



BONAM VENKATA CHALAMAYYA ENGINEERING COLLEGE
ODALAREVU – 533 210, Andhra Pradesh, India
Autonomous

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
Course Structure – BR23 Regulations
For UG - B.Tech: ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
II Year Course Structure

Semester-I							
S.No.	Course Category	Course Code	Course Name	L	T	P	Credits
1.	BSC	23BS3T09	Discrete Mathematics & Graph Theory	3	0	0	3
2.	HSMC	23HM3T02	Universal human values – understanding harmony and Ethical human conduct	2	1	0	3
3.	ESC	23ES3T11	Artificial Intelligence	3	0	0	3
4.	PCC	23CS3T02	Advanced Data Structures and Algorithm Analysis	3	0	0	3
5.	PCC	23CS3T03	Object Oriented Programming Through Java	3	0	0	3
6.	PCC	23CS3L02	Advanced Data Structures and Algorithm Analysis Lab	0	0	3	1.5
7.	PCC	23CS3L03	Object Oriented Programming Through Java Lab	0	0	3	1.5
5	SEC	23CS3S03	Python Programming	0	1	2	2
9.	Audit Course	23AC3T01	Environmental Science	2	0	0	-
Total				16	2	8	20

Dr. N Ramakrishnaiah, Professor of CSE. UCEK, JNTUK Kakinada.	Dr. Jimson Mathew, Professor of CSE. IIT Patna	Dr. B D Sahoo, Professor of CSE, NIT Rourkela.	Narayana Rao Routhu, Technology Manager, Hidden Brains, Ahmadabad.	Dr. S Rao Chintalapudi, Professor and HoD, CSE(AIML) CMR Technical Campus, Hyderabad.	Dr. B S N Murthy Professor of CSE, BVCEC.

Head of the
CAD, AIML & CSM
BVC Engineering College, Odalarevu
East Godavari, A.P. 533 210



**BONAM VENKATA CHALAMAYYA ENGINEERING COLLEGE ODALAREVU – 533 210,
Andhra Pradesh, India**

II Year - I Semester	Code: 23ES3T11	L	T	P	C
		3	0	0	3

ARTIFICIAL INTELLIGENCE

Course Objectives:

1. The student should be made to learn the methods of solving problems using Artificial Intelligence.
2. The student should be made to introduce the concepts of Expert Systems.
3. To understand the applications of AI, namely game playing, theorem proving, and machine learning.
4. To learn different knowledge representation techniques

Course Outcomes:

CO Number	Course Outcome	Blooms Level
CO1	The student should be made to study the concepts of Artificial Intelligence.	BL1
CO2	The student should be made to learn the methods of solving problems using Artificial Intelligence.	BL2
CO3	The student should be made to introduce the concepts of Expert Systems.	BL3
CO4	Students will be able to understand the applications of AI, namely game playing, theorem proving, and machine learning.	BL2
CO5	Students will be able to learn different knowledge representation techniques	BL3

UNIT – I

Introduction: AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.

UNIT – II

Searching- Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Hill climbing, A*, AO* Algorithms, Problem reduction, Game Playing-Adversial search, Games, mini-max algorithm, optimal decisions in multiplayer games, Problem in Game playing, Alpha-Beta pruning, Evaluation functions

UNIT – III

Representation of Knowledge: Knowledge representation issues, predicate logic- logic programming, semantic nets- frames and inheritance, constraint propagation, representing knowledge using rules, rules-based deduction systems. Reasoning under uncertainty, review of probability, Bayes' probabilistic interferences and Dempster Shafer theory.

			<i>online</i>	<i>Ch. S. Rao</i>	
Dr. N Ramakrishnaiah, Professor of CSE. UCEK, JNTUK Kakinada.	Dr. Jimson Mathew, Professor of CSE. IIT Patna	Dr. B D Sahoo, Professor of CSE, NIT Rourkela.	Narayana Rao Routhu, Technology Manager, Hidden Brains, Ahmadabad.	Dr. S Rao Chintalapudi, Professor and HoD, CSE(AIML) CMR Technical Campus, Hyderabad.	Dr. B S N Murthy Professor of CSE, BVCEC.

**Head of the
CAD, AIML & CSM
BVC Engineering College, Odalarevu
East Godavari, A.P. 533 21**



BONAM VENKATA CHALAMAYYA ENGINEERING COLLEGE ODALAREVU – 533 210,
Andhra Pradesh, India

UNIT – IV

Logic concepts: First order logic. Inference in first order logic, propositional vs. first order inference, unification & forward chaining, Backward chaining, Resolution, Learning from observation Inductive learning, Decision trees Explanation based learning, Statistical Learning methods, Reinforcement Learning.

UNIT – V

Expert Systems: Architecture of expert systems, Roles of expert systems – Knowledge Acquisition Meta knowledge Heuristics. Typical expert systems – MYCIN, DART, XCON: Expert systems shells.

Textbooks

- 1.S.Russel and P. Norvig, “Artificial Intelligence – A Modern Approach”, Second Edition, Pearson Education.
- 2.Kevin Night and Elaine Rich, Nair B., “Artificial Intelligence (SIE)”, Mc Graw Hill

Reference Books:

- 1.David Poole, Alan Mackworth, Randy Goebel, “Computational Intelligence: a logical approach”, Oxford University Press.
- 2.G.Luger, “Artificial Intelligence: Structures and Strategies for complex problem solving”, Fourth Edition, Pearson Education.
3. J. Nilsson, “Artificial Intelligence: A new Synthesis”, Elsevier Publishers. Artificial Intelligence, Saroj Kaushik, CENGAGE Learning.

Online Learning Resources:

1. <https://ai.google/>
2. https://swayam.gov.in/nd1_noc19_me71/preview

Dr. N Ramakrishnaiah, Professor of CSE. UCEK, JNTUK Kakinada.	Dr. Jimson Mathew, Professor of CSE. IIT Patna	Dr. B D Sahoo, Professor of CSE, NIT Rourkela.	Narayana Rao Routhu, Technology Manager, Hidden Brains, Ahmadabad.	Dr. S Rao Chintalapudi, Professor and HoD, CSE(AIML) CMR Technical Campus, Hyderabad.	Dr. B S N Murthy Professor of CSE, BVCEC.

Head of the
CAD, AIML & CSM
BVC Engineering College, Odalarevu
East Godavari, A.P. 533 210



II Year - I Semester	Code: 23CS3T02	L	T	P	C
		3	0	0	3
ADVANCED DATA STRUCTURES AND ALGORITHM ANALYSIS (Common to CSE/IT/CSE(AI&DS)/CSE(AI&ML)/AIML)					
Course Objectives: The main objectives of the course is to <input type="checkbox"/> provide knowledge on advance data structures frequently used in Computer Science domain <input type="checkbox"/> Develop skills in algorithm design techniques popularly used <input type="checkbox"/> Understand the use of various data structures in the algorithm design					
Course Outcomes: Students are able to					
CO Number	Course Outcome				Blooms Level
CO1	Analyze the time and space complexities of algorithms and perform the tree operations.				BL4
CO2	Understand the concepts of graphs and bi connected components.				BL2
CO3	Apply Greedy algorithm and Dynamic programming to schedule jobs efficiently				BL3
CO4	Solve 0/1 Knapsack problem using back tracking and graph coloring problems.				BL3
CO5	Formulate the problem of scheduling identical processors and NP hardness				BL6
UNIT I					10Hrs
Introduction to Algorithm Analysis: Space and Time Complexity analysis, Asymptotic Notations. AVL Trees – Creation, Insertion, Deletion operations and Applications B-Trees – Creation, Insertion, Deletion operations and Applications					
UNIT II					8Hrs
Heap Trees (Priority Queues) – Min and Max Heaps, Operations and Applications, Graphs – Terminology, Representations, Basic Search and Traversals, Connected, Components and Biconnected Components, applications,					
UNIT III					15Hrs
Divide and Conquer: The General Method, Quick Sort, Merge Sort, Strassen’s matrix multiplication, Convex Hull. Greedy Method: General Method, Job Sequencing with deadlines, Knapsack Problem, Minimum cost spanning trees, Single Source Shortest Path.					

Dr. N Ramakrishnaiah, Professor of CSE. UCEK, JNTUK Kakinada.	Dr. Jimson Mathew, Professor of CSE. IIT Patna	Dr. B D Sahoo, Professor of CSE, NIT Rourkela.	Narayana Rao Routhu, Technology Manager, Hidden Brains, Ahmadabad.	Dr. S Rao Chintalapudi, Professor and HoD, CSE(AIML) CMR Technical Campus, Hyderabad.	Dr. B S N Murthy Professor of CSE, BVCEC.

Head of the
CAD, AIML & CSM
BVC Engineering College, Odalarevu
East Godavari, A.P. 533 211



UNIT IV	Dynamic Programming: General Method, All pairs shortest paths, Single Source Shortest Paths– General Weights (Bellman Ford Algorithm), Optimal Binary Search Trees, 0/1 Knapsack, String Editing, Travelling Salesperson problem. Backtracking: General Method, 8-Queens Problem, Sum of Subsets problem, Graph Coloring, 0/1 Knapsack Problem.	12Hrs
UNIT V	Branch and Bound: The General Method, 0/1 Knapsack Problem, Travelling Salesperson problem NP Hard and NP Complete Problems: Basic Concepts, Cook’s theorem NP Hard Graph Problems: Clique Decision Problem (CDP), Chromatic Number Decision Problem (CNDP), Travelling Salesperson Decision Problem (TSP) NP Hard Scheduling Problems: Scheduling Identical Processors, Job Shop Scheduling	15Hrs
Text Books:	<ol style="list-style-type: none"> 1. Fundamentals of Data Structures in C++, Horowitz, Ellis; Sahni, Sartaj; Mehta, Dinesh, 2ndEdition Universities Press 2. Computer Algorithms in C++, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, 2nd Edition University Press 3. Data Structures and algorithms in C++: Adan,drozdek 4. Design and Anlysis of Computer Algorithms:AHO/ULLMAN 5. Fundamentals of Computer Algorithms: ELLIS HOROWITZ,SARTAJ SAHNI, RAJASEKHARAN 	
Reference Books:	<ol style="list-style-type: none"> 1. Data Structures and program design in C, Robert Kruse, Pearson Education Asia 2. An introduction to Data Structures with applications, Trembley& Sorenson, McGraw Hill 3. The Art of Computer Programming, Vol.1: Fundamental Algorithms, Donald E Knuth, Addison-Wesley, 1997. 4. Data Structures using C & C++: Langsam, Augenstein & Tanenbaum, Pearson, 1995 5. Algorithms + Data Structures & Programs:, N. Wirth, PHI 6. Fundamentals of Data Structures in C++: Horowitz Sahni& Mehta, Galgottia Pub. 7. Data structures in Java:, Thomas Standish, Pearson Education Asia 8. Design and Analysis of Computer Algorithms, Aho Ullman. 9. Data Structures and Algorithms in C++, Adan, Drozedek 	
Online Learning Resources:	<ol style="list-style-type: none"> 1. https://www.tutorialspoint.com/advanced_data_structures/index.asp 2. http://peterindia.net/Algorithms.html 3. Abdul Bari, Introduction to Algorithms (youtube.com) 	

Dr. N Ramakrishnaiah, Professor of CSE. UCEK, JNTUK Kakinada.	Dr. Jimson Mathew, Professor of CSE. IIT Patna	Dr. B D Sahoo, Professor of CSE, NIT Rourkela.	Narayana Rao Routhu, Technology Manager, Hidden Brains, Ahmadabad.	Dr. S Rao Chintalapudi, Professor and HoD, CSE(AIML) CMR Technical Campus, Hyderabad.	Dr. B S N Murthy Professor of CSE, BVCEC.

**Head of the
CAD, AIML & CSM
Engineering College, Odalarevu
East Godavari, A.P. 521101**



II Year - I Semester	Code: 23CS3T03	L	T	P	C
		3	0	0	3

OBJECT ORIENTED PROGRAMMING THROUGH JAVA
 (Common to CSE/IT/CSE(AI&DS)/CSE(AI&ML)/AIML)

Course Objectives:

The learning objectives of this course are to:

- Identify Java language components and how they work together in applications
- Learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
 Learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications
- Understand how to design applications with threads in Java
- Understand how to use Java APIs for program development

Course Outcomes: Students are able to

CO Number	Course Outcome	Blooms Level
CO1	Illustrate a primitive data types , operators and flow of control and how they work together in applications	BL3
CO2	Apply the concepts of object-oriented programming and class concepts.	BL3
CO3	Apply the concept of inheritance and Interfaces	BL3
CO4	Create a packages, files and Exception handling	BL6
CO5	Able to apply the concept of multithreading and JDBC	BL3

UNIT I

Object Oriented Programming: Basic concepts, Principles, Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences, Comments, Programming Style.

Data Types, Variables, and Operators :Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable, Identifier, Literal, Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables, Introduction to Operators, Precedence and Associativity of Operators, Assignment Operator (=), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean, Logical Operators, Bitwise Operators. Control Statements: Introduction, if Expression, Nested if Expressions, if-else Expressions, Ternary Operator?., Switch Statement, Iteration Statements, while Expression, do-while Loop, for Loop, Nested for Loop, For-Each for Loop, Break Statement, Continue Statement.

Dr. N Ramakrishnaiah, Professor of CSE. UCEK, JNTUK Kakinada.	Dr. Jimson Mathew, Professor of CSE. IIT Patna	Dr. B D Sahoo, Professor of CSE, NIT Rourkela.	Narayana Rao Routhu, Technology Manager, Hidden Brains, Ahmadabad.	Dr. S Rao Chintalapudi, Professor and HoD, CSE(AIML) CMR Technical Campus, Hyderabad.	Dr. B S N Murthy Professor of CSE, BVCEC.

Head of the
CAD, AIML & CSM
BVC Engineering College, Odalarevu
East Godavari, A.P. 533 210



UNIT II

Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this. **Methods:** Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static.

UNIT III

Arrays: Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three dimensional Arrays, Arrays as Vectors. **Inheritance:** Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class-Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes. **Interfaces:** Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.

UNIT IV

Packages and Java Library: Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java.lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Autoboxing and Auto-unboxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java.time.Instant), Formatting for Date/Time in Java, Temporal Adjusters Class. **Exception Handling:** Introduction, Hierarchy of Standard Exception Classes, Unchecked Exceptions, Checked Exceptions, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable. **Java I/O and File:** Java I/O API, standard I/O streams, types, Byte streams, Character streams, Scanner class, Files in Java(Text Book 2)

Dr. N Ramakrishnaiah, Professor of CSE. UCEK, JNTUK Kakinada.	Dr. Jimson Mathew, Professor of CSE. IIT Patna	Dr. B D Sahoo, Professor of CSE, NIT Rourkela.	Narayana Rao Routhu, Technology Manager, Hidden Brains, Ahmadabad.	Dr. S Rao Chintalapudi, Professor and HoD, CSE(AIML) CMR Technical Campus, Hyderabad.	Dr. B S N Murthy Professor of CSE, BVCEC.

Head of the CAD, AIML & CSM
BVC Engineering College, Odalarevu
East Godavari, A.P. 533 210



UNIT V

String Handling in Java: Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Comparison, Modifying, Searching; Class String Buffer.

Multithreaded Programming: Introduction, Need for Multiple Threads, Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread, Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter-thread Communication - Suspending, Resuming, and Stopping of Threads.

Java Database Connectivity: Introduction, JDBC Architecture, Installing MySQL and MySQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, Result Set Interface.

Java FX GUI: Java FX Scene Builder, Java FX App Window Structure, displaying text and image, event handling, laying out nodes in scene graph, mouse events (Text Book 3)

Text Books:

- 1) JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
- 2) Joy with JAVA, Fundamentals of Object Oriented Programming, Debasis Samanta, Monalisa Sarma, Cambridge, 2023.
- 3) JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.
- 4) Programming with JAVA E Balaguru Samy

Reference Books:

- 1) The complete Reference Java, 11th edition, Herbert Schildt, TMH
- 2) Introduction to Java programming, 7th Edition, Y Daniel Liang, Pearson

Online Learning Resources:

1. <https://nptel.ac.in/courses/106/105/106105191/>
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547618816347_shared/overview
3. <https://myacademy.oracle.com/>

Dr. N Ramakrishnaiah, Professor of CSE. UCEK, JNTUK Kakinada.	Dr. Jimson Mathew, Professor of CSE. IIT Patna	Dr. B D Sahoo, Professor of CSE, NIT Rourkela.	Narayana Rao Routhu, Technology Manager, Hidden Brains, Ahmadabad.	Dr. S Rao Chintalapudi, Professor and HoD, CSE(AIML) CMR Technical Campus, Hyderabad.	Dr. B S N Murthy Professor of CSE, BVCEC.

Head of the
CAD, AIML & CSM
BVC Engineering College, Odalarevu
East Godavari, A.P. 533 210



II Year - I Semester	Code: 23CS3L02	L	T	P	C																		
		0	0	3	1.5																		
ADVANCED DATA STRUCTURES AND ALGORITHM ANALYSIS LAB (Common to CSE/IT/CSE(AI&DS)/CSE(AI&ML)/AIML)																							
Course Objectives: The objectives of the course is to <input type="checkbox"/> acquire practical skills in constructing and managing Data structures <input type="checkbox"/> apply the popular algorithm design methods in problem-solving scenarios																							
Course Outcomes: Students are able to <table border="1"> <thead> <tr> <th>CO Number</th> <th>Course Outcome</th> <th>Blooms Level</th> </tr> </thead> <tbody> <tr> <td>CO1</td> <td>Analyse AVL Trees and B-Tree</td> <td>BL4</td> </tr> <tr> <td>CO2</td> <td>Apply algorithms of advance data structures used in heap tree, graph and divide and conquer</td> <td>BL3</td> </tr> <tr> <td>CO3</td> <td>Apply greedy method techniques and shortest path algorithm</td> <td>BL3</td> </tr> <tr> <td>CO4</td> <td>Implement to queens and 0/1 knapsack problems</td> <td>BL3</td> </tr> <tr> <td>CO5</td> <td>Describe various branch and bound approaches</td> <td>BL2</td> </tr> </tbody> </table>						CO Number	Course Outcome	Blooms Level	CO1	Analyse AVL Trees and B-Tree	BL4	CO2	Apply algorithms of advance data structures used in heap tree, graph and divide and conquer	BL3	CO3	Apply greedy method techniques and shortest path algorithm	BL3	CO4	Implement to queens and 0/1 knapsack problems	BL3	CO5	Describe various branch and bound approaches	BL2
CO Number	Course Outcome	Blooms Level																					
CO1	Analyse AVL Trees and B-Tree	BL4																					
CO2	Apply algorithms of advance data structures used in heap tree, graph and divide and conquer	BL3																					
CO3	Apply greedy method techniques and shortest path algorithm	BL3																					
CO4	Implement to queens and 0/1 knapsack problems	BL3																					
CO5	Describe various branch and bound approaches	BL2																					
Experiments covering the Topics: <ul style="list-style-type: none"> ➤ Operations on AVL trees, B-Trees, Heap Trees ➤ Graph Traversals ➤ Sorting techniques ➤ Minimum cost spanning trees ➤ Shortest path algorithms ➤ 0/1 Knapsack Problem ➤ Travelling Salesperson problem ➤ Optimal Binary Search Trees ➤ N-Queens Problem ➤ Job Sequencing 																							
Sample Programs: <ol style="list-style-type: none"> Construct an AVL tree for a given set of elements which are stored in a file. And implement insert and delete operation on the constructed tree. Write contents of tree into a new file using in-order. Construct B-Tree an order of 5 with a set of 100 random elements stored in array. Implement searching, insertion and deletion operations. Construct Min and Max Heap using arrays, delete any element and display the content of the Heap. Implement BFT and DFT for given graph, when graph is represented by a) Adjacency Matrix b) Adjacency Lists Write a program for finding the biconnected components in a given graph. 																							

Dr. N Ramakrishnaiah, Professor of CSE. UCEK, JNTUK Kakinada.	Dr. Jimson Mathew, Professor of CSE. IIT Patna	Dr. B D Sahoo, Professor of CSE, NIT Rourkela.	Narayana Rao Routhu, Technology Manager, Hidden Brains, Ahmadabad.	Dr. S Rao Chintalapudi, Professor and HoD, CSE(AIML) CMR Technical Campus, Hyderabad.	Dr. B S N Murthy Professor of CSE, BVCEC.



6. Implement Quick sort and Merge sort and observe the execution time for various input sizes (Average, Worst and Best cases).
7. Compare the performance of Single Source Shortest Paths using Greedy method when the graph is represented by adjacency matrix and adjacency lists.
8. Implement Job Sequencing with deadlines using Greedy strategy.
9. Write a program to solve 0/1 Knapsack problem Using Dynamic Programming.
10. Implement N-Queens Problem Using Backtracking.
11. Use Backtracking strategy to solve 0/1 Knapsack problem.
12. Implement Travelling Sales Person problem using Branch and Bound approach.

Reference Books:

1. Fundamentals of Data Structures in C++, Horowitz Ellis, Sahni Sartaj, Mehta, Dinesh, 2nd Edition, Universities Press
2. Computer Algorithms/C++ Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, 2nd Edition, University Press
3. Data Structures and program design in C, Robert Kruse, Pearson Education Asia
4. An introduction to Data Structures with applications, Trembley & Sorenson, McGraw Hill

Online Learning Resources:

1. <http://cse01-iiith.vlabs.ac.in/>
2. <http://peterindia.net/Algorithms.html>
3. <https://myacademy.oracle.com/>
4. <https://gradwise.in/>

Note: At the end of Lab course students have to complete a Mini Project/Case Study for evaluation of Internal Marks.

			online	Ch. S. Rao	
Dr. N Ramakrishnaiah, Professor of CSE. UCEK, JNTUK Kakinada.	Dr. Jimson Mathew, Professor of CSE. IIT Patna	Dr. B D Sahoo, Professor of CSE, NIT Rourkela.	Narayana Rao Routhu, Technology Manager, Hidden Brains, Ahmadabad.	Dr. S Rao Chintalapudi, Professor and HoD, CSE(AIML) CMR Technical Campus, Hyderabad.	Dr. B S N Murthy Professor of CSE, BVCEC.

Head of the
CAD, AIML & CSM
BVC Engineering College, Odalarevu
East Godavari, A.P. 533 210



II Year - I Semester	Code: 23CS3L03	L	T	P	C
		0	0	3	1.5
OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB (Common to CSE/IT/CSE(AI&DS)/CSE(AI&ML)/AIML)					
Course Objectives: The aim of this course is to <ul style="list-style-type: none"> ➤ Practice object oriented programming in the Java programming language ➤ Implement Classes, Objects, Methods, Inheritance, Exception, Runtime ➤ Polymorphism, User defined Exception handling mechanism ➤ Illustrate inheritance, Exception handling mechanism, JDBC connectivity ➤ Construct Threads, Event Handling, implement packages, Java FX GUI 					
Course Outcomes: Students are able to					
CO Number	Course Outcome				Blooms Level
CO1	Illustrate a primitive data types , operators and flow of control and how they work together in applications				BL3
CO2	Apply the concepts of object-oriented programming and class concepts.				BL3
CO3	Apply the concept of inheritance and Interfaces				BL3
CO4	Create a packages, files and Exception handling				BL6
CO5	Able to apply the concept of multithreading and JDBC				BL3
Experiments covering the Topics: <ul style="list-style-type: none"> ➤ Object Oriented Programming fundamentals- data types, control structures ➤ Classes, methods, objects, Inheritance, polymorphism, ➤ Exception handling, Threads, Packages, Interfaces ➤ Files, I/O streams, Java FX GUI 					
Sample Experiments: Exercise – 1: a) Write a JAVA program to display default value of all primitive data type of JAVA b) Write a java program that display the roots of a quadratic equation $ax^2+bx=0$. Calculate the discriminate D and basing on value of D, describe the nature of root.					
Exercise - 2 a) Write a JAVA program to search for an element in a given list of elements using binary search mechanism. b) Write a JAVA program to sort for an element in a given list of elements using bubble sort c) Write a JAVA program using String Buffer to delete, remove character.					

Dr. N Ramakrishnaiah, Professor of CSE. UCEK, JNTUK Kakinada.	Dr. Jimson Mathew, Professor of CSE. IIT Patna	Dr. B D Sahoo, Professor of CSE, NIT Rourkela.	Narayana Rao Routhu, Technology Manager, Hidden Brains, Ahmadabad.	Dr. S Rao Chintalapudi, Professor and HoD, CSE(AIML) CMR Technical Campus, Hyderabad.	Dr. B S N Murthy Professor of CSE, BVCEC.

Head of the
CAD, AIML & CSM
BVC Engineering College, Odalarevu
East Godavari, A.P. 533 210



Exercise - 3

- a) Write a JAVA program to implement class mechanism. Create a class, methods and invoke them inside main method.
- b) Write a JAVA program implement method overloading.
- c) Write a JAVA program to implement constructor.
- d) Write a JAVA program to implement constructor overloading.

Exercise - 4

- a) Write a JAVA program to implement Single Inheritance
- b) Write a JAVA program to implement multi level Inheritance
- c) Write a JAVA program for abstract class to find areas of different shapes

Exercise - 5

- a) Write a JAVA program give example for “super” keyword.
- b) Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?
- c) Write a JAVA program that implements Runtime polymorphism

Exercise - 6

- a) Write a JAVA program that describes exception handling mechanism
- b) Write a JAVA program Illustrating Multiple catch clauses
- c) Write a JAVA program for creation of Java Built-in Exceptions
- d) Write a JAVA program for creation of User Defined Exception

Exercise - 7

- a) Write a JAVA program that creates threads by extending Thread class. First thread display “Good Morning “every 1 sec, the second thread displays “Hello “every 2 seconds and the third display “Welcome” every 3 seconds,(Repeat the same by implementing Runnable)
- b) Write a program illustrating is Alive and join ()
- c) Write a Program illustrating Daemon Threads.
- d) Write a JAVA program Producer Consumer Problem

Exercise – 8

- a) Write a JAVA program that import and use the user defined packages
- b) Without writing any code, build a GUI that display text in label and image in an Image View (use Java FX)
- c) Build a Tip Calculator app using several JavaFX components and learn how to respond to user interactions with the GUI

			online	Ch. S. Rao	
Dr. N Ramakrishnaiah, Professor of CSE. UCEK, JNTUK Kakinada.	Dr. Jimson Mathew, Professor of CSE. IIT Patna	Dr. B D Sahoo, Professor of CSE, NIT Rourkela.	Narayana Rao Routhu, Technology Manager, Hidden Brains, Ahmadabad.	Dr. S Rao Chintalapudi, Professor and HoD, CSE(AIML) CMR Technical Campus, Hyderabad.	Dr. B S N Murthy Professor of CSE, BVCEC.

**Head of the
CAD, AIML & CSM
BVC Engineering College, Odalarevu
East Godavari, A.P. 533 210**



Exercise – 9

- Write a java program that connects to a database using JDBC
- Write a java program to connect to a database using JDBC and insert values into it.
- Write a java program to connect to a database using JDBC and delete values from it

Text Books:

- JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
- Joy with JAVA, Fundamentals of Object Oriented Programming, Debasis Samanta, Monalisa Sarma, Cambridge, 2023.
- JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.

Reference Books:

- The complete Reference Java, 11th edition, Herbert Schildt, TMH
- Introduction to Java programming, 7th Edition, Y Daniel Liang, Pearson

- <https://nptel.ac.in/courses/106/105/106105191/>
- https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547618816347_shared/overview
- <https://myacademy.oracle.com/>
- <https://gradwise.in/>

Note: At the end of Lab course students have to complete a Mini Project/Case Study for evaluation of Internal Marks.

			Online	Ch. S. Rao,	
Dr. N Ramakrishnaiah, Professor of CSE. UCEK, JNTUK Kakinada.	Dr. Jimson Mathew, Professor of CSE. IIT Patna	Dr. B D Sahoo, Professor of CSE, NIT Rourkela.	Narayana Rao Routhu, Technology Manager, Hidden Brains, Ahmadabad.	Dr. S Rao Chintalapudi, Professor and HoD, CSE(AIML) CMR Technical Campus, Hyderabad.	Dr. B S N Murthy Professor of CSE, BVCEC.

Head of the
CAD, AIML & CSM
BVC Engineering College, Odalarevu
East Godavari, A.P. 533 210



II Year - I Semester	Code: 23CS3S03	L	T	P	C
		0	1	2	2

PYTHON PROGRAMMING
(Common to CSE/IT/CSE(AI&DS)/CSE(AI&ML)/AIML)

Course Objectives:

The main objectives of the course are to

- Introduce core programming concepts of Python programming language.
- Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries
- Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications using these

Course Outcomes: Students are able to

CO Number	Course Outcome	Blooms Level
CO1	Apply python programming concepts and the basic operations like operators and data types and control flow	BL3
CO2	Apply concepts of functions, string and create list and List Methods	BL3
CO3	Apply Python data structures like Lists, Tuples, Sets and dictionaries	BL3
CO4	Apply file Functions, array and matrices concepts	BL3
CO5	Apply concept of data science , functional programming and XML in python	BL3

UNIT I

9Hrs

History of Python Programming Language, Thrust Areas of Python, Installing Anaconda Python Distribution, Installing and Using Jupyter Notebook. Parts of Python Programming Language: 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: if statement, if-else statement, if...elif...else, Nested if statement, while Loop, for Loop, continue and break Statements, Catching Exceptions Using try and except Statement.

Sample Experiments:

1. Write a program to find the largest element among three Numbers.
2. Write a Program to display all prime numbers within an interval
3. Write a program to swap two numbers without using a temporary variable.
4. Demonstrate the following Operators in Python with suitable examples.
 - i) Arithmetic Operators
 - ii) Relational Operators
 - iii) Assignment Operators
 - iv) Logical Operators
 - v) Bit wise Operators
 - vi) Ternary Operator
 - vii) Membership Operators
 - viii) Identity Operators
5. Write a program to add and multiply complex numbers
6. Write a program to print multiplication table of a given number.

Dr. N Ramakrishnaiah, Professor of CSE. UCEK, JNTUK Kakinada.	Dr. Jimson Mathew, Professor of CSE. IIT Patna	Dr. B D Sahoo, Professor of CSE, NIT Rourkela.	Narayana Rao Routhu, Technology Manager, Hidden Brains, Ahmadabad.	Dr. S Rao Chintalapudi, Professor and HoD, CSE(AIML) CMR Technical Campus, Hyderabad.	Dr. B S N Murthy Professor of CSE, BVCEC.



UNIT II

9Hrs

Functions: Built-In Functions, Commonly Used Modules, Function Definition and Calling the function, return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments. Strings: Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings.
Lists: Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement.

Sample Experiments:

1. Write a program to define a function with multiple return values.
2. Write a program to define a function using default arguments.
3. Write a program to find the length of the string without using any library functions.
4. Write a program to check if the substring is present in a given string or not.
5. Write a program to perform the given operations on a list:
i. addition ii. Insertion iii. slicing
6. Write a program to perform any 5 built-in functions by taking any list.

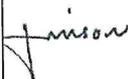
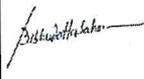
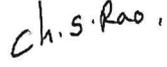
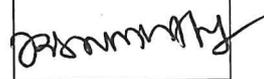
UNIT III

10Hrs

Dictionaries: Creating Dictionary, Accessing and Modifying key: value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement.
Tuples and Sets: Creating Tuples, Basic Tuple Operations, tuple() Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip() Function, Sets, Set Methods, Frozenset.

Sample Experiments:

1. Write a program to create tuples (name, age, address, college) for at least two members and concatenate the tuples and print the concatenated tuples.
2. Write a program to count the number of vowels in a string (No control flow allowed).
3. Write a program to check if a given key exists in a dictionary or not.
4. Write a program to add a new key-value pair to an existing dictionary.
5. Write a program to sum all the items in a given dictionary.

					
Dr. N Ramakrishnaiah, Professor of CSE. UCEK, JNTUK Kakinada.	Dr. Jimson Mathew, Professor of CSE. IIT Patna	Dr. B D Sahoo, Professor of CSE, NIT Rourkela.	Narayana Rao Routhu, Technology Manager, Hidden Brains, Ahmadabad.	Dr. S Rao Chintalapudi, Professor and HoD, CSE(AIML) CMR Technical Campus, Hyderabad.	Dr. B S N Murthy Professor of CSE, BVCEC.

**Head of the
CAD, AIML & CSM
BVC Engineering College, Odalarevu
East Godavari, A.P. 533 210**



UNIT IV

10Hrs

Files: Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, Pickle Module, Reading and Writing CSV Files, Python os and os.path Modules.

Object-Oriented Programming: Classes and Objects, Creating Classes in Python, Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes Vs Data Attributes, Encapsulation, Inheritance, Polymorphism.

Sample Experiments:

1. Write a program to sort words in a file and put them in another file. The output file should have only lower-case words, so any upper-case words from source must be lowered.
2. Python program to print each line of a file in reverse order.
3. Python program to compute the number of characters, words and lines in a file.
4. Write a program to create, display, append, insert and reverse the order of the items in the array.
5. Write a program to add, transpose and multiply two matrices.
6. Write a Python program to create a class that represents a shape. Include methods to calculate its area and perimeter. Implement subclasses for different shapes like circle, triangle, and square

Dr. N Ramakrishnaiah, Professor of CSE. UCEK, JNTUK Kakinada.	Dr. Jimson Mathew, Professor of CSE. IIT Patna	Dr. B D Sahoo, Professor of CSE, NIT Rourkela.	Narayana Rao Routhu, Technology Manager, Hidden Brains, Ahmadabad.	Dr. S Rao Chintalapudi, Professor and HoD, CSE(AIML) CMR Technical Campus, Hyderabad.	Dr. B S N Murthy Professor of CSE, BVCEC.

Head of the
CAD, AIML & CSM
BVC Engineering College, Odalarevu
East Godavari, A.P. 533 210



UNIT V	10Hrs
Introduction to Data Science: Functional Programming, JSON and XML in Python, NumPy with Python, Pandas.	
Sample Experiments:	
<ol style="list-style-type: none"> 1. Python program to check whether a JSON string contains complex object or not. 2. Python Program to demonstrate NumPy arrays creation using array () function. 3. Python program to demonstrate use of ndim, shape, size, dtype. 4. Python program to demonstrate basic slicing, integer and Boolean indexing. 5. Python program to find min, max, sum, cumulative sum of array 6. Create a dictionary with at least five keys and each key represent value as a list where this list contains at least ten values and convert this dictionary as a pandas data frame and explore the data through the data frame as follows: <ol style="list-style-type: none"> a) Apply head () function to the pandas data frame b) Perform various data selection operations on Data Frame 7. Select any two columns from the above data frame, and observe the change in one attribute with respect to other attribute with scatter and plot operations in matplotlib 	
Reference Books:	
<ol style="list-style-type: none"> 1. Gowrishankar S, Veena A., Introduction to Python Programming, CRC Press. 2. Python Programming, S Sridhar, J Indumathi, V M Hariharan, 2ndEdition, Pearson,2024 3. Introduction to Programming Using Python, Y. Daniel Liang, Pearson. 4. Python programming :Vamsikurama 5. Python programming using Problem solving Approach:Reema Thareja 6. Python programming :Ch.satyanarayana,M.Radhika mani,B N Jagadesh 	
Online Learning Resources:	
<ol style="list-style-type: none"> 1. https://www.coursera.org/learn/python-for-applied-data-science-ai 2. https://www.coursera.org/learn/python?specialization=python#syllabus 3. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01384308180914995230308_shared/overview 4. https://myacademy.oracle.com/ 5. https://gradwise.in 	

Note: At the end of Lab course students have to complete a Mini Project/Case Study for evaluation on Internal Marks.

Dr. N Ramakrishnaiah, Professor of CSE. UCEK, JNTUK Kakinada.	Dr. Jimson Mathew, Professor of CSE. IIT Patna	Dr. B D Sahoo, Professor of CSE, NIT Rourkela.	Narayana Rao Routhu, Technology Manager, Hidden Brains, Ahmadabad.	Dr. S Rao Chintalapudi, Professor and HoD, CSE(AIML) CMR Technical Campus, Hyderabad.	Dr. B S N Murthy Professor of CSE, BVCEC.

*Head of the
CAD, AIML & CSM
BVC Engineering College, Odalarevu
East Godavari, A.P. 533 210*



BONAM VENKATA CHALAMAYYA ENGINEERING COLLEGE
ODALAREVU – 533 210, Andhra Pradesh, India
Autonomous

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
Course Structure – BR23 Regulations
For UG - B.Tech: ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
II Year Course Structure

Semester-II							
S.No.	Course Category	Course Code	Course Name	L	T	P	Credits
1.	HSMC	23HM4T05	Optimization Techniques	2	0	0	2
2.	BSC	23BS4T11	Probability & Statistics	3	0	0	3
3.	PCC	23AM4T01	Machine Learning	3	0	0	3
4.	PCC	23CS4T05	Database Management Systems	3	0	0	3
5.	PCC	23AM4T02	Digital Logic & Computer Organization	3	0	0	3
6.	PCC	23ML4L01	AI & ML Lab	0	0	3	1.5
7.	PCC	23CS4L05	Database Management Systems Lab	0	0	3	1.5
8.	PCC	23CS4S05	Full Stack Development -I	0	1	2	2
9.	BSC	23ES4L06	Design Thinking & Innovation	1	0	2	2
Total				15	1	10	21
Mandatory Community Service Project Internship of 08 weeks duration during summer vacation							

Dr. N Ramakrishnaiah, Professor of CSE. UCEK, JNTUK Kakinada.	Dr. Jimson Mathew, Professor of CSE. IIT Patna	Dr. B D Sahoo, Professor of CSE, NIT Rourkela.	Narayana Rao Routhu, Technology Manager, Hidden Brains, Ahmadabad.	Dr. S Rao Chintalapudi, Professor and HoD, CSE(AIML) CMR Technical Campus, Hyderabad.	Dr. B S N Murthy Professor of CSE, BVCEC.

Head of the
CAD, AIML & CSM
BVC Engineering College, Odalarevu
East Godavari, A.P. 533 210



II Year – II Semester	Code: 23AM4T01	L	T	P	C
		3	0	0	3
MACHINE LEARNING					
<p>Course Objectives: The objectives of the course is to</p> <ul style="list-style-type: none"> Define machine learning and its different types (supervised and unsupervised) and understand their applications. Apply supervised learning algorithms including decision trees and k-nearest neighbours (k-NN). Implement unsupervised learning techniques, such as K-means clustering. 					
Course Outcomes:					
CO Number	Course Outcome				Blooms Level
CO1	Students will be able to learn about computing central tendency measures and Data preprocessing techniques				BL1
CO2	Students will be able to learn about classification and regression algorithms				BL1
CO3	Students will be able to apply different clustering algorithms for a problem.				BL3
CO4	Students will be able to Adjust and refine the parameters of the K-means algorithm to optimize clustering results.				BL4
CO5	Students will be able to Modify the EM algorithm parameters to optimize clustering performance for specific datasets.				BL5
<p>UNIT-I: Introduction to Machine Learning: Evolution of Machine Learning, Paradigms for ML, Learning by Rote, Learning by Induction, Reinforcement Learning, Types of Data, Matching, Stages in Machine Learning, Data Acquisition, Feature Engineering, Data Representation, Model Selection, Model Learning, Model Evaluation, Model Prediction, Search and Learning, Data Sets.</p>					
<p>UNIT-II: Nearest Neighbor-Based Models: Introduction to Proximity Measures, Distance Measures, Non-Metric Similarity Functions, Proximity Between Binary Patterns, Different Classification Algorithms Based on the Distance Measures ,K-Nearest Neighbor Classifier, Radius Distance Nearest Neighbor Algorithm, KNN Regression, Performance of Classifiers, Performance of Regression Algorithms.</p>					
<p>UNIT-III: Models Based on Decision Trees: Decision Trees for Classification, Impurity Measures, Properties, Regression Based on Decision Trees, Bias–Variance Trade-off, Random Forests for Classification and Regression.</p>					

			<i>online</i>	<i>Ch. S. Rao</i>	
Dr. N Ramakrishnaiah, Professor of CSE. UCEK, JNTUK Kakinada.	Dr. Jimson Mathew, Professor of CSE. IIT Patna	Dr. B D Sahoo, Professor of CSE, NIT Rourkela.	Narayana Rao Routhu, Technology Manager, Hidden Brains, Ahmadabad.	Dr. S Rao Chintalapudi, Professor and HoD, CSE(AIML) CMR Technical Campus, Hyderabad.	Dr. B S N Murthy Professor of CSE, BVCEC.



UNIT-IV:

Linear Discriminants for Machine Learning: Introduction to Linear Discriminants, Linear Discriminants for Classification, Perceptron Classifier, Perceptron Learning Algorithm, Support Vector Machines, Linearly Non-Separable Case, Non-linear SVM, Kernel Trick, Logistic Regression, Linear Regression, Multi-Layer Perceptrons(MLPs), Backpropagation for Training an MLP.

UNIT-V:

Clustering : Introduction to Clustering, Partitioning of Data, Matrix Factorization | Clustering of Patterns, Divisive Clustering, Agglomerative Clustering, Partitional Clustering, K-Means Clustering, Soft Partitioning, Soft Clustering, Fuzzy C-Means Clustering, Rough Clustering, Rough K-Means Clustering Algorithm, Expectation Maximization-Based Clustering, Spectral Clustering.

Text Books:

1. “Machine Learning Theory and Practice”, M N Murthy, V S Ananthanarayana, Universities Press (India), 2024

Reference Books:

1. “Machine Learning”, Tom M. Mitchell, McGraw-Hill Publication, 2017

2. “Machine Learning in Action”, Peter Harrington, DreamTech

3. “Introduction to Data Mining”, Pang-Ning Tan, Michel Stenbach, Vipin Kumar, 7th Edition, 2019.

Dr. N Ramakrishnaiah, Professor of CSE. UCEK, JNTUK Kakinada.	Dr. Jimson Mathew, Professor of CSE. IIT Patna	Dr. B D Sahoo, Professor of CSE, NIT Rourkela.	Narayana Rao Routhu, Technology Manager, Hidden Brains, Ahmadabad.	Dr. S Rao Chintalapudi, Professor and HoD, CSE(AIML) CMR Technical Campus, Hyderabad.	Dr. B S N Murthy Professor of CSE, BVCEC.

**Head of the
CAD, AIML & CSM
BVC Engineering College, Odalarevu
East Godavari, A.P. 533 210**



II Year - II Semester	Code: 23CS4T05	L	T	P	C
		3	0	0	3

DATABASE MANAGEMENT SYSTEMS
(Common to CSE/IT/CSE(AI&ML)/AIML)

Course Objectives:

The main objectives of the course is to

- Introduce database management systems and to give a good formal foundation on the relational model of data and usage of Relational Algebra
- Introduce the concepts of basic SQL as a universal Database language
- Demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization
- Provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques

Course Outcomes: Students are able to

CO Number	Course Outcome	Blooms Level
CO1	Explain the fundamental concepts of database systems and their characteristics, distinguishing them from file systems.	BL 1
CO2	Apply basic DML operations such as insert, delete, and update on tables in SQL.	BL 3
CO3	Create tables with relationships and implement primary key, foreign key, and integrity constraints.	BL 3
CO4	Analyze and apply the concepts of lossless join and dependency preserving decomposition during normalization.	BL 4
CO5	Implement operations on B+ Trees, including insertion, deletion, and search.	BL 3

UNIT I

10Hrs

Introduction: Database system, Characteristics (Database Vs File System), Database Users, Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database. Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams.

UNIT II

8Hrs

Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance, Relational Algebra, Relational Calculus. BASIC SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update).

Dr. N Ramakrishnaiah, Professor of CSE. UCEK, JNTUK Kakinada.	Dr. Jimson Mathew, Professor of CSE. IIT Patna	Dr. B D Sahoo, Professor of CSE, NIT Rourkela.	Narayana Rao Routhu, Technology Manager, Hidden Brains, Ahmadabad.	Dr. S Rao Chintalapudi, Professor and HoD, CSE(AIML) CMR Technical Campus, Hyderabad.	Dr. B S N Murthy Professor of CSE, BVCEC.



UNIT III	8Hrs SQL:Basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions(Date and Time, Numeric, String conversion).Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updatable and non-updatable), relational set operations.	
UNITIV	10Hrs Schema Refinement (Normalization):Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency Lossless join and dependency preserving decomposition, (1NF, 2NF and 3 NF), concept of surrogate key, Boyce-Codd normal form(BCNF), MVD, Fourth normal form(4NF), Fifth Normal Form (5NF).	
UNIT V	10Hrs Transaction Concept: Transaction State, ACID properties, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, lock based, time stamp based, optimistic, concurrency protocols, Deadlocks, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm. Introduction to Indexing Techniques: B+ Trees, operations on B+ Trees, Hash Based Indexing/	
Text Books:		
1) Database Management Systems, 3rd edition, Raghurama Krishnan, Johannes Gehrke, TMH (For Chapters 2, 3, 4) 2) Database System Concepts,5th edition, Silberschatz, Korth, Sudarsan, TMH (For Chapter 1 and Chapter 3) 3) Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning. 4) Database Management Systems,Battacharya,Pritimoy 5) Database Management Systems,POST,Gerald V 6) Database Management System,Pujari,Arun k.		
Reference Books:		
1) Introduction to Database Systems, 8thedition, C J Date, Pearson. 2) Database Management System, 6th edition, Ramez Elmasri, Shamkant B. Navathe, Pearson 3) Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.		
Online Learning Resources:		
1) https://nptel.ac.in/courses/106/105/106105175/ 2) https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01275806667282022456_shared/overview		

Dr. N Ramakrishnaiah, Professor of CSE. UCEK, JNTUK Kakinada.	Dr. Jimson Mathew, Professor of CSE. IIT Patna	Dr. B D Sahoo, Professor of CSE, NIT Rourkela.	Narayana Rao Routhu, Technology Manager, Hidden Brains, Ahmadabad.	Dr. S Rao Chintalapudi, Professor and HoD, CSE(AIML) CMR Technical Campus, Hyderabad.	Dr. B S N Murthy Professor of CSE, BVCEC.



II Year – II Semester	Code: 23AM4T02	L	T	P	C
		3	0	0	3

DIGITAL LOGIC & COMPUTER ORGANIZATION

Course Objectives:

The main objectives of the course is to

- provide students with a comprehensive understanding of digital logic design principles and computer organization fundamentals
- Describe memory hierarchy concepts
- Explain input/output (I/O) systems and their interaction with the CPU, memory, and peripheral devices

Course Outcomes:

CO Number	Course Outcome	Blooms Level
CO1	Students should be able to design, implement, and troubleshoot digital systems and the use of decoders and multiplexers.	BL3
CO2	Students should be able to design, implement and analyze various sequential circuits, including binary counters, registers, and shift registers,	BL4
CO3	Students should be able to Understand, and apply arithmetic circuits and algorithms, understanding processor organization	BL3
CO4	Students will be able to understand and apply efficient memory systems and memory organization techniques	BL3
CO5	Design an efficient I/O system integrating DMA and various bus architectures to optimize system performance	BL6

UNIT I

Data Representation: Binary Numbers, Fixed Point Representation. Floating Point Representation. Number base conversions, Octal and Hexadecimal Numbers, components, Signed binary numbers, Binary codes Digital Logic Circuits-I: Basic Logic Functions, Logic gates, universal logic gates, Minimization of Logic expressions. K-Map Simplification, Combinational Circuits, Decoders, Multiplexers

UNIT II

Digital Logic Circuits-II: Sequential Circuits, Flip-Flops, Binary counters, Registers, Shift Registers, Ripple Counters Basic Structure of Computers: Computer Types, Functional units, Basic operational concepts, Bus structures, Software, Performance, multiprocessors and multi computers, Computer Generations, Von- Neumann Architecture

UNIT III

Computer Arithmetic : Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed-operand Multiplication, Fast Multiplication, Integer Division, Floating-Point Numbers and Operations Processor Organization: Fundamental Concepts, Execution of a Complete Instruction, Multiple-Bus Organization, Hardwired Control and Multi programmed Control

Dr. N Ramakrishnaiah, Professor of CSE. UCEK, JNTUK Kakinada.	Dr. Jimson Mathew, Professor of CSE. IIT Patna	Dr. B D Sahoo, Professor of CSE, NIT Rourkela.	Narayana Rao Routhu, Technology Manager, Hidden Brains, Ahmadabad.	Dr. S Rao Chintalapudi, Professor and HoD, CSE(AIML) CMR Technical Campus, Hyderabad.	Dr. B S N Murthy Professor of CSE, BVCEC.



UNIT IV

The Memory Organization: Basic Concepts, Semiconductor RAM Memories, Read-Only Memories, Speed, Size and Cost, Cache Memories, Performance Considerations, Virtual Memories, Memory Management Requirements, Secondary Storage

UNIT V

Input/Output Organization: Accessing I/O Devices, Interrupts, Processor Examples, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces

Text Books:

1. Computer Organization, Carl Hamacher, Zvonko Vranesic, Safwat Zaky, 6th edition, McGraw Hill
2. Digital Design, 6th Edition, M. Morris Mano, Pearson Education.
3. Computer Organization and Architecture, William Stallings, 11th Edition, Pearson.

Reference Books:

1. Computer Systems Architecture, M. Morris Mano, 3rd Edition, Pearson
2. Computer Organization and Design, David A. Patterson, John L. Hennessy, Elsevier
3. Fundamentals of Logic Design, Roth, 5th Edition, Thomson

Online Learning Resources:

1. <https://nptel.ac.in/courses/106/103/106103068/>

Dr. N Ramakrishnaiah, Professor of CSE. UCEK, JNTUK Kakinada.	Dr. Jimson Mathew, Professor of CSE. IIT Patna	Dr. B D Sahoo, Professor of CSE, NIT Rourkela.	Narayana Rao Routhu, Technology Manager, Hidden Brains, Ahmadabad.	Dr. S Rao Chintalapudi, Professor and HoD, CSE(AIML) CMR Technical Campus, Hyderabad.	Dr. B S N Murthy Professor of CSE, BVCEC.

Head of the
CAD, AIML & CSM
BVC Engineering College, Odalarevu
East Godavari, A.P. 533 210



II Year – II Semester	Code: 23ML4L01	L	T	P	C
		0	0	3	1.5
AI & ML LAB					
<p>Course Objectives:</p> <ol style="list-style-type: none"> 1.The student should be made to learn the methods of solving problems using ArtificialIntelligence. 2.The student should be made to introduce the concepts of Expert Systems and machinelearning. 3.To learn about computing central tendency measures and Data preprocessingtechniques. 4.To learn about classification and regression algorithms. 5.To apply different clustering algorithms for a problem. 					
<p>Software Required for ML: Python/R/Weka List of Experiments</p> <p>1.Pandas Library</p> <ol style="list-style-type: none"> a) Write a python program to implement Pandas Series with labels. b) Create a Pandas Series from a dictionary. c) Creating a Pandas Data Frame. d) Write a program which makes use of the following Pandas methods <ol style="list-style-type: none"> i) describe () ii) head () iii) tail () iv) info () 					
<p>2.Pandas Library: Visualization</p> <ol style="list-style-type: none"> a) Write a program which use pandas inbuilt visualization to plot following graphs: <ol style="list-style-type: none"> i. Bar plots ii. Histograms iii. Line plots iv. Scatter plot 3. Write a Program to Implement Breadth First Search using Python. 4. Write a program to implement Best First Searching Algorithm 5. Write a Program to Implement Depth First Search using Python. 6. Write a program to implement the Heuristic Search 7. Write a python program to implement A* and AO* algorithm. (Ex: find the shortestpath) 					

Dr. N Ramakrishnaiah, Professor of CSE. UCEK, JNTUK Kakinada.	Dr. Jimson Mathew, Professor of CSE. IIT Patna	Dr. B D Sahoo, Professor of CSE, NIT Rourkela.	Narayana Rao Routhu, Technology Manager, Hidden Brains, Ahmadabad.	Dr. S Rao Chintalapudi, Professor and HoD, CSE(AIML) CMR Technical Campus, Hyderabad.	Dr. B S N Murthy Professor of CSE, BVCEC.

Head of the
CAD, AIML & CSM
BVC Engineering College, Odalarevu
East Godavari, A.P. 533 210



8. Apply the following Pre-processing techniques for a given dataset.
a) Attribute selection b) Handling Missing Values c) Discretization d) Elimination of Outliers
9. Apply KNN algorithm for classification and regression.
10. Demonstrate decision tree algorithm for a classification problem and perform parameter tuning for better results.
11. Apply Random Forest algorithm for classification and regression.
12. Demonstrate Naïve Bayes Classification algorithm.
13. Apply Support Vector algorithm for classification
14. Implement the K-means algorithm and apply it to the data you selected. Evaluate performance by measuring the sum of the Euclidean distance of each example from its class center. Test the performance of the algorithm as a function of the parameters K.

Note: At the end of Lab course students have to complete a Mini Project/Case Study for evaluation of Internal Marks.

Dr. N Ramakrishnaiah, Professor of CSE. UCEK, JNTUK Kakinada.	Dr. Jimson Mathew, Professor of CSE. IIT Patna	Dr. B D Sahoo, Professor of CSE, NIT Rourkela.	Narayana Rao Routhu, Technology Manager, Hidden Brains, Ahmadabad.	Dr. S Rao Chintalapudi, Professor and HoD, CSE(AIML) CMR Technical Campus, Hyderabad.	Dr. B S N Murthy Professor of CSE, BVCEC.

Head of the
CAD, AIML & CSM
BVC Engineering College, Odalarevu
East Godavari, A.P. 533 210.



II Year - II Semester	Code: 23CS4L05	L	T	P	C															
		0	0	3	1.5															
DATABASE MANAGEMENT SYSTEMS LAB (Common to CSE/IT/CSE(AI&ML)/AIML)																				
Course Objectives: This Course will enable students to <input type="checkbox"/> Populate and query a database using SQL DDL/DML Commands <input type="checkbox"/> Declare and enforce integrity constraints on a database <input type="checkbox"/> Writing Queries using advanced concepts of SQL <input type="checkbox"/> Programming PL/SQL including procedures, functions, cursors and triggers																				
Course Outcomes: Students are able to <table border="1"> <thead> <tr> <th align="center">CO Number</th> <th align="center">Course Outcome</th> <th align="center">Blooms Level</th> </tr> </thead> <tbody> <tr> <td align="center">CO1</td> <td>Populate and query a database using SQL DDL/DML Commands</td> <td align="center">BL 3</td> </tr> <tr> <td align="center">CO2</td> <td>Declare and enforce integrity constraints on a database</td> <td align="center">BL 3</td> </tr> <tr> <td align="center">CO3</td> <td>Writing Queries using advanced concepts of SQL</td> <td align="center">BL 4</td> </tr> <tr> <td align="center">CO4</td> <td>Programming PL/SQL including procedures, functions, cursors and triggers</td> <td align="center">BL 3</td> </tr> </tbody> </table>						CO Number	Course Outcome	Blooms Level	CO1	Populate and query a database using SQL DDL/DML Commands	BL 3	CO2	Declare and enforce integrity constraints on a database	BL 3	CO3	Writing Queries using advanced concepts of SQL	BL 4	CO4	Programming PL/SQL including procedures, functions, cursors and triggers	BL 3
CO Number	Course Outcome	Blooms Level																		
CO1	Populate and query a database using SQL DDL/DML Commands	BL 3																		
CO2	Declare and enforce integrity constraints on a database	BL 3																		
CO3	Writing Queries using advanced concepts of SQL	BL 4																		
CO4	Programming PL/SQL including procedures, functions, cursors and triggers	BL 3																		
Experiments covering the topics: <ul style="list-style-type: none"> ➤ DDL, DML, DCL commands ➤ Queries, nested queries, built-in functions, ➤ PL/SQL programming- control structures ➤ Procedures, Functions, Cursors, Triggers, ➤ Database connectivity- ODBC/JDBC 																				
Sample Experiments: <ol style="list-style-type: none"> Creation, altering and dropping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example:- Select the roll number and name of the student who secured fourth rank in the class. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views. Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date) 																				

Dr. N Ramakrishnaiah, Professor of CSE. UCEK, JNTUK Kakinada.	Dr. Jimson Mathew, Professor of CSE. IIT Patna	Dr. B D Sahoo, Professor of CSE, NIT Rourkela.	Narayana Rao Routhu, Technology Manager, Hidden Brains, Ahmadabad.	Dr. S Rao Chintalapudi, Professor and HoD, CSE(AIML) CMR Technical Campus, Hyderabad.	Dr. B S N Murthy Professor of CSE, BVCEC.

**Head of the
CAD, AIML & CSM
BVCE Engineering College, Odalarevu,
East Godavari, A.P. 533 210**



- 5.
- i. Create a simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found)
 - ii. Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
6. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.
7. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISEAPPLICATION ERROR.
8. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.
9. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.
10. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.
11. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers
12. Create a table and perform the search operation on table using indexing and non indexing techniques.
- Text Books:**
- 1. Oracle: The Complete Reference by Oracle Press
 - 2. Nilesh Shah, "Database Systems Using Oracle", PHI, 2007
 - 3. Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007
- Online Learning Resources:**
- 1. <https://gradwise.in/>
 - 2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013841672533762048748_shared/overview
 - 3. <https://myacademy.oracle.com/>

Note: At the end of Lab course students have to complete a Mini Project/Case Study for evaluation on Internal Marks.

Dr. N Ramakrishnaiah, Professor of CSE. UCEK, JNTUK Kakinada.	Dr. Jimson Mathew, Professor of CSE. IIT Patna	Dr. B D Sahoo, Professor of CSE, NIT Rourkela.	Narayana Rao Routhu, Technology Manager, Hidden Brains, Ahmadabad.	Dr. S Rao Chintalapudi, Professor and HoD, CSE(AIML) CMR Technical Campus, Hyderabad.	Dr. B S N Murthy Professor of CSE, BVCEC.

Head of the
CAD, AIML & CSM
BVC Engineering College, Odalarevu
East Godavari, A.P. 533 210



II Year - II Semester	Code: 23CS4S05	L	T	P	C
		0	1	2	2
FULL STACK DEVELOPMENT – I (Common to CSE/CSE(AI&DS)/CSE(AI&ML)/AIML)					
Course Objectives: The main objectives of the course are to <input type="checkbox"/> Make use of HTML elements and their attributes for designing static web pages <input type="checkbox"/> Build a web page by applying appropriate CSS styles to HTML elements <input type="checkbox"/> Experiment with JavaScript to develop dynamic web pages and validate forms					
Course Outcomes: Students are able to					
CO Number	Course Outcome				Blooms Level
CO1	Apply HTML5 and CSS, differentiate types of CSS, with a focus on modern web design principles.				BL3
CO2	Apply understanding of HTML for developing basic web pages incorporating lists, links, images, tables, forms and frames				BL3
CO3	Creating and manipulating HTML tables, forms and frames				BL3
CO4	Effectively applying JavaScript with a focus on I/O, type conversion, and handling of both internal and external scripts				BL3
CO5	Developing proficiency in the use of JavaScript Functions, Events, and application of Node.js				BL3
Experiments covering the Topics: <ul style="list-style-type: none"> ➤ Lists, Links and Images ➤ HTML Tables, Forms and Frames ➤ HTML 5 and Cascading Style Sheets, Types of CSS ➤ Selector forms ➤ CSS with Color, Background, Font, Text and CSS Box Model ➤ Applying JavaScript - internal and external, I/O, Type Conversion ➤ JavaScript Conditional Statements and Loops, Pre-defined and User-defined Objects ➤ JavaScript Functions and Events ➤ Node.js 					

Dr. N Ramakrishnaiah, Professor of CSE. UCEK, JNTUK Kakinada.	Dr. Jimson Mathew, Professor of CSE. IIT Patna	Dr. B D Sahoo, Professor of CSE, NIT Rourkela.	Narayana Rao Routhu, Technology Manager, Hidden Brains, Ahmadabad.	Dr. S Rao Chintalapudi, Professor and HoD, CSE(AIML) CMR Technical Campus, Hyderabad.	Dr. B S N Murthy Professor of CSE, BVCEC.

**Head of the
CAD, AIML & CSM
BVCE Engineering College, Odalarevu
East Godavari, A.P. 533 210**



Sample Experiments:

1. Lists, Links and Images

a. Write a HTML program, to explain the working of lists.

Note: It should have an ordered list, unordered list, nested lists and ordered list in an unordered list and definition lists.

b. Write a HTML program, to explain the working of hyperlinks using <a> tag and href, target Attributes.

c. Create a HTML document that has your image and your friend's image with a specific height and width. Also when clicked on the images it should navigate to their respective profiles.

d. Write a HTML program, in such a way that, rather than placing large images on a page, the preferred technique is to use thumbnails by setting the height and width parameters to something like to 100*100 pixels. Each thumbnail image is also a link to a full sized version of the image. Create an image gallery using this technique

2. HTML Tables, Forms and Frames

a. Write a HTML program, to explain the working of tables. (use tags: <table>, <tr>, <th>, <td> and attributes: border, rowspan, colspan)

b. Write a HTML program, to explain the working of tables by preparing a timetable. (Note: Use <caption> tag to set the caption to the table & also use cell spacing, cell padding, border, rowspan, colspan etc.).

c. Write a HTML program, to explain the working of forms by designing Registration form.

(Note: Include text field, password field, number field, date of birth field, checkboxes, radio buttons, list boxes using <select>&<option> tags, <text area> and two buttons ie: submit and reset. Use tables to provide a better view).

d. Write a HTML program, to explain the working of frames, such that page is to be divided into 3 parts on either direction. (Note: first frame □ image, second frame □ paragraph, third frame □ hyperlink. And also make sure of using “no frame” attribute such that frames to be fixed).

3. HTML 5 and Cascading Style Sheets, Types of CSS

a. Write a HTML program, that makes use of <article>, <aside>, <figure>, <figcaption>, <footer>, <header>, <main>, <nav>, <section>, <div>, tags.

b. Write a HTML program, to embed audio and video into HTML web page.

c. Write a program to apply different types (or levels of styles or style specification formats) - inline, internal, external styles to HTML elements. (identify selector, property and value).

4. Selector forms

a. Write a program to apply different types of selector forms

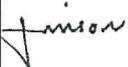
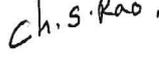
i. Simple selector (element, id, class, group, universal)

ii. Combinator selector (descendant, child, adjacent sibling, general sibling)

iii. Pseudo-class selector

iv. Pseudo-element selector

v. Attribute selector

					
Dr. N Ramakrishnaiah, Professor of CSE. UCEK, JNTUK Kakinada.	Dr. Jimson Mathew, Professor of CSE. IIT Patna	Dr. B D Sahoo, Professor of CSE, NIT Rourkela.	Narayana Rao Routhu, Technology Manager, Hidden Brains, Ahmadabad.	Dr. S Rao Chintalapudi, Professor and HoD, CSE(AIML) CMR Technical Campus, Hyderabad.	Dr. B S N Murthy Professor of CSE, BVCEC.



5. CSS with Color, Background, Font, Text and CSS Box Model
- Write a program to demonstrate the various ways you can reference a color in CSS.
 - Write a CSS rule that places a background image halfway down the page, tilting it horizontally. The image should remain in place when the user scrolls up or down.
 - Write a program using the following terms related to CSS font and text:
 - font-size
 - font-weight
 - font-style
 - text-decoration
 - text-transformation
 - text-alignment
 - Write a program, to explain the importance of CSS Box model using
 - Content
 - Border
 - Margin
 - padding
6. Applying JavaScript - internal and external, I/O, Type Conversion
- Write a program to embed internal and external JavaScript in a web page.
 - Write a program to explain the different ways for displaying output.
 - Write a program to explain the different ways for taking input.
 - Create a webpage which uses prompt dialogue box to ask a voter for his name and age. Display the information in table format along with either the voter can vote or not

Dr. N Ramakrishnaiah, Professor of CSE. UCEK, JNTUK Kakinada.	Dr. Jimson Mathew, Professor of CSE. IIT Patna	Dr. B D Sahoo, Professor of CSE, NIT Rourkela.	Narayana Rao Routhu, Technology Manager, Hidden Brains, Ahmadabad.	Dr. S Rao Chintalapudi, Professor and HoD, CSE(AIML) CMR Technical Campus, Hyderabad.	Dr. B S N Murthy Professor of CSE, BVCEC.

Head of the
CAD, AIML & CSM
BVC Engineering College, Odalarevu
East Godavari, A.P. 533 210



7. Java Script Pre-defined and User-defined Objects

- Write a program using document object properties and methods.
- Write a program using window object properties and methods.
- Write a program using array object properties and methods.
- Write a program using math object properties and methods.
- Write a program using string object properties and methods.
- Write a program using regex object properties and methods.
- Write a program using date object properties and methods.
- Write a program to explain user-defined object by using properties, methods, accessors, constructors and display.

8. Java Script Conditional Statements and Loops

- Write a program which asks the user to enter three integers, obtains the numbers from the user and outputs HTML text that displays the larger number followed by the words "LARGER NUMBER" in an information message dialog. If the numbers are equal, output HTML text as "EQUAL NUMBERS".
- Write a program to display week days using switch case.
- Write a program to print 1 to 10 numbers using for, while and do-while loops.
- Write a program to print data in object using for-in, for-each and for-of loops
- Develop a program to determine whether a given number is an 'ARMSTRONG NUMBER' or not. [Eg: 153 is an Armstrong number, since sum of the cube of the digits is equal to the number i.e., $1^3 + 5^3 + 3^3 = 153$]
- Write a program to display the denomination of the amount deposited in the bank in terms of 100's, 50's, 20's, 10's, 5's, 2's & 1's. (Eg: If deposited amount is Rs.163, the output should be 1-100's, 1-50's, 1-10's, 1-2's & 1-1's)

Dr. N Ramakrishnaiah, Professor of CSE. UCEK, JNTUK Kakinada.	Dr. Jimson Mathew, Professor of CSE. IIT Patna	Dr. B D Sahoo, Professor of CSE, NIT Rourkela.	Narayana Rao Routhu, Technology Manager, Hidden Brains, Ahmadabad.	Dr. S Rao Chintalapudi, Professor and HoD, CSE(AIML) CMR Technical Campus, Hyderabad.	Dr. B S N Murthy Professor of CSE, BVCEC.

Head of the
CAD, AIML & CSM
BVC Engineering College, Odalarevu
East Godavari, A.P. 533 210



9. Java Script Functions and Events
- a. Design a appropriate function should be called to display
- Factorial of that number
 - Fibonacci series up to that number
 - Prime numbers up to that number
 - Is it palindrome or not
- b. Design a HTML having a text box and four buttons named Factorial, Fibonacci, Prime, and Palindrome. When a button is pressed an appropriate function should be called to display
- Factorial of that number
 - Fibonacci series up to that number
 - Prime numbers up to that number
 - Is it palindrome or not
- c. Write a program to validate the following fields in a registration page
- Name (start with alphabet and followed by alphanumeric and the length should not be less than 6 characters)
 - Mobile (only numbers and length 10 digits)
 - E-mail (should contain format like xxxxxxxx@xxxxxx.xxx)

Text Books:

- Programming the World Wide Web, 7th Edition, Robert W Sebesta, Pearson, 2013.
- Web Programming with HTML5, CSS and JavaScript, John Dean, Jones & Bartlett Learning, 2019 (Chapters 1-11).
- Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, Vasam Subramanian, 2nd edition, APress, O'Reilly.

Online Learning Resources:

- <https://www.w3schools.com/html>
- <https://www.w3schools.com/css>
- <https://www.w3schools.com/js/>
- <https://www.w3schools.com/nodejs>
- <https://gradwise.in/>

Note: At the end of Lab course students have to complete a Mini Project/Case Study for evaluation on Internal Marks.

Dr. N Ramakrishnaiah, Professor of CSE. UCEK, JNTUK Kakinada.	Dr. Jimson Mathew, Professor of CSE. IIT Patna	Dr. B D Sahoo, Professor of CSE, NIT Rourkela.	Narayana Rao Routhu, Technology Manager, Hidden Brains, Ahmadabad.	Dr. S Rao Chintalapudi, Professor and HoD, CSE(AIML) CMR Technical Campus, Hyderabad.	Dr. B S N Murthy Professor of CSE, BVCEC.



II Year - II Semester	CODE: 23ES4L06	L	T	P	C
		1	0	2	2

DESIGN THINKING & INNOVATION

Course Objectives:

This Course will enable students to

- Bring awareness on innovative design and new product development.
- Explain the basics of design thinking.
- Familiarize the role of reverse engineering in product development.
- Train how to identify the needs of society and convert into demand.
- Introduce product planning and product development process.

Course Outcomes: Students are able to

COs	Statement	Blooms Level
CO1	Define the concepts related to design thinking.	L1
CO2	Explain the fundamentals of Design Thinking and innovation.	L2
CO3	Apply the design thinking techniques for solving problems in various sectors.	L3
CO4	Analyse to work in a multidisciplinary environment.	L4
CO5	Evaluate the value of creativity.	L5

UNIT – I Introduction to Design Thinking

Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

UNIT - II Design Thinking Process

Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development Activity: Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

UNIT - III Innovation

Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity.

Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.

Dr. N Ramakrishnaiah, Professor of CSE. UCEK, JNTUK Kakinada.	Dr. Jimson Mathew, Professor of CSE. IIT Patna	Dr. B D Sahoo, Professor of CSE, NIT Rourkela.	Narayana Rao Routhu, Technology Manager, Hidden Brains, Ahmadabad.	Dr. S Rao Chintalapudi, Professor and HoD, CSE(AIML) CMR Technical Campus, Hyderabad.	Dr. B S N Murthy Professor of CSE, BVCEC.

**Head of the
CAD, AIML & CSM
BVC Engineering College, Odalarevu
East Godavari, A.P. 533 210**



UNIT - IV Product Design

Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications. Innovation towards product design Case studies.

Activity: Importance of modeling, how to set specifications, Explaining their own product design.

UNIT – V Design Thinking in Business Processes

Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs. Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes.

Activity: How to market our own product, about maintenance, Reliability and plan for startup.

Textbooks:

1. Tim Brown, Change by design, 1/e, Harper Bollins, 2009.
2. Idris Mootee, Design Thinking for Strategic Innovation, 1/e, Adams Media, 2014.

Reference Books:

1. David Lee, Design Thinking in the Classroom, Ulysses press, 2018.
2. Shrutin N Shetty, Design the Future, 1/e, Norton Press, 2018.
3. William lidwell, Kritinaholden, & Jill butter, Universal principles of design, 2/e, Rockport Publishers, 2010.
4. Chesbrough.H, The era of open innovation, 2003.

Online Learning Resources:

1. <https://nptel.ac.in/courses/110/106/110106124/>
2. <https://nptel.ac.in/courses/109/104/109104109/>
3. https://swayam.gov.in/nd1_noc19_mg60/preview
4. https://onlinecourses.nptel.ac.in/noc22_de16/preview

Dr. N Ramakrishnaiah, Professor of CSE. UCEK, JNTUK Kakinada.	Dr. Jimson Mathew, Professor of CSE. IIT Patna	Dr. B D Sahoo, Professor of CSE, NIT Rourkela.	Narayana Rao Routhu, Technology Manager, Hidden Brains, Ahmadabad.	Dr. S Rao Chintalapudi, Professor and HoD, CSE(AIML) CMR Technical Campus, Hyderabad.	Dr. B S N Murthy Professor of CSE, BVCEC.

Head of the
CAD, AIML & CSM
BVC Engineering College, Odalarevu
East Godavari, A.P. 533 210