5 | 1 | 0 | 3 | 1 | 0 | 4 | 14-15 |
| 3 | DAI- 123 | Data Structures | 75 | - | 25 | 100 | 5 | 1 | 0 | 3 | 1 | 0 | 4 | 16-17 |
| 4 | DAI- 124P | Lab I: - Based on R Language | - | 37 | 13 | 50 | 0 | 0 | 6 | 0 | 0 | 2 | 2 | 18 |
| 5 | DAI- 125P | Lab II: - Data Structures Implementation using Python | - | 37 | 13 | 50 | 0 | 0 | 6 | 0 | 0 | 2 | 2 | 19-20 |
| | | | | | | | | | | | | | Total Credits=16 | |

**DIPLOMA IN ARTIFICIAL INTELLIGENCE**
**SEMESTER-II**
**DAI-121: Introduction to Machine Learning**
**Discipline Specific Course (DSC)**

**Time: 3 Hrs.**                                                        **Total Marks: 100**

| Credits | | |
|---------|---|---|
| **L** | **T** | **P** |
| **3** | **1** | **0** |

**Theory Marks: 75**

**Theory Internal Assessment Marks:25**

**Note for paper setter and students:**

1. **Medium of Examination is English Language.**
2. **There will be five sections.**
3. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 marks each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
4. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

**Course Objectives:**

| | | |
|---|---|---|
| 1. | To understand the basic theory underlying machine learning. | |
| 2. | To be able to formulate machine learning problems corresponding to different applications. | |
| 3. | To understand a range of machine learning algorithms along with their strengths and weaknesses. | |
| 4. | To be able to apply machine learning algorithms to solve problems of moderate complexity. | |
| 5. | To apply the algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models. | |

## UNIT I
**Introduction to Machine Learning:** Introduction to Machine learning, Types: supervised learning and unsupervised learning, Applications of machine learning.

## UNIT II
**Basic Concepts of Learning Models and its performance Evaluation:** Dimensionality reduction using Principal component analysis, a general view of feature extraction, Feature ranking, Validation techniques, Confusion matrix and its related performance parameters.

## UNIT III
**Supervised Learning algorithms:** Perceptron learning algorithms: Pocket algorithm without and with Ratches
**Unsupervised Learning Algorithms:** K-means Clustering, Hierarchical clustering

## UNIT IV

**Introduction to ANNs:** Biological Neural Networks, Usefulness and Applications of ANNs, Architectures of ANNs: Single layer, Multi layer, Competitive layer.

**References:**

1. Marco Gori , Machine Learning: A Constraint-Based Approach, Morgan Kaufmann. 2017
2. Ethem Alpaydin, Machine Learning: The New AI, MIT Press-2016
3. Ryszard, S., Michalski, J. G. Carbonell and Tom M. Mitchell, Machine Learning: An Artificial Intelligence Approach, Volume 1, Elsevier. 2014
4. Stephen Marsland, Taylor & Francis 2009. Machine Learning: An Algorithmic Perspective.

**Course Outcomes:**

After completing this course, the student will be able to

| | |
|---|---|
| **CO-1.** | Understand the various supervised and non-supervised techniques helpful in the construction of learning models. |
| **CO-2.** | Understand the different performance evaluation measures helpful in appraising the developed learning models. |
| **CO-3.** | Understand a very broad collection of machine learning algorithms and problems |
| **CO-4.** | Learn algorithmic topics of machine learning and mathematically deep enough to introduce the required theory |

# DIPLOMA IN ARTIFICIAL INTELLIGENCE
## SEMESTER-II
### DAI-122: R Programming
### Discipline Specific Course (DSC)

**Time: 3 Hrs.** **Total Marks: 100**

| Credits | | |
|---|---|---|
| **L** | **T** | **P** |
| **3** | **1** | **0** |

**Theory Marks: 75**

**Theory Internal Assessment Marks:25**

**Note for paper setter and students:**

1. **Medium of Examination is English Language.**
2. **There will be five sections.**
3. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 marks each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
4. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

**Course Objectives:**

| 1. | This course introduces R, which is a popular statistical programming language. |
|---|---|
| 2. | The course covers data reading and its manipulation using R, which is widely used for data analysis internationally. Understand and implement functions that support linear modelling, non-linear modelling, classical statistics, classifications, clustering and more. |
| 3. | The course also covers different control structures and design of user-defined functions. |
| 4. | Learn how to develop the program in R Programming. |

## UNIT-I

Introduction to R: Introduction to R, Installation of R interpreter, overview of R, features of R, R character set, R words, constants, operators, precedence and associativity of the operators.

## UNIT-II

R programming environment: Programming in R using, Sequence, Selection iteration and Case logic structures.

## UNIT-III

User-defined functions in R, Recursion, Basic data structures in R (vector, factor, list, data frame, matrix, array).

## UNIT –IV

R factors: Understanding factors, Modifying factors, Factors in Data frames. Data frames in

R: Creating data frame, Operations on data frames, Accessing data frames, Creating data frames, from various sources

**References:**

1. A First Course in Statistic Programming with R by Braun & Murdoch.
2. A Beginner's Guide to R by Zuur,
3. R in a Nutshell by Adler.
4. An introduction to R by Venables & Smith.
5. Machine Learning with R by Brettlantz.

**Course Outcomes:**

**On Completing the course, the students will be able to:**

| | |
|---|---|
| **CO-1.** | Develop an R script and execute on R Programming Environment. |
| **CO-2.** | Demonstrate how to install and configure RStudio. |
| **CO-3.** | Utilize R Data types for developing programs and learn all the basics of R-Programming (Data types, Variables, and Operators) |
| **CO-4.** | Analyse data and generate reports based on the data. |
| **CO-5.** | Apply various concepts to write programs in R. |

**DIPLOMA IN ARTIFICIAL INTELLIGENCE**
**SEMESTER-II**
**DAI-123: Data Structures**
**Discipline Specific Course (DSC)**

**Time: 3 Hrs.**                                                        **Total Marks: 100**

| Credits | | |
|---|---|---|
| **L** | **T** | **P** |
| **3** | **1** | **0** |

**Theory Marks: 75**

**Theory Internal Assessment Marks:25**

**Note for paper setter and students:**

1.  **Medium of Examination is English Language.**
2.  **There will be five sections.**
3.  **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 marks each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
4.  **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

**Course Objectives:**

| 1. | The main objective of this course is to help students to understand the concept of organizing and managing data in computer's memory. |
|---|---|
| 2. | Therefore, this course introduces different data structure techniques along with their representation in computer's memory. |

**UNIT – I**

Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Operations, array and linked representations of stacks, stack applications, Queues-operations, array and linked representations.

**UNIT – II**

Search Trees: Binary Search Trees, Definition, Implementation, Operations- Searching, Insertion and Deletion, AVL Trees, Definition, Height of an AVL Tree, Operations – Insertion, Deletion and Searching, Red –Black, Splay Trees.

**UNIT-III**

Graphs: Graph Implementation Methods. Graph Traversal Methods. Sorting: Heap Sort, External Sorting- Model for external sorting, Merge Sort.

**UNIT-IV**

Pattern Matching and Tries: Pattern matching algorithms-Brute force, the Boyer –Moore algorithm, the Knuth-Morris-Pratt algorithm, Standard Tries, Compressed Tries, Suffix tries.

**References:**

1. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.
2. Data Structures using C – A. S. Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Educ
3. Data Structures: A Pseudocode Approach with C, 2nd Edition, R. F. Gilberg and B.A. Forouzan, Cengage Learning.

**Course Outcomes:**

After the course completion, the students will be able to

| | |
|---|---|
| **CO-1.** | Understand the concept of algorithm complexity and will acquire knowledge about mathematical notations which can be used to measure the algorithm's Complexity. |
| **CO-2.** | Comprehend different data structure techniques, such as array, stacks, queue, Linked |
| **CO-3.** | Apply linear search and binary search techniques in real word applications to Identify the particular element. |
| **CO-4.** | Get knowledge about different sorting algorithms along with their time Complexities. |
| **CO-5.** | List, trees, and graphs, along with the operations performed on them. |
| **CO-6.** | Understand the memory representation of the above-mentioned data Structures. |

**Time: 3 Hrs.**                                                     **Total Marks: 50**

| Credits | | |
|---|---|---|
| L | T | P |
| 0 | 0 | 2 |

**Practical Marks: 37**

**Internal Assessment Marks:13**

**Course Objectives:**

| | |
|---|---|
| 1. | Understand and implement functions that support linear modelling, non-linear modelling, classical statistics, classifications, clustering and more. |
| 2. | Learn how to develop the program in R Programming. Learn how to develop an open-source scripting language for predictive analytics and data visualization. |

**Programs based on R Language**

**Course Outcomes:**

**On Completing the course, the students will be able to:**

| | |
|---|---|
| **CO-1.** | Show the installation of the R Programming Environment. |
| **CO-2.** | Utilize R Data types for developing programs and Learn all the basics of R-Programming (Data types, Variables, and Operators). |
| **CO-3.** | Implementation of R-loops with different examples, learn the basics of functions in R and Implement with example. |
| **CO-4.** | Join columns and rows in a data frame using bind functions, developing packages, data Frames. |
| **CO-5.** | Learning with different file systems and CSV file systems. |

**DIPLOMA IN ARTIFICIAL INTELLIGENCE**
**SEMESTER-II**
**DAI-125P Lab II- Data Structures Implementation using Python**
**Skill Enhancement Course (SEC)**

**Time: 3 Hrs.**                                                        **Total Marks: 50**

| Credits | | |
|---|---|---|
| **L** | **T** | **P** |
| **0** | **0** | **2** |

**Practical Marks: 37**

**Theory Internal Assessment Marks:13**

**Course Objectives:**

| | |
|---|---|
| 1. | The main objective of this practical lab is to make the students to be able to implement the programs utilizing different data structure techniques to organize and manage data in computer's memory. |
| 2. | The students will gain an understanding of different approaches available for searching and sorting the data and further be able to identify the methods Requiring minimum time to perform the pre-mentioned tasks. |

**Data Structures Implementation using Python**

1. Binary Search in Python
2. Linear Search in Python
3. Bubble Sort in Python
4. Insertion Sort in Python
5. Heap Sort in Python
6. Merge Sort in Python
7. Python program to create a Circular Linked List of N nodes and count the number of nodes
8. Python program to create a Circular Linked List of n nodes and display it in reverse order
9. Python program to create and display a Circular Linked List
10. Python program to delete a node from the beginning of the Circular Linked List
11. Python program to delete a node from the end of the Circular Linked List
12. Python program to delete a node from the middle of the Circular Linked List
13. Python program to find the maximum and minimum value node from a circular linked list
14. Python program to insert a new node at the beginning of the Circular Linked List
15. Python program to insert a new node at the end of the Circular Linked List

16. Python program to insert a new node at the middle of the Circular Linked List

17. Python program to remove duplicate elements from a Circular Linked List

18. Python program to search an element in a Circular Linked List

19. Python program to sort the elements of the Circular Linked List

20. Python program to convert a given binary tree to doubly linked list

21. Python program to create a doubly linked list from a ternary tree

22. Python program to create a doubly linked list of n nodes and count the number of nodes

23. Python program to create a doubly linked list of n nodes and display it in reverse order

24. Python program to create and display a doubly linked list

25. Python program to delete a new node from the beginning of the doubly linked list

26. Python program to delete a new node from the end of the doubly linked list

27. Python program to delete a new node from the middle of the doubly linked list

28. Python program to find the maximum and minimum value node from a doubly linked  list

29. Python program to insert a new node at the beginning of the Doubly Linked list

30. Python program to insert a new node at the end of the Doubly Linked List

**Course Outcomes:**

After the completion of this course, students will be able

| CO-1. | To implement the real world applications by making use of linear data structure, such as, arrays, stacks, queues, linked lists, trees and graphs, to handle the data stored in computer's memory. |
|---|---|
| CO-2. | To perform the implementation using non-linear data structure, such as, trees and graphs. |
| CO-3. | To perform traversing, insertion, and deletion operations on the above-Mentioned data structures. |
| CO-4. | To perform the search operations by making use of suitable search technique. |
| CO-5. | To sort the data by using different sorting techniques and can also assess the Time requirement of the available sorting techniques. |