NARAYANA ENGINEERING COLLEGE::GUDUR

AUTONOMOUS

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING(AI & ML)

B. Tech – CSM - Course Structure, w.e.f AY: 2024-25

DEPARTMENTVISION&MISSION

VISIONOFTHEDEPARTMENT

- To empower students to become AI and ML professionals, driving industry innovation to meet the needs of Industry and society through cutting-edge technologies along with research and consultancy, lifelong learning, leadership qualities and ethics.

MISSIONOFTHEDEPARTMENT

- To establish a solid foundation by quality technical education in Artificial Intelligence and Machine Learning and effectively teaching Learning process to make self sufficient individuals.
- To develop resilient professionals by inculcating problem solving skills to create applications for industry innovation.
- To cultivate professional behavior with ethical values, leadership and lifelong learning that have a positive impact on society through value based education.

PEOs, Pos, PSOs

PEOs

PEO 1: Attain higher positions in careers by demonstrating expertise in solving real-world problems using AI and ML techniques.

PEO 2: Bridge technical gaps, take on leadership roles, and drive innovation to achieve impactful results for organizational growth in AI-driven industries.

PEO 3: Adapt to rapidly evolving AI and ML technologies through lifelong learning, research, and continuous skill enhancement.

POs

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication:**Communicateeffectivelyoncomplexengineeringactivitieswith the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning:** Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PSOs

PSO 1: AI-Driven Software Development

Demonstrate the ability to apply software engineering principles and practices to develop high-quality software applications integrated with artificial intelligence and machine learning technologies, ensuring scalability, reliability, and efficiency.

PSO 2: Career Opportunities in AI/ML

Pursue successful careers in the industry by leveraging expertise in programming languages, AI/ML algorithms, and tools, or establish entrepreneurial ventures by creating innovative solutions powered by artificial intelligence and machine learning.

SEMESTER – III

Course Code	Category	Course Title	Contact Periods per week				Credits	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total marks
23A54301	BS&H	Discrete Mathematics & Graph Theory	3	0	0	3	3	30	70	100
23A52301	BS&H	Universal Human Values Understanding Harmony and Ethical human conduct	2	1	0	3	3	30	70	100
23A31301T	ES	Artificial Intelligence	3	0	0	3	3	30	70	100
23A05302T	PC	Advanced Data Structures & Algorithms Analysis	3	0	0	3	3	30	70	100
23A05303T	PC	Object – Oriented Programming Through JAVA	3	0	0	3	3	30	70	100
23A05302P	PC	Advanced Data Structures and Algorithms Analysis Lab	0	0	3	3	1.5	30	70	100
23A05303P	PC	Object – Oriented Programming Through JAVA Lab	0	0	3	3	1.5	30	70	100
23A05304	SE	Python programming	0	1	2	3	2	30	70	100
23A99301	AC	Environmental Science	2	0	0	2	0		100	100
	SC	Career competency Development I	0	0	2	2	0	30	70	100
	SC	Value added course/Certificate course I	0	0	0	0	0	30	70	100
		Counseling/Mentoring	0	0	1	1	0	--	--	--
		Sports/Hobby Clubs/Activities	0	0	2	2	0	--	--	--
		Activity Point Programme	During the Semester				20 Pts			
			16	**2**	**13**	**31**	**20**	**300**	**800**	**900**

NARAYANA ENGINEERING COLLEGE:GUDUR								
III Sem	DISCRETE MATHEMATICS & GRAPH THEORY							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A54301	3	0	0	48	3	30	70	100

Course Outcomes: After successful completion of this course, the students should be able to:

CO 1	Apply mathematical logic to solve problems.(BL1, BL3)
CO 2	Understand the concepts and perform the operations related to sets, relations and functions. Gain the conceptual background needed and identify structures of algebraic nature. (BL3, BL5)
CO 3	Apply basic counting techniques to solve combinatorial problems. (BL3)
CO 4	Formulate problems and solve recurrence relations. (BL2, BL3)
CO 5	Apply Graph Theory in solving computer science problems. (BL3, BL5)

COURSE CONTENT		
MODULE – 1	**Mathematical Logic**	**9H**
Introduction, Statements and Notation, Connectives, Well-formed formulas, Tautology, Duality law, Equivalence, Implication, Normal Forms, Functionally complete set of connectives, Inference Theory of Statement Calculus, Predicate Calculus, Inference theory of Predicate Calculus.		
MODULE – 2	**Set Theory**	**10H**
The Principle of Inclusion- Exclusion, Pigeon hole principle and its application, Functions composition of functions, Inverse Functions, Recursive Functions, Lattices and its properties. Algebraic structures: Algebraic systems-Examples and General Properties, Semi groups and Monoids, groups, sub groups, homomorphism, Isomorphism.		
MODULE – 3	**Elementary Combinatorics**	**10H**
Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutations with Constrained Repetitions, Binomial Coefficients, The Binomial and Multinomial Theorems.		
MODULE – 4	**Recurrence Relations**	**10H**
Generating Functions of Sequences, Calculating Coefficients of Generating Functions, Recurrence relations, Solving Recurrence Relations by Substitution and Generating functions, The Method of Characteristic roots, Solutions of Inhomogeneous, Recurrence Relations.		
MODULE – 5	**Graphs**	**9H**
Basic Concepts, Isomorphism and Sub graphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multi graphs and Euler Circuits, Hamiltonian Graphs.		
	Total hours:	**48 hours**

TEXTBOOK:

1. J. P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill, 2002.
2. Kenneth H. Rosen, Discrete Mathematics and its Applications with Combinatorics and Graph Theory, 7th Edition, McGraw Hill Education (India) Private Limited.

REFERENCES:

1. JoeL.Mott, Abraham Kandel and Theodore P. Baker, Discrete Mathematics for Computer Scientists & Mathematicians, 2nd Edition, Pearson Education.
2. Narsingh Deo, Graph Theory with Applications to Engineering and Computer Science.

Online Learning Resources:

1. http://www.cs.yale.edu/homes/aspnes/classes/202/notes.pdf

NARAYANA ENGINEERING COLLEGE:GUDUR								
III Sem	UNIVERSAL HUMAN VALUES–UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A52301	2	1	0	48	3	30	70	100

Course Objectives:

- To help the students appreciate the essential complementary between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

Course Outcomes: At the end of the course, students will be able to

CO 1	Define the terms like Natural Acceptance, Happiness and Prosperity. **(BL1, BL2)**
CO 2	Identify one's self, and one's surroundings (family, society nature). **(BL1, BL2)**
CO 3	Apply what they have learnt to their own self in different day-to-day settings in real life. **(BL3)**
CO 4	Relate human values with human relationship and human society. **(BL4)**
CO 5	Justify the need for universal human values and harmonious existence. **(BL5)**
CO 5	Develop as socially and ecologically responsible engineers. **(BL3, BL6)**

COURSE CONTENT		
MODULE – 1	**Introduction to Value Education**	**9H**
Lecture 1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) Lecture2: Understanding Value Education Tutorial 1: Practice Session PS1 Sharing about Oneself Lecture3: self-exploration as the Process for Value Education Lecture4:Continuous Happiness and Prosperity–the Basic Human Aspirations Tutorial2: Practice Session PS2 Exploring Human Consciousness Lecture 5: Happiness and Prosperity – Current Scenario Lecture 6: Method to Fulfill the Basic Human Aspirations Tutorial3:Practice Session PS3 Exploring Natural Acceptance		
MODULE – 2	**Harmony in the Human Being**	**10H**
Lecture 7: Understanding Human being as the Co-existence of the self and the body. Lecture8: Distinguishing between the Needs of the self and the body Tutorial 4: Practice Session PS4 Exploring the difference of Needs of self and body. Lecture9:The body as an Instrument of the self Lecture 10: Understanding Harmony in the self Tutorial5: Practice Session PS5 Exploring Sources of Imagination in the self Lecture 11: Harmony of the self with the body Lecture12:Programme to ensure self-regulation and Health Tutorial6:Practice Session PS6 Exploring Harmony of self with the body		
MODULE – 3	**Harmony in the Family and Society**	**10H**
Lecture13: Harmony in the Family–the Basic Unit of Human Interaction Lecture 14: 'Trust' – the Foundational Value in Relationship Tutorial7: Practice Session PS7 Exploring the Feeling of Trust Lecture 15: 'Respect' – as the Right Evaluation Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect Lecture16: Other Feelings, Justice in Human-to-Human Relationship Lecture 17: Understanding Harmony in the Society Lecture18:Vision for the Universal Human Order Tutorial9:Practice Session PS9 Exploring Systems to fulfil Human Goal		
MODULE – 4	**Harmony in the Nature / Existence**	**10H**
Lecture19: Understanding Harmony in the Nature Lecture20: Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature Tutorial10: Practice Session PS10 Exploring the Four Orders of Nature Lecture 21: Realizing Existence as Co-existence at All Levels Lecture22: The Holistic Perception of Harmony in Existence Tutorial11: Practice Session PS11 Exploring Co-existence in Existence		
MODULE – 5	**Implications of the Holistic Understanding – a Look at Professional Ethics**	**9H**
Lecture 23: Natural Acceptance of Human Values Lecture24:Definitivenessof(Ethical) Human Conduct Tutorial12: Practice Session PS12 Exploring Ethical Human Conduct Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human		

Order Lecture26: Competence in Professional Ethics Tutorial13: Practice Session PS13 Exploring Humanistic Models in Education Lecture 27: Holistic Technologies, Production Systems and Management Models-Typical Case Studies Lecture28: Strategies for Transition towards Value-based Life and Profession Tutorial14: Practice Session PS14 Exploring Steps of Transition towards Universal Human Order	
Total hours:	**48 hours**

TEXTBOOK:

a. The Text book

RR Gaur, R Asthana, G P Bagaria,*A Foundation Course in Human Values and Professional Ethics*, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1

b. The Teacher's Manual

R R Gaur, R Asthana, G P Bagaria, *Teachers' Manual for A Foundation Course in Human Values and Professional Ethics*,2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

REFERENCES:

1. *Jeevan Vidya: EkParichaya*, ANagaraj, Jeevan Vidya Prakashan, Amarkantak,1999.
2. *Human Values*, A.N.Tripathi,NewAgeIntl.Publishers,NewDelhi,2004.
3. *The Story of Stuff* (Book).
4. *The Story of My Experiments with Truth*-by Mohandas Karamchand Gandhi
5. *Smallis Beautiful*- E.FSchumacher.
6. *Slowi Beautifu*l-Cecile Andrews
7. *Economy of Permanence*-JC Kumarappa
8. *Bharat Mein Angreji Raj*–Pandit Sunder lal
9. *Redis covering India*-by Dharam pal
10. *HindSwarajorIndianHomeRule*-byMohandasK.Gandhi
11. *IndiaWinsFreedom*-MaulanaAbdulKalamAzad
12. *Vivekananda*-RomainRolland(English)
13. *Gandhi*-RomainRolland(English)

NARAYANA ENGINEERING COLLEGE:GUDUR								
III Sem	ARTIFICIAL INTELLIGENCE							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A31301T	3	0	0	48	3	30	70	100

Pre-requisite:

- Knowledge in Computer Programming.
- A course on "Mathematical Foundations of Computer Science".
- Background in linear algebra, data structures and algorithms, and probability.

Course Outcomes: After successful completion of this course, the students should be able to:

CO 1	The student should be made to study the concepts of Artificial Intelligence
CO 2	The student should be made to learn the methods of solving problems using ArtificialIntelligence
CO 3	The student should be made to introduce the concepts of Expert Systems.
CO 4	To understand the applications of AI, namely game playing, theorem proving, andmachine learning
CO 5	To learn different knowledge representation techniques

COURSE CONTENT		
MODULE – 1		**9H**
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.		
MODULE – 2		**10H**
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.		
MODULE – 3		**10H**
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 dempstershafer theory.		
MODULE – 4		**10H**
Logic concepts: First order logic. Inference in first order logic, propositional vs. first order inference, unification & lifts forward chaining, Backward chaining, Resolution, Learning from observation Inductive learning, Decision trees, Explanation based learning, Statistical Learning methods, Reinforcement Learning		
MODULE – 5		**9H**
Expert Systems: Architecture of expert systems, Roles of expert systems – Knowledge Acquisition Meta knowledge Heuristics. Typical expert systems – MYCIN, DART, XCON: Expert systems shells.		
	Total hours:	**48 hours**

Textbooks:

1. S. Russel and P. Norvig, "Artificial Intelligence – A Modern Approach", SecondEdition, 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 logicalapproach", Oxford University Press.
2. G. Luger, "Artificial Intelligence: Structures and Strategies for com
3. J. Nilsson, "Artificial Intelligence: A new Synthesis", Elsevier Publishers.
4. Artificial Intelligence, SarojKaushik, CENGAGE Learning.

Online Learning Resources:

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

NARAYANA ENGINEERING COLLEGE:GUDUR								
III Sem	ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A05302T	3	0	0	48	3	30	70	100

Course Objectives: The main objective of the course is to

- provide knowledge on advance data structures frequently used in Computer Science domain
- Develop skills in algorithm design techniques popularly used
- Understand the use of various data structures in the algorithm design

Course Outcomes: After successful completion of this course, the students should be able to:

CO 1	Illustrate the working of the advanced tree data structures and their applications **(BL2)**
CO 2	Understand the Graph data structure, traversals and apply them in various contexts**. (BL2)**
CO 3	Use various data structures in the design of algorithms(BL3)
CO 4	Recommend appropriate data structures based on the problem being solved**(BL5)**
CO 5	Analyze algorithms with respect to space and time complexities**(BL4)**
CO6	Design new algorithms**(BL6)**

COURSE CONTENT		
MODULE – 1		**9H**
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		
MODULE – 2		**10H**
Heap Trees (Priority Queues)–Min and Max Heaps, Operations and Applications Graphs–Terminology, Representations, Basic Search and Traversals, Connected Components and Biconnected Components, applications Divide and Conquer: The General Method, Quick Sort, Merge Sort, Strassen's matrix multiplication, Convex Hull		
MODULE – 3		**10H**
Greedy Method: General Method, Job Sequencing with deadlines, Knapsack Problem, Minimum cost spanning trees, Single Source Shortest Paths 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		
MODULE – 4		**10H**
Backtracking: General Method, 8-Queens Problem, Sum of Subsets problem, Graph Coloring, 0/1 Knapsack Problem Branch and Bound: The General Method, 0/1 Knapsack Problem, Travelling Salesperson problem		
MODULE – 5		**9H**
NP Hard and NP Complete Problems: Basic Concepts, Cook's theorem NP Hard Graph Problems: Clique Decision Problem (CDP), Chromatic Number Decision Problem (CNDP), Traveling Salesperson Decision Problem (TSP) NPHardSchedulingProblems:SchedulingIdenticalProcessors,JobShopSchedulin		
	Total hours:	**48 hours**

Textbooks:

1. FundamentalsofDataStructuresinC++,Horowitz,Ellis;Sahni,Sartaj;Mehta,Dinesh 2nd Edition Universities Press
2. Computer Algorithms/C++ EllisHorowitz,SartajSahni,SanguthevarRajasekaran2nd Edition University Press

Reference Books:

1. DataStructuresandprogramdesigninC,RobertKruse,PearsonEducationAsia
2. An introduction to Data Structures with applications, Trembley & Sorenson, McGrawHill
3. The Art of Computer Programming, Vol.1: Fundamental Algorithms, Donald E Knuth, Addison-Wesley, 1997.
4. DataStructuresusingC&C++:Langsam,Augenstein&Tanenbaum,Pearson,1995
5. Algorithms + Data Structures & Programs :N.Wirth,PHI
6. Fundamentals of Data Structures in C++:HorowitzSahni & Mehta, GalgottiaPub.
7. Data structures in Java: Thomas Standish, Pearson Education Asia
8.

Online Learning Resources:

1. https://www.tutorialspoint.com/advanced_data_structures/index.asp
2. http://peterindia.net/Algorithms.html
3. AbdulBari,1.IntroductiontoAlgorithms(youtube.com)

NARAYANA ENGINEERING COLLEGE:GUDUR								
III Sem	OBJECT – ORIENTED PROGRAMMING THROUGH JAVA							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A05303T	3	0	0	48	3	30	70	100

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 ap is for program development

Course Outcomes: After successful completion of this course, the students should be able to:

CO 1	Analyze problems, design solutions using OOP principles, and implement them efficiently in Java. (BL4)
CO 2	Design and implement classes to model real-world entities, with a focus on attributes, behaviors, and relationships between objects (BL4)
CO 3	Demonstrate an understanding of inheritance hierarchies and polymorphic behaviour, including method overriding and dynamic method dispatch. (BL3)
CO 4	Apply Competence in handling exceptions and errors to write robust and fault-tolerant code. (BL3)
CO 5	Perform file input/output operations, including reading from and writing to files using Java I/O classes, graphical user interface (GUI) programming using Java FX. (BL3)
CO6	Choose appropriate data structure of Java to solve a problem(BL6)

COURSE CONTENT		
MODULE – 1		**9H**

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 and Methods, Attribute Final, **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 Logical 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.

MODULE – 2		**10H**

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.

MODULE – 3		**10H**

Arrays: Introduction,DeclarationandInitializationofArrays,StorageofArrayin ComputerMemory,AccessingElementsofArrays,OperationsonArrayElements,AssigningArray 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 and Inheritance.

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.

MODULE – 4		**10H**

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, Auto-boxing 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, Temporal Adjusters Class.
Exception Handling: Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions.
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)

MODULE – 5		**9H**

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	
Total hours:	**48 hours**

Text Books:

1. JAVA on estepahead, AnithaSeth, B.L.Juneja, Oxford.
2. Joy with JAVA, Fundamentals of Object Oriented Programming, DebasisSamanta, MonalisaSarma, Cambridge, 2023.
3. JAVA9for Programmers, PaulDeitel, HarveyDeitel,4th Edition, Pearson.

References Books:

1. The complete Reference Java, 11th edition, HerbertSchildt, TMH
2. Introduction to Java programming,7th Edition,YDanielLiang, Pearson

Online Resources:

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

NARAYANA ENGINEERING COLLEGE:GUDUR								
III Sem	ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS LAB							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A05302P	0	0	3	48	1.5	30	70	100

Course Objectives: The objective of the course is to

- acquire practical skills in constructing and managing Data structures
- apply the popular algorithm design methods in problem-solving scenarios

Course Outcomes: After successful completion of this course, the students should be able to:

CO 1	Design and develop programs to solve real world problems with the popular algorithm design methods. **(BL5)**
CO 2	Demonstrate an understanding of Non-Linear data structures by developing implementing the operations on AVL Trees, B-Trees, Heaps and Graphs**.(BL2)**
CO 3	Critically assess the design choices and implementation strategies of algorithms and data structures in complex applications. (BL5)
CO 4	Utilize appropriate data structures and algorithms to optimize solutions for specific computational problems. **(BL3)**
CO 5	Compare the performance of different of algorithm design strategies**(BL4)**
CO6	Design algorithms to new real world problems**(BL6)**

Experiments covering the Topics:

- Operations on AVL trees, B-Trees, Heap Trees
- Graph Traversals
- Sorting techniques
- Minimum cost spanning trees
- Shortest path algorithms
- 0/1KnapsackProblem
- Travelling Sales person problem
- Optimal Binary Search Trees
- N-Queens Problem
- Job Sequencing

COURSE CONTENT	CO
List of Experiments	
TASK–1	**CO1**
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.	
TASK–2	
Construct B-Tree an order of 5 with a set of 100 random elements stored in array. Implement searching, insertion and deletion operations.	
TASK–3	**CO1**
Construct Min and Max Heap using arrays, delete any element and display the content of the Heap.	
TASK–4	**CO1**
Implement BFT and DFT for given graph, when graph is represented by a) Adjacency Matrix b)Adjacency Lists	
TASK–5	**CO2**
Write a program for finding the bi-connected components in a given graph.	
TASK–6	**CO2**
Implement Quick sort and Merge sort and observe the execution time for various input sizes (Average, Worst and Best cases).	
TASK–7	**CO2**
Compare the performance of Single Source Shortest Paths using Greedy method when the graph is represented by adjacency matrix and adjacency lists.	
TASK–8	**CO3**
Implement Job sequencing with deadlines using Greedy strategy.	
TASK–9	**CO4**
Write a program to solve 0/1 Knapsack problem Using Dynamic Programming.	
TASK–10	**CO5**
Implement N-Queens Problem Using Backtracking.	
TASK–11	**CO5**
Use Backtracking strategy to solve 0/1Knapsack problem.	

TASK–12	CO5
Implement Travelling Sales Person problem using Branch and Bound approach.	

Reference Books:

1. Fundamentals of Data Structures in C++, Horowitz Ellis, SahniSartaj, Mehta, Dinesh, 2nd Edition, Universities Press
2. ComputerAlgorithms/C++EllisHorowitz,SartajSahni,SanguthevarRajasekaran, 2nd Edition, University Press
3. DataStructuresandprogramdesigninC,RobertKruse,PearsonEducationAsia
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

NARAYANA ENGINEERING COLLEGE:GUDUR								
III Sem	OBJECT - ORIENTED PROGRAMMING THROUGH JAVA LAB							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A05303P	0	0	3	48	1.5	30	70	100

Course Objectives: The aim of this course is to

- 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, JavaFXGUI

Course Outcomes: After successful completion of this course, the students should be able to:

CO 1	Demonstrate a solid understanding of Java syntax, including data types, control structures, methods, classes, objects, inheritance, polymorphism, and exception handling. **(BL2)**
CO 2	Apply fundamental OOP principles such as encapsulation, inheritance, polymorphism, and abstraction to solve programming problems effectively**.(BL3)**
CO 3	Familiar with commonly used Java libraries and APIs, including the Collections Framework, Java I/O, JDBC, and other utility classes. **(BL2)**
CO 4	Develop problem-solving skills and algorithmic thinking, applying OOP concepts to design efficient solutions to various programming challenges. **(BL3)**
CO 5	Proficiently construct graphical user interface (GUI) applications using JavaFX **(BL4)**
CO6	Develop new programs for solving typical computer science problems**(BL6)**

Experiments covering the Topics:

- Object Oriented Programming fundamentals – data types, control structures
- Classes, methods, objects, Inheritance, polymorphism,
- Exception handling, Threads, Packages, Interfaces
- Files, I/O streams, JavaFX GUI

COURSE CONTENT	**CO**
List of Experiments	
TASK–1	**CO1**
a) Write a JAVA program to display default value of all primitive data type of JAVA b) Write a java program that displaytherootsofaquadraticequation$ax^2+bx=0$. Calculate the discriminate D and basing on value of D, describe the nature of root.	
TASK–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.	
TASK–3	**CO1**
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.	
TASK–4	**CO1**
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	
TASK–5	**CO2**
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	
TASK–6	**CO2**
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	
TASK–7	**CO2**
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 **isAlive** and **join ()** c) Write a Program illustrating Daemon Threads. d) Write a JAVA program Producer Consumer Problem	
TASK–8	**CO3**
a) Write a JAVA program that import and use the user defined packages **b)** Withoutwritinganycode,buildaGUIthatdisplaytextinlabelandimageinan Image View (use JavaFX) **c)** BuildaTipCalculatorappusingseveralJavaFXcomponentsandlearnhowtorespond to user interactions with the GUI	

TASK–9	CO4
a) Write a java program that connects to a database using JDBC **b)** Write a java program to connect to a database using JDBC and insert values into it. c) Write a java program to connect to a database using JDBC and delete values from it	
Textbooks: 1. JAVA one step a head, AnithaSeth, B.L.Juneja, Oxford. 2. JoywithJAVA, Fundamentals of Object Oriented Programming, DebasisSamanta, MonalisaSarma, Cambridge, 2023. JAVA9forProgrammers,PaulDeitel,HarveyDeitel,4th Edition,Pearson	
References Books: 1. The completeReferenceJava,11th edition,HerbertSchildt,TMH 2. IntroductiontoJavaprogramming,7th Edition,YDanielLiang,Pearson **Online Resources:** 1. https://nptel.ac.in/courses/106/105/106105191/ 2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547618816347_shared/overview	

NARAYANA ENGINEERING COLLEGE:GUDUR								
III Sem	PYTHON PROGRAMMING							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A05304	0	1	2	48	2	30	70	100

Course Objectives: The main objectives of the course are to

- Introduce core programming concepts of Python programming language.
- DemonstrateaboutPythondatastructureslikeLists,Tuples,Setsanddictionaries
- ImplementFunctions,ModulesandRegularExpressionsinPythonProgramming

and to create practical and contemporary applications using these

Course Outcomes: After successful completion of this course, the students should be able to:

CO 1	Classify data structures of Python(BL4)
CO 2	Apply Python programming concepts to solve a variety of computational problems (BL3)
CO 3	Understand the principles of object-oriented programming (OOP) in Python, including classes, objects, inheritance, polymorphism, and encapsulation, and apply them to design and implement Python programs (BL3)
CO 4	Become proficient in using commonly used Python libraries and frameworks such as JSON, XML, NumPy, pandas (BL2)
CO 5	Exhibit competence in implementing and manipulating fundamental data structures such as lists, tuples, sets, dictionaries (BL3)
CO6	Propose new solutions to computational problems(BL6)

COURSE CONTENT		
MODULE – 1		**9H**

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 with in 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)Bitwise 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.

MODULE – 2		**10H**

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. Writeaprogramtofindthelengthofthestringwithoutusinganylibraryfunctions.
4. Write a program to check if the sub string 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. Writeaprogramtoperformany5 built-in functions by taking any list.

MODULE – 3		**10H**

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, Frozen set.

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.

MODULE – 4		**10H**

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.

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.

MODULE – 5		**9H**

Introduction to Data Science: Functional Programming, JSON and XML in Python, NumPy with Python, Pandas.

Sample Experiments:

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:

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

	Total hours:	**48 hours**

Reference Books:

1. Gowri shankarS, VeenaA., Introduction to Python Programming, CRCPress.
2. Python Programming, S Sridhar, J Indumathi, V M Hariharan, 2nd Edition, Pearson, 2024
3. Introduction to Programming Using Python, Y.DanielLiang, Pearson.

Online Learning Resources /Virtual Labs:

1. https://www.coursera.org/learn/python-for-applied-data-science-ai
2. https://www.coursera.org/learn/python?specialization=python#syllabus

NARAYANA ENGINEERING COLLEGE:GUDUR								
III Sem	ENVIRONMENTAL SCIENCE							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A99301	2	0	0	48	0	30	70	100

Course Objectives:

- To make the students to get awareness on environment.
- To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life
- To save earth from the inventions by the engineers.

COURSE CONTENT		
MODULE – 1		**9H**

Multidisciplinary Nature of Environmental Studies:–Definition, Scope and Importance– Need for Public Awareness.

Natural Resources : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use andex ploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

MODULE – 2		**10H**

Ecosystems: Concept of an ecosystem. – Structure and function of an ecosystem –Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem.
b. Grass land ecosystem
c. Desert ecosystem.
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and its Conservation : Introduction 0 Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values– Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

MODULE – 3		**10H**

Environmental Pollution: Definition, Cause, effects and control measures of:

a. Air Pollution.
b. Water pollution

c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

Solid Waste Management: Causes**,** effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

MODULE – 4		**10H**

Social Issues and the Environment: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, water shed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution)Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

MODULE – 5		**9H**

Human Population and the Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

Field Work: Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc..

Total hours:	**48 hours**

Textbooks:

1. Textbook of Environmental Studies for Undergraduate Courses Erach Bharuch a for University Grants Commission, Universities Press.
2. Palani swamy, "Environmental Studies", Pearson education
3. S.AzeemUnnisa, "Environmental Studies" Academic Publishing Company
4. K.Raghavan Nambiar, "Textbook of Environmental Studies for Under graduate Courses as per UGC model syllabus", Scitech Publications (India), Pvt. Ltd.

References:

1. DeekshaDave and E.SaiBaba Reddy,"Text book of Environmental Science", Cengage Publications.
2. M.AnjiReddy, "Textbook of Environmental Sciences and Technology", BS Publication.
3. J.P.Sharma, Comprehensive Environmental studies, Laxmi publications.
4. J.GlynnHenryandGaryW.Heinke,"EnvironmentalSciencesandEngineering", Prentice hall of India Private limited
5. G.R.Chatwal,"ATextBookofEnvironmentalStudies"HimalayaPublishingHouse
6. Gilbert M. Masters and Wendell P. Ela, "Introduction to Environmental Engineering and Science, Prentice hall of India Private limited.

SEMESTER – IV

Course Code	Category	Course Title	Contact Periods per week				Credits	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total marks
23A52402e	MC	Optimization techniques	2	0	0	2	2	30	70	100
23A54401	ES	Probability & Statistics	3	0	0	3	3	30	70	100
23A31401T	PC	Machine Learning	3	0	0	3	3	30	70	100
23A05402T	PC	Database Management Systems	3	0	0	3	3	30	70	100
23A30402	PC	Digital Logic and Computer Organization	3	0	0	3	3	30	70	100
23A31401P	PC	Machine Learning Lab	0	0	3	3	1.5	30	70	100
23A05402P	PC	Database Management Systems Lab	0	0	3	3	1.5	30	70	100
23A52401	SE	FullStackDevelopment-1	0	1	2	3	2	30	70	100
23A99401	BS&H	Design Thinking & Innovation	1	0	2	3	2	30	70	100
	SC	Career competency Development I	0	0	2	2	0	30	70	100
	SC	Industry Oriented Course I	0	0	0	0	0	30	70	100
		Counseling/Mentoring	0	0	1	1	0	--	--	--
		Sports/Hobby Clubs/Activities	0	0	2	2	0	--	--	--
		Activity Point Programme	During the Semester				20 Pts			
			15	**1**	**15**	**31**	**21**	**330**	**770**	**1100**

Mandatory Community Service Project Internship of 08 weeks duration during summer vacation

NARAYANA ENGINEERING COLLEGE:GUDUR								
IV Sem	OPTIMIZATION TECHNIQUES							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A52402e	2	0	0	48	2	30	70	100

Course Objectives: The objectives of the course are

- To provide the basic knowledge about Optimization, importance, application areas ofin the industry, Linear Programming.
- To impart different optimization models under typical situations in the businessorganization like transportation, assignment.
- To understand the process of sequencing in a typical industry.
- To describe different game strategies under cut-throat competitive businessenvironment
- To develop networks of activities of projects and to find out optimal modes ofcompleting projects using network modelling evaluation techniques.

Course Outcomes: After successful completion of this course, the students should be able to:

CO 1	Understanding Optimization and Formulation of Linear Programing Models**(BL1)**
CO 2	Formulate and Solve Transportation & Assignment Models**(BL3)**
CO 3	Sequencing of operations and optimizing**(BL2)**
CO 4	Discuss the game theory and strategies**(BL2)**
CO 5	Developing networks of activities and finding optimal mode of projects**(BL3)** evaluation.

COURSE CONTENT		
MODULE – 1		**9H**
Introduction: Meaning, Nature, Scope & Significance of Optimization - Typical applications.The Linear Programming Problem – Introduction, Formulation of Linear Programming problem, Limitations of L.P.P, Graphical method, Simplex method: Maximization and Minimization model(exclude Duality problems), Big-M method and Two Phase method.		
MODULE – 2		**10H**
Transportation Problem: Introduction, Transportation Model, Finding initial basic feasible solutions, Moving towards optimality, Unbalanced Transportation problems, Transportation problems with maximization, Degeneracy. Assignment Problem – Introduction, Mathematical formulation of the problem, Solution of an Assignment problem, Hungarian Algorithm, Multiple Solution, Unbalanced Assignment problems, Maximization in Assignment Model.		
MODULE – 3		**10H**
Sequencing – Job sequencing, Johnsons Algorithm for n Jobs and Two machines, n Jobs and Three Machines, n jobs through m machines, Two jobs and m Machines Problems.		
MODULE – 4		**10H**
Game Theory: Concepts, Definitions and Terminology, Two Person Zero Sum Games, Pure Strategy Games (with Saddle Point), Principal of Dominance, Mixed Strategy Games (Game without Saddle Point), Significance of Game Theory in Managerial Application.		
MODULE – 5		**9H**
Project Management: Network Analysis – Definition –objectives -Rules for constructing network diagram- Determining Critical Path – Earliest & Latest Times – Floats - Application of CPM and PERT techniques in Project Planning and Control – PERT Vs CPM. (exclude Project Crashing).		
	Total hours:	**48 hours**

Textbooks:

1. Operations Research / R.Pannerselvam, PHI Publications.
2. Operations Research / S.D.Sharma-Kedarnath
3. Operations Research /A.M.Natarajan,P.Balasubramani,A. Tamilarasi/PearsonEducation.
4. Engineering Optimization: Theory and practice / S.S.Rao, New Age International (P)Limited

Reference Books:

1. Quantitative Techniques in Management / ND Vohra, Tata McGraw Hill, 4th Edition,2011.
2. ntroduction to O.R/Hiller &Libermann (TMH).
3. Operations Research: Methods & Problems / Maurice Saseini, ArhurYaspan&Lawrence Friedman. Pearson
4. Quantitative Analysis For Management/ Barry Render, Ralph M. Stair, Jr and Michael E. Hanna/

5. Operations Research / Wagner/ PHI Publications.

Online Learning Sources

https://onlinecourses.swayam2.ac.in/cec20_ma10/preview
https://onlinecourses.nptel.ac.in/noc20_ma23/preview
https://onlinecourses.nptel.ac.in/noc19_ma29/preview
https://www.slideshare.net/rossanz/production-and-cost-45827016
https://www.slideshare.net/darkyla/business-organizations-19917607
https://www.slideshare.net/balarajbl/market-and-classification-of-market
https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396
https://www.slideshare.net/ashu1983/financial-accounting

NARAYANA ENGINEERING COLLEGE:GUDUR								
IV Sem	PROBABILITY & STATISTICS							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A54401	3	0	0	48	3	30	70	100

Course Outcomes: After successful completion of this course, the students should be able to:

CO 1	Acquire knowledge in finding the analysis of categorically and various statistical elementary tools.**(BL2,BL3)**
CO 2	Develop skills in designing mathematical models involving probability, random variables and the critical thinking in the theory of probability and its applications in real life problems. **(BL3,BL5)**
CO 3	Apply the theoretical probability distributions like binomial, Poisson, and Normal in the relevant application areas. **(BL3)**
CO 4	Analyze to test various hypotheses included in theory and types of errors for large samples. **(BL2,BL3)**
CO 5	Apply the different testing tools like t-test, F-test, chi-square test to analyze the relevant real life problems. **(BL3,BL5)**

COURSE CONTENT		
MODULE – 1	**Descriptive statistics**	**9H**
Statistics Introduction, Population vs Sample, Collection of data, primary and secondary data, Measures of Central tendency, Measures of Variability (spread or variance) Skewness, Kurtosis, correlation, correlation coefficient, rank correlation, regression coefficients, method of least squares, regression lines.		
MODULE – 2	**Probability**	**10H**
Probability, probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem, random variables (discrete and continuous), probability density functions, properties, mathematical expectation.		
MODULE – 3	**Probability distributions**	**10H**
Probability distributions: Binomial, Poisson and Normal-their properties (Chebyshevs inequality). Approximation of the binomial distribution to normal distribution.		
MODULE – 4	**Estimation and Testing of hypothesis, large sample tests**	**10H**
Estimation-parameters, statistics, sampling distribution, point estimation, Formulation of null hypothesis, alternative hypothesis, the critical and acceptance regions, level of significance, two types of errors and power of the test. Large Sample Tests: Test for single proportion, difference of proportions, test for single mean and difference of means. Confidence interval for parameters in one sample and two sample problems		
MODULE – 5	**Smallsampletests**	**9H**
Student t-distribution (test for single mean, two means and pair edt-test), testing of equality of variances (F-test), $\chi 2$ - test for goodness of fit, $\chi 2$ - test for independence of attributes		
	Total hours:	**48 hours**

Textbooks:

1. MillerandFreunds,ProbabilityandStatisticsforEngineers,7/e,Pearson,2008.
2. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.

ReferenceBooks:

1. S.Ross,aFirstCourseinProbability,PearsonEducationIndia,2002.
2. W.Feller,anIntroductiontoProbabilityTheoryanditsApplications,1/e,Wiley, 1968.
3. B.V.Ramana,HigherEngineeringMathematics,McGrawHillEducation.

OnlineLearningResources:

1. https://onlinecourses.nptel.ac.in/noc21_ma74/preview
2. https://onlinecourses.nptel.ac.in/noc22_mg31/preview

NARAYANA ENGINEERING COLLEGE:GUDUR								
IV Sem	MACHINE LEARNING							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A31401T	3	0	0	48	3	30	70	100

Course Objectives: The objectives of the course are

- Define machine learning and its different types (supervised and unsupervised) andunderstand their applications.
- Apply supervised learning algorithms including decision trees and k-nearest neighbors (k-NN).
- Implement unsupervised learning techniques, such as K-means clustering.

Course Outcomes: After successful completion of this course, the students should be able to:

CO 1	CO1: Identify machine learning techniques suitable for a given problem. **(BL3)**
CO 2	CO2: Solve real-world problems using various machine learning techniques. **(BL3)**
CO 3	CO3: Apply Dimensionality reduction techniques for data preprocessing. **(BL3)**
CO 4	CO4: Explain what is learning and why it is essential in the design of intelligentmachines. **(BL2)**
CO 5	CO5: Evaluate Advanced learning models for language, vision, speech, decisionmaking etc. **(BL5)**

COURSE CONTENT		
MODULE – 1	**Introduction to Machine Learning**	**9H**
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.		
MODULE – 2	**Nearest Neighbor-Based Models**	**10H**
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.		
MODULE – 3	**Models Based on Decision Trees**	**10H**
Decision Trees for Classification, Impurity Measures, Properties, Regression Based on Decision Trees, Bias–Variance Trade-off, Random Forests for Classification and Regression. The Bayes Classifier: Introduction to the Bayes Classifier, Bayes' Rule and Inference, The Bayes Classifier and its Optimality, Multi-Class Classification | Class Conditional Independence and Naive Bayes Classifier (NBC)		
MODULE – 4	**Linear Discriminants for Machine Learning**	**10H**
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.		
MODULE – 5	**Clustering**	**9H**
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.		
	Total hours:	**48 hours**

Textbooks:

1."Machine Learning Theory and Practice", M N Murthy, V S Ananthanarayana, UniversitiesPress (India), 2024

Reference Books:

1."Machine Learning", Tom M. Mitchell, McGraw-Hill Publication, 20172."Machine Learning in Action",Peter Harrington, DreamTech
3."Introduction to Data Mining", Pang-Ning Tan, Michel Stenbach, Vipin Kumar, 7thEdition, 2019

NARAYANA ENGINEERING COLLEGE:GUDUR								
IV Sem	DATABASE MANAGEMENT SYSTEMS							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A05402T	3	0	0	48	3	30	70	100

Course Objectives: The main objective 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: After successful completion of this course, the students should be able to:

CO 1	Understand the basic concepts of database management systems**(BL2)**
CO 2	Analyze a given database application scenario to use ER model for conceptual design of the database **(BL4)**
CO 3	Utilize SQL proficiently to address diverse query challenges **(BL3).**
CO 4	Employ normalization methods to enhance database structure**(BL3)**
CO 5	Assess and implement transaction processing, concurrency control and database recovery protocols in databases. **(BL4)**

COURSE CONTENT		
MODULE – 1		**9H**
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.		
MODULE – 2		**10H**
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).		
MODULE – 3		**10H**
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.		
MODULE – 4		**10H**
Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency Loss less 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).		
MODULE – 5		**9H**
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:		
	Total hours:	**48 hours**

Textbooks:

1. Database Management Systems, 3rd edition, Raghurama Krishnan, Johannes Gehrke, TMH (For Chapters 2, 3, 4)
2. DatabaseSystemConcepts,5thedition,Silberschatz,Korth,Sudarsan,TMH(For Chapter 1 and Chapter 5)

ReferenceBooks:

1. IntroductiontoDatabaseSystems,8thedition,CJDate,Pearson.
2. DatabaseManagementSystem,6thedition,RamezElmasri,ShamkantB.Navathe, Pearson
3. DatabasePrinciplesFundamentalsofDesignImplementationandManagement, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

Web-Resources:

1. https://nptel.ac.in/courses/106/105/106105175/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012758066672820224 56_shared/overview

NARAYANA ENGINEERING COLLEGE:GUDUR								
III Sem	DIGITAL LOGIC & COMPUTER ORGANIZATION							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A30402	3	0	0	48	3	30	70	100

Course Objectives:

The main objective of the course is to

- providestudentswithacomprehensiveunderstandingofdigitallogicdesign 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: After successful completion of this course, the students should be able to:

CO 1	Differentiate between combinational and sequential circuits based on their characteristics and functionalities. **(BL2)**
CO 2	Demonstrate an understanding of computer functional units.**(BL2)**
CO 3	Analyze the design and operation of processors, including instruction execution, pipelining, and control unit mechanisms, to comprehend their role in computer systems.**(BL3)**
CO 4	Describe memory hierarchy concepts, including cache memory, virtual memory, and secondary storage, and evaluate their impact on system performance and scalability. **(BL3)**
CO 5	Explain input/output (I/O) systems and their interaction with the CPU, memory, and peripheral devices, including interrupts, DMA, and I/O mapping techniques. **(BL3)**
CO6	Design Sequential and Combinational Circuits**(BL6)**

COURSE CONTENT		
MODULE – 1		**9H**
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		
MODULE – 2		**10H**
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		
MODULE – 3		**10H**
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		
MODULE – 4		**10H**
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		
MODULE – 5		**9H**
Input /Output Organization: Accessing I/O Devices, Interrupts, Processor Examples, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces		
	Total hours:	**48 hours**

Textbooks:

1. Computer Organization, CarlHamacher, ZvonkoVranesic, SafwatZaky, 6th edition, McGraw Hill, 2023.
2. Digital Design, 6th Edition, M. MorrisMano, PearsonEducation,2018.
3. ComputerOrganizationandArchitecture,WilliamStallings,11th Edition,Pearson, 2022.

Reference Books:

1. Computer Systems Architecture, M. MorisMano,3rd Edition, Pearson, 2017.
2. Computer Organization and Design, David A. Paterson, John L. Hennessy, Elsevier, 2004.
3. Fundamentals of Logic Design, Roth, 5th Edition, Thomson, 2003.

Online Learning Resources:

https://nptel.ac.in/courses/106/103/106103068/

NARAYANA ENGINEERING COLLEGE:GUDUR								
IV Sem	MACHINE LEARNING LAB							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A31401T	0	0	3	48	1.5	30	70	100

Course Objectives:

- To learn about computing central tendency measures and Data preprocessing techniques
- To learn about classification and regression algorithms
- To apply different clustering algorithms for a problem.

Course Outcomes: After successful completion of the course, student will be able to:	
CO 1	Understand the Mathematical and statistical prospective of machine learning algorithms through python programming (BL2)
CO 2	Appreciate the importance of visualization in the data analytics solution. (BL5)
CO 3	Derive insights using Machine learning algorithms(BL2)
CO 4	Evaluate and demonstrate AI and ML algorithms. (L5)
CO 5	Evaluate different algorithms. (L5)

COURSE CONTENT	CO
List of Experiments	
TASK–1	**CO1**
1. Compute Central Tendency Measures: Mean, Median, Mode Measure of Dispersion: Variance, Standard Deviation.	
TASK–2	
2. Apply the following Pre-processing techniques for a given dataset. a. Attribute selection b. Handling Missing Values c. Discretization d. Elimination of Outliers	
TASK–3	**CO1**
3. Apply KNN algorithm for classification and regression	
TASK–4	**CO1**
4. Demonstrate decision tree algorithm for a classification problem and perform parameter tuning for better results	
TASK–5	**CO2**
5. Demonstrate decision tree algorithm for a regression problem	
TASK–6	**CO2**
6. Apply Random Forest algorithm for classification and regression	
TASK–7	**CO2**
7. Demonstrate Naïve Bayes Classification algorithm.	
TASK–8	**CO3**
8. Apply Support Vector algorithm for classification	
TASK–9	**CO4**
9. Demonstrate simple linear regression algorithm for a regression problem	
TASK–10	**CO4**
10. Apply Logistic regression algorithm for a classification problem	
TASK–11	**CO4**
11. Demonstrate Multi-layer Perceptron algorithm for a classification problem	
TASK–12	
12. 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.	
TASK–13	
13.Demonstrate the use of Fuzzy C-Means Clustering	
TASK–14	
14. Demonstrate the use of Expectation Maximization based clustering algorithm	

IV Sem	DATABASEMANAGEMENT SYSTEMS LAB							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A05402P	0	0	3	48	1.5	30	70	100

Course Objectives: This Course will enable students to

- Populate and query a database using SQL DDL/DML Commands
- Declare and enforce integrity constraints on a database
- Writing Queries using advanced concepts of SQL
- Programming PL/SQL including procedures, functions, cursors and triggers.

Course Outcomes: After successful completion of this course, the students should be able to:

CO 1	Utilizing Data Definition Language (DDL), Data Manipulation Language (DML), and Data Control Language (DCL) commands effectively within a database environment **(BL3)**
CO 2	Constructing and execute queries to manipulate and retrieve data from databases **(BL3)**
CO 3	Develop application programs using PL/SQL **(BL3)**
CO 4	Analyze requirements and design custom Procedures, Functions, Cursors, and Triggers, leveraging their capabilities to automate tasks and optimize database functionality **(BL4)**
CO 5	Establish database connectivity through JDBC(Java Database Connectivity) **(BL3)**

Experiments covering the topics:

- DDL, DML, DCL commands
- Queries, nested queries, built-in functions,
- PL/SQL programming-control structures
- Procedures, Functions, Cursors, Triggers,
- Database connectivity-ODBC/JDBC

COURSE CONTENT	CO
List of Experiments	
TASK–1	**CO1**
1. Creation, altering and droping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.	
TASK–2	
1. 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.	
TASK–3	**CO1**
1. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.	
TASK–4	**CO1**
1. Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr andinstr),datefunctions(Sysdate,next_day,add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date)	
TASK–5	**CO2**
1. i. Create a simple PL/SQL program which includes declaration section, executable section and exception–Handling section(Ex. Student mark scan 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.	
TASK–6	**CO2**
1. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.	
TASK–7	**CO2**
1. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE-APPLICATION ERROR.	
TASK–8	**CO3**
1. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.	
TASK–9	**CO4**
1. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.	
TASK–10	**CO4**

1. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.	
TASK–11	**CO4**
1. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers	
TASK–12	**CO4**
1. Create a table and perform the search operation on table using indexing and non- indexing techniques.	
TASK–13	**CO4**
1. Write a Java program that connects to a database using JDBC	
TASK–14	**CO4**
1. Write a Java program to connect to a data base using JDBC and insert values into it	
TASK–15	**CO4**
1. WriteaJavaprogramtoconnecttoadatabaseusingJDBCanddeletevaluesfromit	

Text Books / Suggested Reading:

1. Oracle: The Complete Reference by Oracle Press
2. NileshShah, "DatabaseSystemsUsingOracle",PHI,2007
3. RickFVanderLans,"IntroductiontoSQL",FourthEdition,PearsonEducation,2007

IV Sem	FULLSTACK DEVELOPMENT–1							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A52401	0	1	2	48	1.5	30	70	100

Course Objectives: The main objectives of the course are to

- Make use of HTML elements and their attributes for designing static WebPages
- Build a webpage by applying appropriate CSS styles to HTML elements
- Experiment with Java Script to develop dynamic web pages and validate forms

Course Outcomes: After successful completion of this course, the students should be able to:

CO 1	Design Websites**.(BL6)**
CO 2	Apply Styling to WebPages. **(BL4)**
CO 3	Make WebPages interactive**.(BL6)**
CO 4	Design Forms for applications**.(BL6)**
CO 5	Choose Control Structure based on the logic to be implemented**.(BL3)**
CO6	Understand HTML tags, Attributes and CSS properties**(BL2)**

Experiments covering the Topics:

- Lists, Links and Images
- HTML Tables, Forms and Frames
- HTML5 and Cascading Style Sheets, Types of CSS
- Select or 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

COURSE CONTENT	CO
List of Experiments	
TASK–1	**CO1**

1. Lists, Links and Images

a. Write a HTML program, to explain the working of lists.
Note: It should have an ordered list, un ordered 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

TASK–2	

2. HTML Tables, Forms and Frames

a. Write a HTML program, to explain the working of tables. (usetags:<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).

TASK–3	CO1

3. HTML5andCascadingStyleSheets,TypesofCSS

a. WriteaHTMLprogram,thatmakesuseof<article>,<aside>,<figure>,<figcaption>, <footer>,<header>,<main>,<nav>,<section>, ,tags.

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

c. Write a program to apply different types (or levels of styles or style specification formats) -inline,internal,externalstylestoHTMLelements.(identifyselector,propertyand value).

TASK–4	CO1

4. Selector forms

a. Write a program to apply different types of selector forms
- Simples elector (element, id, class, group, universal)
- Combinator selector (descendant, child, adjacent sibling, general sibling)
- Pseudo-class selector
- Pseudo-element selector
- Attribute selector

TASK–5	CO2

5. CSS with Color, Background, Font, Text and CSS Box Model

a. Write a program to demonstrate the various ways you can reference a color in CSS.
b. 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.
c. Write a program using the following terms related to CSS font and text:
   i. font-size ii. font-weight iii. font-style
   iv. text-decoration v. text-transformation vi. text-alignment
d. Writeaprogram,toexplaintheimportanceofCSSBoxmodelusing
   i. Content ii. Border iii. Margin iv. padding

TASK–6	CO2

6. Applying JavaScript-internal and external, I/O, Type Conversion

a. Write a program to embed internal and external JavaScript in a webpage.
b. Write a program to explain the different ways for displaying output.
c. Write a program to explain the different ways for taking input.
d. 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

TASK–7	CO2

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

a. Write a program using document object properties and methods.
b. Write a program using window object properties and methods.
c. Write a program using array object properties and methods.
d. Write a program using math object properties and methods.
e. Write a program using string object properties and methods.
f. Write a program using regex object properties and methods.
g. Write a program using date object properties and methods.
h. Write a program to explain user-defined object by using properties, methods, accessors, constructors and display.

TASK–8	CO3

8. Java Script Conditional Statements and Loops

a. 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".
b. Write a program to display week days using switch case.
c. Write a program to print 1to10 numbers using for, while and do-while loops.
d. Writeaprogramtoprintdatainobjectusingfor-in,for-eachandfor-ofloops
e. 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.,13 + 53+ 33 = 153]
f. 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)

TASK–9	CO4

9. Java script Functions and Events

a. Design a appropriate function should be called to display
- Factorial of that number
- Fibonacci series upto that number
- Prime numbers upto 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
9. Factorial of that number
10. Fibonacci series upto that number
11. Prime numbers upto that number
12. Is it palindrome or not

c. Write a program to validate the following fields in a registration page
i. Name(start with alphabet and followed by alphanumeric and the length should not be less than 6 characters)
ii. Mobile(only numbers and length10 digits)
iii. E-mail(should contain form at like xxxxxxx@xxxxxx.xxx)

Textbooks:

1. Programming the World Wide Web, 7thEdition, RobetWSebesta, Pearson,2013.
2. WebProgrammingwithHTML5,CSS and JavaScript, JohnDean, Jones&Bartlett Learning, 2019 (Chapters 1-11).
3. Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, Vasan Subramanian, 2nd edition, APress, O'Reilly.

Web Links:

1. https://www.w3schools.com/html
2. https://www.w3schools.com/css
3. https://www.w3schools.com/js/
4. https://www.w3schools.com/nodejs

https://www.w3schools.com/typescript

NARAYANA ENGINEERING COLLEGE:GUDUR								
IV Sem	DESIGN THINKING FOR INNOVATION							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A99401	1	0	2	48	2	30	70	100

Course Objectives:

The objective of this course is to familiarize students with design thinking process as a tool for breakthrough innovation. It aims to equip students with design thinking skills and ignite the minds to create innovative ideas, develop solutions for real-time problems.

Course Outcomes: After successful completion of this course, the students should be able to:

CO 1	Define the concepts related to design thinking.**(BL1, BL2)**
CO 2	Explain the fundamentals of Design Thinking and innovation **(BL1, BL2)**
CO 3	Apply the design thinking techniques for solving problems in various sectors. **(BL3)**
CO 4	Analyse to work in a multi disciplinary environment **(BL4)**
CO 5	Evaluate the value of creativity **(BL5)**
CO 6	Formulate specific problem statements of real time issues **(BL3, BL6)**

COURSE CONTENT		
MODULE – 1	**Introduction to Design Thinking**	**9H**
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.		
MODULE – 2	**Design Thinking Process**	**10H**
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.		
MODULE – 3	**Innovation**	**10H**
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.		
MODULE – 4	**Product Design**	**10H**
Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications- Innovation towards product design- Case studies **Activity:** Importance of modelling, how to set specifications, Explaining their own product design.		
MODULE – 5	**Design Thinking in Business Processes**	**9H**
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-DesignthinkingforStartups-DefiningandtestingBusinessModelsandBusinessCases- Developing & testing prototypes. **Activity:** How to market our own product, About maintenance, Reliability and plan for startup.		
	Total hours:	**48 hours**

Textbooks:

1. TimBrown, Change by design, Harper Bollins(2009)
2. IdrisMootee, Design Thinking for Strategic Innovation, 2013, John Wiley&Sons.

ReferenceBooks:

1. DavidLee, Design Thinking in the Classroom, Ulyssespress
2. ShrutinNShetty, Design the Future, NortonPress
3. WilliamLidwell, Universal Principles of Design-Kritinaholden,JillButter.

Chesbrough.H,TheEraofOpenInnovation– 2013

Online Learning Resources: https://nptel.ac.in/courses/110/106/110106124/
https://nptel.ac.in/courses/109/104/109104109/
https://swayam.gov.in/nd1_noc19_mg60/preview