CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

(An Autonomous College under JNTUA, Anantapuramu, Approved by AICTE, Accredited by NBA, Accredited by NAAC with 'A' Grade)

Vidya Nagar, Pallavolu(V), Proddatur–516362(A.P)India

Department of Computer Science and Engineering (ARTIFICIAL INTELLIGENCE)

Second Year B.Tech Course Structure and Syllabi under R23 Regulations

HEAD, Dept. of CSE (AI)
Chaitanya Bharathi Institute of Technology
(Autonomous)
Vidyanagar, PRODDATUR, Y.S.R. (Dt.) A.P.-516360

Controller of Examinations
Chaitanya Bharathi Institute of Technology
(Autonomous)
PRODDATUR, Y.S.R. (Dt.) A.P.-516360

PRINCIPAL
Chaitanya Bharathi Institute of Technolog
(Autonomous)
Vidyanagar, PRODDATUR, Y.S.R. (Dt.) A.P.-51636

II B.Tech – I Semester (R23)

Sl. No	Course Code	Course Title	Contact periods per week				Credits	Scheme of Examination Max.Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
1	23E00305T	DISCRETE MATHEMATICS & GRAPH THEORY	3	0	0	3	3	30	70	100
2	23E00306T	UNIVERSAL HUMAN VALUES 2 - UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT	2	1	0	3	3	30	70	100
3	23E31301T	ARTIFICIAL INTELLIGENCE	3	0	0	3	3	30	70	100
4	23E05301T	ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS	3	0	0	3	3	30	70	100
5	23E05302T	OBJECT ORIENTED PROGRAMMING THROUGH JAVA	3	0	0	3	3	30	70	100
6	23E05301L	ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS LAB	0	0	3	3	1.5	30	70	100
7	23E05302L	OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB	0	0	3	3	1.5	30	70	100
8	23E05303SC	**Skill Enhancement Course-I** PYTHON PROGRAMMING	0	1	2	3	2	30	70	100
9	23E00301MC	**Mandatory Non-Credit Course** ENVIRONMENTAL SCIENCE	2	0	0	2	0	30	00	30
TOTAL			**16**	**2**	**8**	**26**	**20**	**270**	**560**	**830**

II B.Tech – II Semester (R23)

Sl.No	Course Code	Course Title	Contact periods per week				Credits	Scheme of Examination Max.Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
1	23E00408T	OPTIMIZATION TECHNIQUES	2	0	0	2	2	30	70	100
2	23E00402T	PROBABILITY & STATISTICS	3	0	0	3	3	30	70	100
3	23E33401T	MACHINE LEARNING	3	0	0	3	3	30	70	100
4	23E05402T	DATABASE MANAGEMENT SYSTEMS	3	0	0	3	3	30	70	100
5	23E04304T	DIGITAL LOGIC & COMPUTER ORGANIZATION	3	0	0	3	3	30	70	100
6	23E31401L	AI & ML LAB	0	0	3	3	1.5	30	70	100
7	23E05402L	DATABASE MANAGEMENT SYSTEMS LAB	0	0	3	3	1.5	30	70	100
8	23E05404SC	**Skill Enhancement Course-II** FULL STACK DEVELOPMENT – 1	0	1	2	3	2	30	70	100
9	23E00404MC	**Mandatory Credit Course** DESIGN THINKING FOR INNOVATION	1	0	2	3	2	30	70	100
TOTAL			**15**	**1**	**10**	**26**	**21**	**270**	**630**	**900**
Mandatory Community Service Project of 08 weeks duration during summer vacation										

II B.Tech – I Semester
(23E00305T) DISCRETE MATHEMATICS & GRAPH THEORY
(Common to CSE, CSE-AI, CSE-DS & CSE-AI&ML)

Int.Marks	Ext.Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

Pre-Requisites: Basics of logical Mathematics

Course Objectives:
The course is designed to
- Introduce the concepts of mathematical logic and gain knowledge in sets, relations and functions
- Solve problems using counting techniques and combinatorics
- To introduce generating functions and recurrence relations.
- Use Graph Theory for solving real world problems

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

CO1: Apply mathematical logic to solve problems.

CO2: Understand the concepts and perform the operations related to sets, relations and functions.

Gain the conceptual background needed and identify structures of algebraic nature.

CO3: Apply basic counting techniques to solve combinatorial problems.

CO4: Formulate problems and solve recurrence relations.

CO5: Apply Graph Theory in solving computer science problem.

UNIT-I: Mathematical Logic

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

UNIT-II: Set Theory

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, monoids, groups, sub groups, homomorphism and Isomorphism.

UNIT-III: Elementary Combinatorics

Combinations and Permutations, Enumeration of Combinations and Permutations,Enumerating of Combinations and Permutations with Repetitions, Enumerating of Combinations and Permutations with constrained Repetitions. Binomial Coefficients, The Binomial and Multinomial Theorems.

UNIT-IV: Recurrence Relations

Generating Functions of Sequences, Calculating Coefficients of Generating Functions. Recurrence relations: Solving Recurrence Relations by Substitution, generating functions and the Method of Characteristic roots, Solutions of Inhomogeneous, Recurrence Relations.

UNIT-V: Graphs

Basic Concepts, Isomorphism and Sub graphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multigraphs and Euler Circuits, Hamiltonian Graphs.

Textbooks:

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 Combinations and Graph Theory, 7th Edition, McGraw Hill Education (India) Private Limited.

References:

1. Joe L. 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

II B.Tech – I Semester

(23E00306T) UNIVERSAL HUMAN VALUES 2–UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT

(Common to All Engineering Branches)

Int.Marks	Ext.Marks	Total Marks	L	T	P	C
30	70	100	2	1	0	3

Pre-requisites: NIL

Course Objectives:

The main objectives of the course is to

- 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:

After completion of the course, students will be able to

CO1: Define the terms like Natural Acceptance, Happiness and Prosperity
CO2: Identify one's self, and one's surroundings(family, society nature)
CO3: Apply what they have learnt to their own self and relate human values with human relationship, human society
CO4: Justify the need for universal human values and harmonious existence
CO5: Develop as socially and ecologically responsible engineers

Course Topics

The course has 28 lectures and 14 tutorials in 5 modules. The lectures and tutorials are of 1- hour duration. Tutorial sessions are to be used to explore and practice what has been proposed during the lecture sessions.

The Teacher's Manual provides the outline for lectures as well as practice sessions. The teacher is expected to present the issues to be discussed as propositions and encourage the students to have a dialogue.

UNIT I

Introduction to Value Education (6 lecturesand3tutorialsforpractice session)

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: PracticeSessionPS2ExploringHumanConsciousness
Lecture 5: Happiness and Prosperity – Current Scenario
Lecture 6: Method to Fulfill the Basic Human Aspirations
Tutorial3: PracticeSessionPS3ExploringNaturalAcceptance

UNIT II

Harmony in the Human Being(6 lectures and 3 tutorials for practice session)

Lecture 7: Understanding Human being as the Co-existence ofthe self and the body.
Lecture8: Distinguishing between the Needs of the self and the body
Tutorial4: 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 SessionPS5Exploring Sources of Imagination in the self Lecture 11: Harmony of the self with the body
Lecture12:Programme to ensure self-regulation and Health
Tutorial6:PracticeSessionPS6 Exploring Harmony of self with the body

UNIT III

Harmony in the Family and Society (6 lectures and 3 tutorials for practice session)

Lecture13: Harmony in the Family–the Basic Unit of Human Interaction
Lecture 14: 'Trust' – the Foundational Value in Relationship
Tutorial7:PracticeSessionPS7ExploringtheFeelingofTrust
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:PracticeSessionPS9ExploringSystemstofulfilHumanGoal

UNIT IV

Harmony in the Nature/Existence(4 lectures and 2 tutorials for practice session)

Lecture19: Understanding Harmony in the Nature
Lecture20: Inter connectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature
Tutorial10:PracticeSessionPS10ExploringtheFourOrdersofNature Lecture 21: Realizing Existence as Co-existence at All Levels
Lecture22: The Holistic Perception of Harmony in Existence
Tutorial11:PracticeSessionPS11ExploringCo-existenceinExistence.

UNIT V

Implications of the Holistic Understanding – a Look at Professional Ethics
(6 lectures and 3 tutorials for practice session)

Lecture 23: Natural Acceptance of Human Values
Lecture24: Definitiveness of (Ethical) Human Conduct
Tutorial12:PracticeSessionPS12 Exploring Ethical Human Conduct
Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order
Lecture26: Competence in Professional Ethics
Tutorial13: PracticeSessionPS13ExploringHumanisticModelsinEducation
Lecture 27: Holistic Technologies, Production Systems and Management Models-Typical Case Studies
Lecture 28: Strategies for Transition towards Value-based Life and Profession
Tutorial14:Practice Session PS14 Exploring Steps of Transition towards Universal Human Order

Practice Sessions for UNIT I–Introduction to Value Education

PS1 Sharing about Oneself
PS2ExploringHumanConsciousness PS3
Exploring Natural Acceptance

Practice Sessions for UNIT II –Harmony in the Human Being

PS4: Exploring the difference of Needs of self and body
PS5:Exploring Sources of Imagination in the self

PS6 :Exploring Harmony of self with the body
Practice Sessions for UNIT III –Harmony in the Family and Society
PS7: Exploring the Feeling of Trust
PS8: Exploring the Feeling of Respect
PS9:Exploring Systems to fulfill Human Goal

Practice Sessions for UNIT IV–Harmony in the Nature (Existence)
PS10: Exploring the Four Orders of Nature
PS11:Exploring Co-existence in Existence

Practice Sessions for UNIT V – Implications of the Holistic Understanding – a Look at Professional Ethics
PS12: Exploring Ethical Human Conduct
PS13: Exploring Humanistic Models in Education
PS14:Exploring Steps of Transition towards Universal Human Order

READINGS:
Text book and Teachers Manual a.TheTextbook
R R 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.TheTeacher'sManual
R R Gaur, R Asthana, G P Bagaria,Teachers' Manual for AFoundation Coursein Human Values and Professional Ethics,2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books
1. JeevanVidya:EkParichaya,ANagaraj,JeevanVidyaPrakashan,Amarkantak,1999.
2. HumanValues,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. Small is Beautiful-E.FSchumacher.
6. Slow is Beautiful-Cecile Andrews
7. Economy of Permanence-JC Kumarappa
8. Bharat Mein Angreji Raj–Pandit Sunderlal
9. Re discovering India-byD harampal
10. Hind Swaraj or Indian HomeRule-byMohandasK.Gandhi
11. India WinsFreedom-Maulana AbdulKalamAzad
12. Vivekananda-RomainRolland(English)
13. Gandhi-RomainRolland(English)

Mode of Conduct:
Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them. Tutorial hours are to be used for practice sessions.
While analyzing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements. In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self exploration.
Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than" extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.
It is recommended that this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content. Additional content may be offered in separate, higher courses. This course is to be taught by faculty from every teaching department, not

exclusively by any one department. Teacher preparation with a minimum exposure to at least one 8-dayFacultyDevelopment Program on Universal Human Values is deemed essential.

Online Resources:

1. https://fdp-si.aicte-india.org/UHVII%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-Introduction%20to%20Value%20Education.pdf

2. https://fdp-si.aicte-india.org/UHVII%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf

3. https://fdp-si.aicte-india.org/UHVII%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf

4. https://fdp-si.aicte-india.org/UHV%201%20Teaching%20Material/D3-S2%20Respect%20July%2023.pdf

5. https://fdp-si.aicte-india.org/UHVII%20Class%20Notes%20&%20Handouts/UHV%20Handout%205-Harmony%20in%20the%20Nature%20and%20Existence.pdf
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6.https://fdp-si.aicte-india.org/download/FDPTeachingMaterial/3-days%20FDPSI%20UHV%20Teaching%20Material/Day%203%20Handouts/UHV%203D%20D3-S2A%20Und%20Nature-Existence.pdf

7. https://fdp-si.aicteindia.org/UHV%20II%20Teaching%20Material/UHV%20II%20Lecture%2023-25%20Ethics%20v1.pdf

8. https://www.studocu.com/in/document/kiet-group-of-institutions/universal-humanvalues/chapter-5-holistic-understanding-of-harmony-on-professional-ethics/62490385
https://onlinecourses.swayam2.ac.in/aic22_ge23/preview

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II B.Tech – I Semester
(23E31301T) ARTIFICIAL INTELLIGENCE
(Common to CSE-AI & CSE-AI&ML)

Int.Marks	Ext.Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

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

Course Objectives:
The main objectives of the course is to
- The student should be made to study the concepts of Artificial Intelligence.
- The student should be made to learn the methods of solving problems using Artificial Intelligence.
- The student should be made to introduce the concepts of Expert Systems.
- To understand the applications of AI, namely game playing, theorem proving, and machine learning.
- To learn different knowledge representation techniques

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

CO1: Articulate AI fundamentals, including agent types and problem formulation.
CO2: Apply and analyze various search strategies and algorithms in problem-solving and game-playing.
CO3: Evaluate knowledge representation methods and perform reasoning under uncertainty using probabilistic models.
CO4: Compare inference techniques in logic and implement learning methods for AIsystems.
CO5: Analyze expert system architecture and evaluate specific systems while understanding knowledge acquisition processes.

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 dempstershafer theory.

UNIT-IV

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.

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,"ArtificialIntelligence:AnewSynthesis",ElsevierPublishers.
4. Artificial Intelligence, Saroj Kaushik, CENGAGE Learning.

Online Learning Resources:

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

II B.Tech – I Semester
(23E05301T) ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS
(Common to CSE, CSE-AI, CSE-DS & CSE-AI&ML)

Int.Marks	Ext.Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

Pre-Requisites: NIL

Course Objectives:
The main objectives 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 completion of the course, students will be able to
CO1: Illustrate the working of the advanced tree data structures and their applications
CO2: Understand the Graph data structure, traversals and apply them in various contexts.
CO3: Use various data structures in the design of algorithms
CO4: Recommend appropriate data structures based on the problem being solved
CO5: Analyze algorithms with respect to space and time complexities

UNIT – I:
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:
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:
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 Paths

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

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

Textbooks:

1. Fundamentals of Data Structures in C++, Horowitz, Ellis; Sahni, Sartaj; Mehta, Dinesh, 2nd Edition Universities Press
2. Computer Algorithms in C++, Ellis Horowitz, SartajSahni, SanguthevarRajasekaran, 2nd Edition University Press

Reference Books:

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

Online Learning Resources:

1. https://www.tutorialspoint.com/advanced_data_structures/index.asp
2. http://peterindia.net/Algorithms.html
3. https://www.youtube.com/playlist?list=PLDN4rrl48XKpZkf03iYFl-O29szjTrs_O

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II B.Tech – I Semester
(23E05302T) OBJECT ORIENTED PROGRAMMING THROUGH JAVA
(Common to CSE, CSE-AI, CSE-DS & CSE-AI&ML)

Int.Marks	Ext.Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

Pre-Requisites: NIL

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:

After completion of the course, students will be able to

CO1: Analyze problems, design solutions using OOP principles, and implement them efficiently in Java.

CO2: Design and implement classes to model real-world entities, with a focus on attributes, Behaviours and relationships between objects

CO3: Demonstrate an understanding of inheritance hierarchies and polymorphic behaviour, including method overriding and dynamic method dispatch.

CO4: Apply Competence in handling exceptions and errors to write robust and fault-tolerant code.

CO5: 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.

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 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.

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 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.

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, 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.

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, ResultSet 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 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 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.

References Books:

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

Online Resources:

1) https://nptel.ac.in/courses/106/105/106105191/
2) https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01288046454761881634 7_shared/overview

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II B.Tech – I Semester
(23E05301L) ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS LAB
(Common to CSE, CSE-AI & CSE-AI&ML)

Int.Marks	Ext.Marks	Total Marks	L	T	P	C
30	70	100	0	0	3	1.5

Pre-Requisites: NIL

Course Objectives:
The objectives 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 completion of the course, students will be able to

CO1: Design and develop programs to solve real world problems with the popular algorithm design methods.

CO2: Demonstrate an understanding of Non-Linear data structures by developing implementing the operations on AVL Trees, B-Trees, Heaps and Graphs.

CO3: Critically assess the design choices and implementation strategies of algorithms and data structures in complex applications.

CO4: Utilize appropriate data structures and algorithms to optimize solutions for specific computational problems.

CO5: Compare the performance of different of algorithm design strategies

Experiments covering the Topics:
- Operations on AVL trees, B-Trees, Heap Trees
- Graph Traversals
- Sorting techniques
- Minimum cost Spanning trees
- Shortest path algorithms using greedy Method
- 0/1 Knapsack Problem using Dynamic Programming and Backtracking
- Travelling Salesperson problem using Branch and Bound
- Optimal Binary Search Trees
- N-Queens Problem using Backtracking
- Job Sequencing using Branch and Bound

Sample Programs:
1. 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.
2. Construct B-Tree an order of 5 with a set of 100 random elements stored in array. Implement searching, insertion and deletion operations.
3. Construct Min and Max Heap using arrays, delete any element and display the content of the Heap.
4. Implement BFT and DFT for given graph, when graph is represented by

   a) Adjacency Matrix b) Adjacency Lists

5. Write a program for finding the biconnected components in a given graph.
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, SahniSartaj, Mehta, Dinesh, 2nd Edition, Universities Press
2. Computer Algorithms/C++ Ellis Horowitz, SartajSahni, SanguthevarRajasekaran, 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

II B.Tech – I Semester

(23E05302L) OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB

(Common to CSE, CSE-AI, CSE-DS & CSE-AI&ML)

Int.Marks	Ext.Marks	Total Marks	L	T	P	C
30	70	100	0	0	3	1.5

Pre-Requisites: NIL

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, Java FX GUI

Course Outcomes:

After completion of the course, students will be able to

CO1: Demonstrate a solid understanding of Java syntax, including data types, control structures, methods, classes, objects, inheritance, polymorphism, and exception handling.

CO2: Apply fundamental OOP principles such as encapsulation, inheritance, polymorphism, and abstraction to solve programming problems effectively. (L3)

CO3: Familiar with commonly used Java libraries and APIs, including the Collections Framework, Java I/O, JDBC, and other utility classes. (L2)

CO4: Develop problem-solving skills and algorithmic thinking, applying OOP concepts to design efficient solutions to various programming challenges. (L3)

CO5: Proficiently construct graphical user interface (GUI) applications using JavaFX (L4)

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, 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 StringBuffer to delete, remove character.

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.

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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 ImageView (use JavaFX)
c) Build a Tip Calculator app using several JavaFX components and learn how to respond to user interactions with the GUI

Exercise – 9
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 ahead, Anitha Seth, B.L.Juneja, Oxford.
2. Joy with JAVA, Fundamentals of Object Oriented Programming, DebasisSamanta,Monalisa Sarma, Cambridge, 2023.
3. JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.

References Books:
1. The complete Reference Java, 11th edition, Herbert Schildt,TMH
2. Introduction to Java programming, 7th Edition, Y Daniel Liang, Pearson

Online Resources:
1. https://nptel.ac.in/courses/106/105/106105191/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547 618816347_ shared / overview

II B.Tech – I Semester
(23E05303SC) PYTHON PROGRAMMING
(Skill Enhancement Course-I)
(Common to CSE, CSE-AI, CSE-DS & CSE-AI&ML)

Int.Marks	Ext.Marks	Total Marks	L	T	P	C
30	70	100	0	1	2	2

Pre-Requisites: NIL

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:
After completion of the course, students will be able to
CO1: Showcase adept command of Python syntax, deftly utilizing variables, data types, control structures, functions, modules, and exception handling to engineer robust and efficient code solutions.
CO2: Apply Python programming concepts to solve a variety of computational problems
CO3: 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
CO4: Become proficient in using commonly used Python libraries and frameworks such as JSON, XML, NumPy, pandas
CO5: Exhibit competence in implementing and manipulating fundamental data structures such as lists, tuples, sets, dictionaries

UNTI-I:
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.

UNIT-II:

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:

7. Write a program to define a function with multiple return values.
8. Write a program to define a function using default arguments.
9. Write a program to find the length of the string without using any library functions.
10. Write a program to check if the substring is present in a given string or not.
11. Write a program to perform the given operations on a list:
    i) Addition ii) Insertion iii) slicing
12. Write a program to perform any 5 built-in functions by taking any list.

UNIT-III:

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:

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

UNIT-IV:

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:

18. 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.
19. Python program to print each line of a file in reverse order.
20. Python program to compute the number of characters, words and lines in a file.
21. Write a program to create, display, append, insert and reverse the order of the items in the array.
22. Write a program to add, transpose and multiply two matrices.
23. 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.

UNIT-V:

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

Sample Experiments:

24. Python program to check whether a JSON string contains complex object or not.
25. Python Program to demonstrate NumPy arrays creation using array () function.
26. Python program to demonstrate use of ndim, shape, size, dtype.
27. Python program to demonstrate basic slicing, integer and Boolean indexing.
28. Python program to find min, max, sum, cumulative sum of array
29. 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
30. 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:

1. Gowrishankar S, Veena A., Introduction to Python Programming, CRC Press.
2. Python Programming, S Sridhar, J Indumathi, V M Hariharan, 2nd Edition, Pearson, 2024
3. Introduction to Programming Using Python, Y. Daniel Liang, 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

II B.Tech – I Semester
(23E00301MC) ENVIRONMENTAL SCIENCE
(Mandatory Non-Credit Course)
(Common to CSE, CSE-AI, CSE-DS & CSE-AI&ML)

Int.Marks	Ext.Marks	Total Marks	L	T	P	C
30	00	30	2	0	0	0

Pre-Requisites: NIL

Course Objectives:
The objectives of the course are

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

CO1: Grasp multidisciplinary nature of environmental studies and various renewable and non renewable resources.
CO2: Understand flow and bio-geo- chemical cycles and ecological pyramids.
CO3:Understand various causes of pollution and solid waste management and related preventive measures.
CO4: About the rainwater harvesting, watershed management, ozone layer depletion and waste land reclamation.
CO5: Casus of population explosion, value education and welfare programs.

UNIT I
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 and exploitation, 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

UNIT II
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. Grassland 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.

UNIT III

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.

UNIT IV

Social Issues and the Environment: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed 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.

UNIT V

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..

Textbooks:

1. Textbook of Environmental Studies for Undergraduate Courses Erach Bharucha for University Grants Commission, Universities Press.
2. Palaniswamy, "Environmental Studies", Pearson education
3. S.Azeem Unnisa, "Environmental Studies" Academic Publishing Company
4. K.Raghavan Nambiar, "Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus", Scitech Publications (India), Pvt. Ltd.

References:

1. Deeksha Dave and E.Sai Baba Reddy, "Textbook of Environmental Science", Cengage Publications.
2. M.Anji Reddy, "Text book of Environmental Sciences and Technology", BS Publication.
3. J.P.Sharma, Comprehensive Environmental studies, Laxmi publications.
4. J. Glynn Henry and Gary W. Heinke, "Environmental Sciences and Engineering", Prentice hall of India Private limited
5. G.R.Chatwal, "A Text Book of Environmental Studies" Himalaya Publishing House
6. Gilbert M. Masters and Wendell P. Ela, "Introduction to Environmental Engineering and Science, Prentice hall of India Private limited.

II B.Tech – II Semester
(23E00408T) OPTIMIZATION TECHNIQUES
(Common to CSE-AI, CSE-DS & CSE-AI&ML)

Int.Marks	Ext.Marks	Total Marks	L	T	P	C
30	70	100	2	0	0	2

Pre-Requisites: NIL

Course Objectives:
The objectives of the course are

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

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

CO1: Understanding Optimization and Formulation of Linear Programing Models
CO2: Formulate and Solve Transportation & Assignment Models
CO3: Sequencing of operations and optimizing
CO4: Discuss the game theory and strategies
CO5: Developing networks of activities and finding optimal mode of projects evaluation

UNIT-I:
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.

UNIT - II
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.

UNIT - III
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.

UNIT - IV
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.

UNIT - V
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).

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/Pearson Education.
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. Introduction 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

II B.Tech – II Semester
(23E00402T) PROBABILITY & STATISTICS
(Common to CSE, CSE-AI & CSE-AI&ML)

Int.Marks	Ext.Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

Pre-Requisites: Probability & Statistics

Course Objectives:
The objectives of the course are
- The theory of Probability and random variables.
- Usage of statistical techniques like testing of hypothesis, testing of significance, chi-square test and basic concepts of Least square methods.

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

CO1: Acquire knowledge in finding the analysis of categorically and various statistical elementary tools of analytic functions.
CO2: 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.
CO3: Apply the theoretical probability distributions like binomial, Poisson, and Normal in the relevant application areas.
CO4: Analyze to test various hypotheses included in theory and types of errors for large samples.
CO5: Apply the different testing tools like t-test, F-test, chi-square test to analyze the relevant real life problems.

UNIT I: Descriptive statistics
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.

UNIT II: Probability
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.

UNIT III: Probability distributions
Probability distributions: Binomial, Poisson and Normal-their properties (Chebyshevs inequality). Approximation of the binomial distribution to normal distribution.

UNIT IV: Estimation and Testing of hypothesis, large sample tests
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

UNIT V: Small sample tests
Student t-distribution (test for single mean, two means and paired t-test), testing of equality of variances (F-test), $\chi 2$ - test for goodness of fit, $\chi 2$ - test for independence of attributes.

Textbooks:

1. Miller and Freunds, Probability and Statistics for Engineers,7/e, Pearson, 2008.
2. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.

Reference Books:

1. S. Ross, a First Course in Probability, Pearson Education India, 2002.
2. W. Feller, an Introduction to Probability Theory and its Applications, 1/e, Wiley, 1968.
3. B. V. Ramana, Higher Engineering Mathematics, Mc Graw Hill Education.

Online Learning Resources:

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

II B.Tech – II Semester
(23E33401T) MACHINE LEARNING
(Common to CSE-AI & CSE-AI&ML)

Int.Marks	Ext.Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

Pre-Requisites: NIL

Course Objectives:
The objectives of the course are
- Define machine learning and its different types (supervised and unsupervised) and understand 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 completion of the course, students will be able to
CO1:Identify machine learning techniques suitable for a given problem.
CO2:Solve real-world problems using various machine learning techniques.
CO3:Apply Dimensionality reduction techniques for data pre processing.
CO4:Explain what is learning and why it is essential in the design of intelligent machines.
CO5:Evaluate Advanced learning models for language,vision, speech,decision making etc

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.

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.

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.
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)

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), Back propagation 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.

Textbooks:

1. "Machine Learning Theory and Practice", MN Murthy, V S Ananthanarayana, Universities Press (India), 2024

Reference Books:

1. "Machine Learning", Tom M.Mitchell,McGraw-HillPublication,2017
2. "Machine Learning in Action", Peter Harrington, Dream Tech
3. "Introduction to Data Mining", Pang-Ning Tan, Michel Stenbach,Vipin Kumar,7th Edition, 2019.

II B.Tech – II Semester
(23E05402T) DATABASE MANAGEMENT SYSTEMS
(Common to CSE, CSE-AI, CSE-DS & CSE-AI&ML)

Int.Marks	Ext.Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

Pre-Requisites: NIL

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

CO1: Understand the basic concepts of database management systems
CO2: Analyze a given database application scenario to use ER model for conceptual design of the database
CO3: Utilize SQL proficiently to address diverse query challenges .
CO4: Employ normalization methods to enhance database structure
CO5: Assess and implement transaction processing, concurrency control and database recovery protocols in databases.

UNIT I:
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:
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).

UNIT III:
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.

UNIT IV:

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:

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 5)

Reference Books:

1) Introduction to Database Systems, 8thedition, C J Date, Pearson.
2) Database Management System, 6th edition, RamezElmasri, Shamkant B. Navathe, Pearson
3) Database Principles Fundamentals of Design Implementation and Management, 10th edition, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning, 2022

Web-Resources:

1) https://nptel.ac.in/courses/106/105/106105175/
2) https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01275806667282022456_shared/overview

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II B.Tech – II Semester
(23E04304T) DIGITAL LOGIC & COMPUTER ORGANIZATION
(Common to CSE-AI & CSE-AI&ML)

Int.Marks	Ext.Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

Pre-Requisites: NIL

Course Objectives:
The main objectives of the course are 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:
After completion of the course, students will be able to

CO1: Understand various number systems and design digital circuits using combinational circuits.
CO2: Design and analyze digital systems including sequential circuits and computer architecture components.
CO3: Design efficient arithmetic circuits and understand processor functionalities.
CO4: Describe memory hierarchy concepts, including cache memory, virtual memory, and secondary storage, and evaluate their impact on system performance and scalability.
CO5: Explain input/output (I/O) systems and their interaction with the CPU, memory, and peripheral devices, including interrupts, DMA, and I/O mapping techniques.

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

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

Textbooks:

1. Computer Organization, Carl Hamacher, ZvonkoVranesic, SafwatZaky, 6th edition, McGraw Hill, 2023.
2. Digital Design, 6th Edition, M. Morris Mano, Pearson Education, 2018.
3. Computer Organization and Architecture, William Stallings, 11thEdition, Pearson, 2022.

Reference Books:

1. Computer Systems Architecture, M.Moris Mano, 3rdEdition, Pearson, 2017.
2. Computer Organization and Design, David A. Paterson, John L. Hennessy, Elsevier, 2004.
3. Fundamentals of Logic Design, Roth, 5thEdition, Thomson, 2003.

Online Learning Resources:

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

II B.Tech – II Semester
(23E31401L) AI & ML LAB
(Only CSE-AI)

Int.Marks	Ext.Marks	Total Marks	L	T	P	C
30	70	100	0	0	3	1.5

Pre-Requisites: Artificial Intelligence

Course Objectives:

The student should be made to study the concepts of Artificial Intelligence.

- The student should be made to learn the methods of solving problems using Artificial Intelligence.
- The student should be made to introduce the concepts of Expert Systems and machine learning.
- 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 completion of the course, students will be able to

CO1: Understand the Mathematical and statistical prospectives of machine learning algorithms through python programming
CO2: Appreciate the importance of visualization in the data analytics solution.
CO3: Derive insights using Machine learning algorithms
CO4: Evaluate and demonstrate AI and ML algorithms.
CO5: Evaluate different algorithms.

Software Required for ML: Python/R/Weka

List of Experiments

1.Pandas Library

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

i) describe () ii) head () iii) tail () iv) info ()

2. Pandas Library: Visualization

a) Write a program which use pandas inbuilt visualization to plot following graphs:

i. Bar plots ii. Histograms iii. Line plots iv. Scatter plots

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 shortest path)

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.

Reference Books:

1.Stuart J. Russell and Peter Norvig, Artificial Intelligence A Modern Approach, Fourth Edition, Pearson, 2020
2. Martin C. Brown (Author), "Python: The Complete Reference" McGraw Hill Education, Fourth edition, 2018
3. R. Nageswara Rao , "Core Python Programming" Dreamtech Press India Pvt Ltd 2018.
4. "Machine Learning", Tom M. Mitchell, McGraw-Hill Publication, 2017
5. "Machine Learning in Action",Peter Harrington, DreamTech
6. "Introduction to Data Mining", Pang-Ning Tan, Michel Stenbach, Vipin Kumar, 7th Edition, 2019.

II B.Tech – II Semester

(23E05402L) DATABASE MANAGEMENT SYSTEMS LAB

(Common to CSE, CSE-AI, CSE-DS & CSE-AI&ML)

Int.Marks	Ext.Marks	Total Marks	L	T	P	C
30	70	100	0	0	3	1.5

Pre-Requisites: NIL

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 completion of the course, students will be able to

CO1: Utilizing Data Definition Language (DDL), Data Manipulation Language (DML), and Data Control Language (DCL) commands effectively within a database environment

CO2: Constructing and execute queries to manipulate and retrieve data from databases.

CO3: Develop application programs using PL/SQL.

CO4: Analyze requirements and design custom Procedures, Functions, Cursors, and Triggers, leveraging their capabilities to automate tasks and optimize database functionality

CO5: Establish database connectivity through JDBC (Java Database Connectivity)

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

Sample Experiments:

1. Creation, altering and droping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.

2. 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.

3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.

4. 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)

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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, RAISE-APPLICATION 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.

13. Write a Java program that connects to a database using JDBC

14. Write a Java program to connect to a database using JDBC and insert values into it

15. Write a Java program to connect to a database using JDBC and delete values from it

Reference 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
4. RamezElmasri, Shamkant, B. Navathe, "Database Systems", Pearson Education, 6th Edition, 2013.
5. Database Principles Fundamentals of Design Implementation and Management, 10th edition, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning, 2022

Online Learning Resources:

1. http://www.scoopworld.in
2. http://vlabs.iitb.ac.in/vlabs-dev/labs/dblab/index.php

II B.Tech – II Semester
(23E05404SC) FULL STACK DEVELOPMENT – I
(Skill Enhancement Course-II)
(Common to CSE, CSE-AI & CSE-AI&ML)

Int.Marks	Ext.Marks	Total Marks	L	T	P	C
30	70	100	0	1	2	2

Pre-Requisites: NIL

Course Objectives:
The main objectives of the course are to
- Make use of HTML elements and their attributes for designing static web pages
- Build a web page by applying appropriate CSS styles to HTML elements
- Experiment with JavaScript to develop dynamic web pages and validate forms

Course Outcomes:
After completion of the course, students will be able to
CO1: Design Websites.
CO2: Apply Styling to web pages.
CO3: Make Web pages interactive.
CO4: Design Forms for applications.
CO5: Choose Control Structure based on the logic to be implemented.

Experiments covering the Topics:
- ❖ 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

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>, , 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

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. Write a program, to explain the importance of CSS Box model using
   i. Content ii. Border iii. Margin iv. padding

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

a. Write a program to embed internal and external JavaScript in a web page.
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

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.

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 1 to 10 numbers using for, while and do-while loops.
d. Write a program to print data in object using for-in, for-each and for-of loops
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)

9. Java Script Functions and Events

a. Design a appropriate function should be called to display
   i. Factorial of that number
   ii. Fibonacci series up to that number
   iii. Prime numbers up to that number
   iv. 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
   i. Factorial of that number
   ii. Fibonacci series up to that number
   iii. Prime numbers up to that number
   iv. 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 length 10 digits)
   iii. E-mail (should contain format like xxxxxxx@xxxxxx.xxx)

Reference Books:

1. Programming the World Wide Web, 7thEdition, Robet W Sebesta, Pearson, 2013.
2. Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, Vasan Subramanian, 2nd edition, APress, O'Reilly.
3. Web Programming with HTML5, CSS and JavaScript, Jones & Bartlett Learning, 2019.

Online Learning Resources:

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

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II B.Tech – II Semester
(23E00404MC) DESIGN THINKING FOR INNOVATION
(Mandatory Credit Course)
(Common to All Engineering Branches)

Int.Marks	Ext.Marks	Total Marks	L	T	P	C
30	70	100	1	0	2	2

Pre-Requisites: NIL

Course Objectives:
The main objectives of the course are to
- To explain the basic knowledge and evolution of design thinking
- To familiarize the students with design thinking process as a tool for break through innovation
- To give an overview on creativity and innovation in organizations
- To explain various innovations towards product design

Course Outcomes:
After completion of the course, students will be able to
CO1: Define the concepts related to design thinking.
CO2: Explain the fundamentals of Design Thinking and innovation
CO3: Apply the design thinking techniques for solving problems in various sectors.
CO4: Analyse to work in a multidisciplinary environment
CO5: Formulate specific problem statements of real time issues

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.

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 modelling, 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 needsDesign thinking for Startups- Defining and testing Business Models and Business CasesDeveloping & testing prototypes.

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

Textbooks:

1. Tim Brown,Change by design, Harper Bollins (2009)
2. Idris Mootee, Design Thinking for Strategic Innovation, 2013, John Wiley & Sons.

Reference Books:

1. David Lee, Design Thinking in the Classroom, Ulysses press
2. Shrutin N Shetty, Design the Future, Norton Press
3. William Lidwell,Universal Principles of Design- Kritinaholden, Jill Butter.
4. Chesbrough.H, The Era of Open Innovation – 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