Bansilal Ramnath Agarwal Charitable Trust's
Vishwakarma Institute of Information Technology, Pune-48
(An Autonomous Institute affiliated to Savitribai Phule Pune University)
Department of Computer Science and Engineering (Artificial Intelligence)

Second Year B.Tech.

Pattern 2020

Syllabus (Year 2023-24)

Bansilal Ramnath Agarwal Charitable Trust's
Vishwakarma Institute of Information Technology, Pune-48
(An Autonomous Institute affiliated to Savitribai Phule Pune University)
Department of Computer Science and Engineering (Artificial Intelligence)

SEMESTER III

Bansilal Ramnath Agarwal Charitable Trust's
Vishwakarma Institute of Information Technology, Pune-48
(An Autonomous Institute affiliated to Savitribai Phule Pune University)
Department of Computer Science and Engineering (Artificial Intelligence)

S.Y. B.Tech. Computer Science and Engineering (AI ML)

SEMESTER III (PATTERN 2020)

Course Code	Course Title	Course Type	Teaching Scheme			Examination Scheme					Total	Credits
			L	T	P	CIE	ISE	SCE	ESE	PR/OR/TW		
1	Discrete Mathematics	TH	3	1	-	20	30	20	30	25	125	4
2	Fundamentals of Data structures	TH	3	-	2	20	30	20	30	25	125	4
3	Digital Logic and Computer Architecture	TH	3	-	2	20	30	20	30	25	125	4
4	Object Oriented Programming	TH	3	-	2	20	30	20	30	25	125	4
5	Universal Human value 2	TH	2	1	-	20	30	20	30	25	125	3
6	Data storytelling and Visualization	CE	2	-	2	-	-	-	-	50	50	3
7	Soft Skills	CE	1	-	2	-	-	-	-	50	50	2
	Mandatory Course	AU	-	-	-	-	-	-	-	-	-	-
	Total		**17**	**2**	**10**	**100**	**150**	**100**	**150**	**225**	**725**	**24**

S.Y. B.Tech. Computer Science and Engineering (AI ML)

SEMESTER IV

CURRICULUM

Course Code	Course Title	Course Type	Teaching Scheme			Examination Scheme					Total	Credits
			L	T	P	CIE	ISE	SCE	ESE	PR/OR/TW		
1	Artificial Intelligence	TH	3	-	2	20	30	20	30	25	125	4
2	Probability and statistics	TH	3	1	-	20	30	20	30	25	125	4
3	Advance Data Structures	TH	3	-	2	20	30	20	30	25	125	4
4	Database Management Systems	TH	3	-	2	20	30	20	30	25	125	4
5	Theory of Computation	TH	3	-	-	20	30	20	30	-	100	3
6	Software Engineering and Project Management	CE	2	-	2	-	-	-	-	50	50	3
7	Web Technology	CE	1	-	2	-	-	-	-	50	50	2
	Mandatory Course	AU	-	-	-	-	-	-	-	-	-	-
	Total		**18**	**2**	**8**	**100**	**150**	**100**	**150**	**200**	**700**	**24**

Discrete Mathematics

Teaching Scheme
Credits : 4
Lectures : 3 Hrs/week
Tutorial : 1 Hr/week

Examination Scheme
Continuous Internal Evaluation(CIE): 20 Marks
In-Semester Examination(ISE): 30 Marks
Skills & Competency Exam(SCE): 20 Marks
End Semester Examination(ESE): 30 Marks
TW: 25 Marks

Prerequisites :
- Linear Algebra

Course Objectives :
- To study basic of logic and set theory
- To understand notion of functions and relations
- To study fundamental principles of graphs
- To study fundamental principles of trees elementary combinatorial processes
- To study fundamental principles of counting
- To introduce basic concepts of algebraic structures

Course Outcomes :

After completion of the course, student will be able to
1. Demonstrate use of logical arguments, proof techniques and set theory principles. (Understanding)
2. Illustrate type, properties and solution of relations and functions. (Understanding)
3. Solve the problems using graph methods and algorithms. (Applying)
4. Apply tree models and methods for obtaining solutions of applications involving searching, prefix code and vertex connectivity. (Applying)
5. Apply principles of counting to solve counting problems. (Understanding & Applying)
6. Prove elementary properties of modular arithmetic and explain their applications in Computer Science,

Unit I : Mathematical Logic and Set Theory

Propositional Logic, Applications of Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Proof Methods and Strategy Sets, Combination of sets, Venn Diagrams, Finite and Infinite sets, Uncountably infinite sets, Principle of inclusion and exclusion, multisets.

Unit II : Functions and Relations

Functions, Composition of functions, Invertible functions, Discrete Numeric functions and Generating functions, Job scheduling Problem. Properties of Binary Relations, Closure of relations, Warshall's algorithm, Equivalence Relations and Partitions, Partial ordering relations and Lattices, Chains and Anti-chains.

Recurrence Relations : Recurrence Relation, Linear Recurrence Relations with constant Coefficients, Homogeneous Solutions, Total solutions, Solutions by the method of generating functions

Unit III : Graphs

Basic terminology, Representation of graph in computer memory, Multigraphs and Weighted graphs, Subgraph, Isomorphic graph, Complete ,Regular and Bipartite graphs, Operation on graph, Paths and Circuits, Hamiltonian and Euler paths and circuits, Shortest path in weighted Graph (Dijkstra's algorithm), Factors of a graph, Planar graph and Travelling salesman problem, Graph colouring

Unit IV : Trees

Trees, Rooted trees, Path length in rooted trees, Prefix codes and optimal prefix codes, Binary search trees, Tree traversals, Spanning trees, Fundamental circuits and cut set, Minimal spanning trees, Kruskal's and Prim's algorithms for minimum spanning tree, The Max flow – Min cut theorem (transport network)

Unit V : Counting

Permutations and Combinations: Rule of sum and product, Pigeonhole principle, Permutations, Combinations, Binomial Coefficients and identities, Algorithms for generation of Permutations and Combinations

Unit VI : Algebraic Structures

The structure of algebra, Algebraic Systems, Semi Groups, Monoids, Groups, Homomorphism and Normal Subgroups, and congruence relations, Rings, Integral Domains and Fields, coding theory, Polynomial Rings and polynomial Codes, **Case Study-** Brief introduction to Galois Theory –Field Theory and Group Theory

Textbooks :

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", 6th edition, McGraw-Hill, 2007. ISBN 978-0-07-288008-3.
2. C. L. Liu and D. P. Mohapatra, "Elements of Discrete Mathematics", 6th edition, TataMcGraw-Hill, 2008, ISBN 10:0-07-066913-9.
3. R. Johnsonbaugh, "Discrete Mathematics", 5th Edition, Pearson Education, 2001 ISBN 81 –7808 – 279 – 9.

Reference Books :

1. B. Kolman, R. Busby and S. Ross, "Discrete Mathematical Structures", 4th Edition, Pearson Education, 2002, ISBN 81-7808-556-9
2. N. Deo, "Graph Theory with application to Engineering and Computer Science", Prentice Hall of India, 1990, 0 – 87692 – 145 – 4
3. Eric Gossett, "Discrete Mathematics with proof", 2nd edition, Wiley Student Edition, ISBN: 978-81-265-2758-8

List of Assignments : Tutorial based on following –

Assignment 1: Mathematical Logic and Set Theory

1. A survey on sample 25 new cars being sold out at a local auto dealer was conducted to see which of three popular option Air Conditioner (A), Radio I, Power Windows(W) were already installed. The survey found 15 had Air Conditioners, 12 had Radios, and 11 had Power Windows. 5 had Air Conditioner and Power Windows, 9\ had Air Conditioner and Radio, 4 had Radio and Power Windows. Three had all three options. Find number of cars which had:
   (i)only one of the option
   (ii)at least one of the option
   (iii)none of the options.

Use principle of inclusion exclusion

2. Draw Venn diagram and prove the expression.
3. Prove by induction that for all n > 1

$$\frac{n(n+1)(n+2)}{3} = 1.2 + 2.3 + \ldots\ldots\ldots\ldots + n(n+1)$$

4.Show that (p ∧ q) -> (p -> q) is a tautology.

5.Consider the following:
   p : This system is good
   q : This system is cheap
   Write each of the following statement in symbolic form.
   (i) This system is good and cheap
   (ii) This system is not good but cheap
   (iii) This system is neither good nor cheap
   (iv) This system is good or cheap

6. A survey has been taken on modes of travels. Each respondent was asked to check bus, train or automobile as major modes of travelling for work. More than one answer was permitted. The result, reported outcome were as follows:
Bus-40 people, train-45 people, automobile-100 people, bus and train-20 people, bus and automobile-15 people, train and automobile-20 people and all three modes-5 people. How many people completed a survey from? Apply principle of inclusion and exclusion.

7.Use mathematical induction to show that:

$$\frac{1}{1.2}+\frac{1}{2.3}+\frac{1}{3.4}+\cdots\ldots\ldots\ldots+\frac{1}{n(n+1)}=\frac{n}{n+1} \quad \text{for all } n \geq 1$$

8. Define the terms Universal Quantifier and Existential Quantifier.

Assignment 2: Functions and Relations

1. Draw Hasse diagram for any relation. Determine the chains and anti-chains.
2. Let A= {1,2,3} and B={a,b,c,d}. In each case state whether the given function (if defined) is injective, subjective, objective.
   F={(1,a),(2,d),(3,b)} g={(1,a),(2,a),(3,d)}
   h={(1,a),(1,b),(2,d),(3,c)} j={(1,a),(2,b)}
3. Find homogeneous solution of a recurrence relation: $a_n=11a_{n-1} - 39a_{n-2}+45a_{n-3}$ for $a_0=5$, $a_1=11$, $a_2=25$.
4. Find the transitive closure of R by Warshall's algorithm. Where A= {1,2,3,4,5,6} and R={(x-y);|x-y|=2}

5. Explain with example–
(i)Equivalence relation
(ii)Partial ordering relation
6. Consider the following relation on {1, 2, 3, 4,5,6}: R= {(I,j)| |i-j|=2}Is R transitive? Is R reflexive? Is R symmetric?
7. Let f, g, h be the functions from N to N, where N is the set of natural numbers so that f(n)=n+1, g(n)=2n, h(n)=0 if n is even and h(n)=1 if n is odd.
Determine fof, fog, gof, goh, hog, fogoh
8.LetRbetherelationonthesetA.A={5,6,8,10,28,36,48}.LetR={(a,b)|a is a divisor of b}.
Draw the Hasse diagram. Compare with diagraph. Determine whether R is equivalence relation.

Assignment 3 : Graphs

1. Solving the shortest path by using Dijkstra's algorithm in any graph.
2. Define following terms with suitable examples:
a. Planar Graph
b. Complete Graph
c. Connected and Disconnected Graph
3. Show that in a connected planar graph with 6 vertices and 12 edges, each of the regions is bounded by 3edges.
4. Explain adjacency matrix and adjacency list with example.
5. Explain term eulerian path and circuit with example.
6. Explain multigraph with example.
7. Define Graph Kn, Kmn.
8. Find whether K6 and K3,3 graphs are isomorphic or not.

Assignment 4:Trees

f. Draw binary search tree forinput data
200,100,300,50,150,400,10,75,125,175.
Which is a root, leaf nodes and interior nodes?
2.For any sets of weights construct an optimal binary Prefix code.
3. 19 lamps are to be connected to single electrical outlet, using extension Cords , each of which has 4 outlets. Find the number of extension cords needed and draw corresponding tree.
4. Find the minimum cost spanning tree of any graph using Prim's algorithm.
5. Find the minimal flow in any transport network using labeling procedure.
Determine the corresponding minimum cut
6. Use Kruskal's algorithm to find minimum spanning tree (MST) of any given graph.
7. Draw the unique binary tree when inorder and preorder traversal of tree is given.
8. What is total number of nodes in a full binary tree with 20 leaves?

Assignment 5: Counting

1. In how many ways can seven men and seven women sit down at a round table in such a way that no two men sit next to each other?
2.One card is drawn from a pack of cards. Express each of the following probabilities:
a.The card is the king of diamonds
b.The card is ace
c.The card is 9 or10
d.The card is a spade
3.A bag contains 3 red & 5 black balls & second bag contains 6 red & 4 black balls. A ball

is drawn from each bag. Find the probability that:

a. Both are red
b. Both are black
c.1 is red & 1 is black

4.Find the number of arrangements that can be made out of the letters:

a. ASSASSINATION b. GANESHPURI

5.A pair of dice is thrown. Find the probability that the sum is 10 or greater if:

a. 5 appears on first die. B. 5 appear on at least one die.

6. Show that if 7 colours are used to paint 50 bicycles, at least 8 bicycles will be the same colour.

7.Suppose repetitions are not permitted

a. How many ways three digits numbers can be formed from six digits 2,3,4,5,7,9?
b. How many of these numbers are less than4000?

8.Explain Pigeonhole Principle.

Assignment 6: Algebraic Structures

1.Let (Z, *) be an algebraic structure, where Z is the set of integers and the operation * is defined by n * m = maximum of (n, m). Show that (Z, *) is a semi group. Is (Z, *) a monoid? Justify your answer

2.In a group (G, *), Prove that the identity element is unique.

3.Explain Galois theory

4.Explain Isomorphism and Homomorphism of two semigroups.

5.Show that (F, +, .) is a field where F is set of all rational numbers and + and . are ordinary addition and multiplication operations?

6.Define Normal subgroup and rings with example

7.Prove that

$$((a + b\sqrt{2}), +, *)$$

Where a, b belongs to R is Integral domain

8.Explain Polynomial codes and Polynomial rings

Fundamentals of Data Structure

Teaching Scheme
Credits : 4
Lectures : 3 Hrs/week
Practical : 2 Hrs/week

Examination Scheme
Continuous Internal Evaluation(CIE): 20 Marks
In-Semester Examination(ISE): 30 Marks
Skills & Competency Exam(SCE): 20 Marks
End Semester Examination(ESE): 30 Marks
PR/OR: 25 Marks

Prerequisites : Computer Fundamentals, Fundamentals of Programming

Course Objectives :

- To understand the different ways of data representation
- To develop the ability to synthesize and analyze algorithms
- To study linear data structures and their applications.
- To understand concepts about searching and sorting techniques.
- To enable students to write algorithms for solving problems with the help of fundamental data structures.

Course Outcomes :

After completion of the course, student will be able to

1. Understand arrays and their implementation with basics of algorithm analysis.(Understand)
2. Synthesize and analyze algorithms with respect to time and space complexity
3. Apply various linear data structures using sequential and linked organization for problem solving and programming.(Apply)
4. Apply advanced linear data structure stack for problem solving and programming.(Apply)
5. Apply advanced linear data structure queue for problem solving and programming. (Apply)
6. Select appropriate searching and/or sorting techniques in the application development.(Evaluate)

Unit I : Introduction to Data Structures

Concept of data, functions, difference between compiler and interpreter, Abstract Data Types (ADT),data structure and its types, Difference between individual variables against Data Structures, Array, Pointers, Analysis of algorithm(Frequency count method)

Unit II : Concept of sequential organization

Concept of Linear data structures, Concept of ordered list, Storage representations of ordered

list such as row major, column major and their address calculation. Representation of sparse matrix using arrays, application of array in polynomial representation and algorithm for sparse matrix addition, simple and fast transpose, pointer to an arrays, array of pointers, String Manipulation.

Unit III : Linear Data Structure- Linked Lists

Concept, Comparison of Sequential and linked organizations, Linked list as an ADT, Singly Linked List, Doubly Linked List and Circular Linked Lists with all operations like Creations, insertion (all positions), Deletion (all positions),

Unit IV : Linear Data Structures –Stack

Stacks: Concept of stack, Stack as an ADT, push and pop operation, Stack implementation using array and linked list, application of stack for expression conversion(numericals infix-postfix,prefix and (numerical postfix)evaluation, Recursion concept and use of internal stack.(program infix-postfix CE).

Unit V : Linear Data Structures-Queue

Concept of queue, Queue as an ADT, Linear queue implementation using array and linked list, Circular queue, Priority queue, Doubly ended queue, Multi-queues, Applications of Queue.

Unit VI : Searching, sorting and hashing techniques

Linear and Binary search, Bubble sort, Selection sort, Insertion Sort, Merge Sort, Quick Sort and complexity Analysis of algorithms. **Hash tables:** Basic concepts, Hash function, collisions, Collision resolution techniques, Applications

Text Books :

1. Horowitz and Sahani, ―Fundamentals of Data Structures in C++, University Press, ISBN 10: 0716782928 ISBN 13: 9780716782926.
2. R. Gillberg, B. Forouzan, ―Data Structures: A Pseudo code approach with C, Cenage Learning, ISBN 9788131503140.
3. A. Tanenbaum, Y. Langsam, M. Augenstein: Fundamentals of Data Structure, 2nd edition, Pearson Education, 2002, ISBN-81-7808-670-0.

Reference Books :

1. M. Weiss, ―Data Structures and Algorithm Analysis in C++, 2nd edition, Pearson Education, 2002, ISBN-81-7808-670-0.
2. Introduction to Algorithms 3rd Edition by Thomas H. Cormen, Charles E.Leiserson,Ronald L Rivest,& Clifford Stein, MIT Press ,Cambridge MA USA ,ISBN 978-81-203-4007-7
3. A. Aho, J. Hopcroft, J. Ulman, "Data Structures and Algorithms", Pearson Education, 1998, ISBN-0-201-43578-0

List of Assignments (Any 5)

Programming Language: C++

1	Perform following string operations with and without pointers: 1. Length 2. Copy 3.Concat 4. Compare 5.Reverse.
2	Accept conventional matrix and convert it into sparse matrix. Implement simple transpose and Fast transpose algorithms on sparse matrix.
3	Create a database using array of structures and perform following operations on it: i. Add record ii. Display Database iii. Search record (binary search) iv. Delete record
4	Create a Singly linked list for employee data and perform a. insertion b. deletion c. search d. modify
5	Implement polynomial using Doubly Linked List and perform Addition/ Multiplication of Polynomials
6	Implement polynomial using Doubly/Circular Linked List and perform Evaluation of polynomial
7	Perform implementation of STACK using array a. Push an element on to stack b. Pop an element c. Demonstrate overflow simulations on stack d. Display stack
8	Perform implementation of STACK using Linked List a. Push an element on to stack b. Pop an element c. Demonstrate overflow simulations on stack d. Display stack
9	Implement stack for expression conversion (infix to postfix)
10	Perform implementation of Queue using array and Linked List a.Enqueue CE b. Dequeue
11	Pizza parlor accepting maximum n orders. Orders are served in FCFS basis. Order once placed can't be cancelled. Write C++ program to simulate the system using circular Queue.
12	Sort the data in ascending order using Bubble sort (Display pass by pass output) and search a particular data using Binary search. OR Implement Quick Sort to sort the given list of numbers. Display corresponding list in each pass.
13	Sort the data in ascending order using Selection sort (Display pass by pass output) and search a particular data using binary search. OR Implement Quick Sort to sort the given list of numbers. Display corresponding list in each pass.

Digital Logic and Computer Architecture

Teaching Scheme
Credits : 4
Lectures : 3 Hrs/week
Practical : 2 Hr/week

Examination Scheme
Continuous Internal Evaluation(CIE): 20 Marks
In-Semester Examination(ISE): 30 Marks
Skills and Competency Exam(SCE): 20 Marks
End Semester Examination(ESE): 30 Marks
TW: 25 Marks

Pre-requisites: Basic Electronics Engineering

Course objectives :

- To learn and understand basic digital circuit design techniques.
- To learn and understand the design of digital circuits using combinational logic.
- To learn and understand the design of digital circuits using sequential logic.
- To introduce programmable logic devices and ASM chart and synchronous state machines
- To learn and distinguish the architecture and programmer's model of advanced processor.
- To identify the system level features and processes of advanced processors.

Course Outcomes:

Upon completion of the course, students will be able to

1. Simplify Boolean algebraic expressions for designing digital circuits using K-Maps.
2. Apply digital concepts in designing combinational circuits.
3. Apply digital concepts in designing sequential circuits.
4. **Develop** simple real-world application using ASM and PLD.
5. **E**xhibit skill of assembly language programming for the application AND **Classify** Processor architectures.
6. **Illustrate** advanced features of memory management and protection of 80386 Microprocessor.

Unit I: Logic Design Minimization Technique:

Number System: Introduction, Binary number System, Sign-Magnitude representation, One's and Two's complement representation, Octal number System, Hexadecimal number System, Basic theorems and properties.

Logic minimization: Representation of truth-table, Sum of Product (SOP) form, Product of Sum (POS) form, Simplification of logical functions, Minimization of SOP and POS forms using K-Maps up to 4 variables and Quine-McCluskey Technique, realization of logic gates.

Unit II — Combinational Logic Design

Design of Combinational Logic: Code converter — BCD, Excess-3, Gray code, Binary Code. Half- Adder, Full Adder, Half Subtractor, Full Subtractor, Binary Adder (IC 7483), BCD adder, Look ahead carry generator, Multiplexers (MUX): MUX (IC 74153, 74151), Demultiplexers

(DEMUX)- Decoder. (IC 74138, IC 74154). Implementation of SOP and POS using MUX, DMUX, Comparators, Parity generators and Checker.

Unit III: Sequential Logic Design

Flip-flop: SR, JK, D, T; Preset & Clear, Master and Slave Flip Flops, Truth Tables and Excitation tables, Conversion from one type to another type of Flip Flop.
Registers: Buffer register, shift register (SISO, SIPO, PISO& PIPO).
Register Counters: Asynchronous Counter, Synchronous Counter, Ring Counter, Johnson Counter, Modulus of the counter (IC 7490)
Synchronous Sequential Circuit Design: Models – Moore and Mealy, State diagram and State Tables, Design Procedure, Sequence generator and detector.

Unit IV: Algorithmic State Machines and Programmable Logic Devices

Algorithmic State Machines: Finite State Machines (FSM) and ASM, ASM charts, notations, construction of ASM chart and realization for sequential circuits.
PLDS: PLD, ROM as PLD, Programmable Logic Array (PLA), Programmable Array Logic (PAL), Designing combinational circuits using PLDs.

Unit V: Introduction to Microprocessor and System Architecture

Introduction to Microprocessor- Architecture of 8086 and 80386DX, Features of 80386DX. 80386: Programmers Model, operating modes, Addressing Modes, Data types, and Instruction Set.
Systems Architecture- Systems Registers -Systems flags, Memory Management registers, Control
registers, Debug registers, Test registers

Unit VI: Memory Management and Protection

Memory Management in 80386-Segment Translation, Page Translation, Combining Segment and Page translation.
Protection: Need of Protection, Overview of 80386 DX protection Mechanism, Privilege levels. Segment level protection, page level protection, combining segment and page level protection.

Text books

1. R. P. Jain, "Modern Digital Electronics", 3rd Edition, Tata McGraw-Hill, 2003, ISBN0 – 07 – 049492 – 4.
2. Stephen Brown, ZvonkoVranesic, "Fundamentals of Digital Logic with VHDL Design", McGraw Hill, ISBN–13:978-1-25-902597-6.
3. Douglas Hall, "Microprocessors & Interfacing", McGraw Hill, Revised 2nd Edition, 2006 ISBN 0-07-100462-9
4.W.Stallings, —Computer Organization and Architecture: Designing for performance, Pearson Education/ Prentice Hall of India, 2003, ISBN 978-93-325-1870-4, 7th Edition**.**

Reference Books

1. John Yarbrough, "Digital Logic applications and Design" Thomson.
2. Flyod "Digital Principles", Pearson Education.
3. Malvino, D.Leach "Digital Principles and Applications", 5th edition, Tata Mc- Graw Hill.
4.Intel 80386 Programmer's Reference Manual 1986, Intel Corporation, Order no.: 231630-011,

December 1995.
5.Chris H. Pappas, William H. Murray, "80386 Microprocessor Handbooks", McGraw-Hill Osborne Media, ISBN-10: 0078812429, 13: 978-0078812422.

Object Oriented Programming (Java)

Teaching Scheme
Credits : 4
Lectures : 3 Hr/week
Practical :2 Hrs/week

Examination Scheme
Continuous Internal Evaluation(CIE): 20 Marks
In-Semester Examination(ISE): 30 Marks
Skills and Competency Exam(SCE): 20 Marks
End Semester Examination(ESE): 30 Marks
TW: 25 Marks

Prerequisites :

- Computer Fundamentals, Fundamentals of Programming

Course Objectives :

- To understand object-oriented concepts such as data abstraction, encapsulation, inheritance, dynamic binding, and polymorphism.
- To use the object-oriented paradigm in program design.
- Provide programming insight using OOP constructs.
- To lay a foundation for advanced programming.

Course Outcomes :

After completion of the course, student will be able to

1. Understand the concept of OOP.
2. Apply concept and use of re-usability
3. Develop application using concept of polymorphisms
4. Implement application using generic programming concepts
5. Percept the utility and applicability of OOP.

Unit I : Oops Concepts and Java Programming

Object-Oriented Programming, Data Types, Variables, and Arrays, Operators in Java-new and delete, Access Specifiers (Private, Public, Protected, default). **Class Fundamentals:** Declaring an Objects, Introducing methods , constructors , Parameterized Constructors , this keyword, Static keyword, Static method, Garbage Collection , The finalize( ) Method

Unit II : Inheritance and Packages & Interfaces

Inheritance: Inheritance hierarchies, super and subclasses, member access rules, super keyword, preventing inheritance: final classes and methods, the object class and its methods; Polymorphism: dynamic binding, method overriding, abstract classes and methods;

Interface: Interfaces VS Abstract classes, defining an interface, implement interfaces, accessing implementations through interface references, extending interface;

Packages: Defining, creating and accessing a package, understanding CLASSPATH, importing packages

Unit III: Exception Handling and Multithreading

Exception Handling: Benefits of exception handling, the classification of exceptions , exception hierarchy, checked exceptions and unchecked exceptions, usage of try, catch,

throw, throws and finally, rethrowing exceptions, exception specification, built in exceptions, creating own exception sub classes. Multithreading: Differences between multiple processes and multiple threads, thread states, creating threads, interrupting threads, thread priorities, synchronizing threads, inter thread communication

Unit IV: Files and Connecting To Database

Files: streams, byte streams, character stream, text input/output, binary input/output, random access file operations, file management using file class: Connecting to Database, querying a database and processing the results, updating data with JDBC

Unit V: GUI Programming

About AWT & Swing, About Jframe (a top level window in Swing), Swing components (Jlabel, About text component like JtextField, Jbutton, Event Handling in Swing Applications, Layout Management using FlowLayout, Border Layout, Grid Layout, Using Jpanel, Choice components like Jcheck Box, Jradio Button, Borders components, Jcombo Box & its events, Jlist & its events with MVC patterns, Key & Mouse Event Handling, Menus in swing, Jtext Area, Dialog boxes in swing, Jtable for Displaying Data in Tabular form, MDI using Jdesktop Pane & Jinternal Frame, Using IDE like Netbeans, Jbuilder for building java applications using Drag & Drop), Adapter classes.

Unit VI: Application Development & Java Applets

Applets: Inheritance hierarchy for applets, differences between applets and applications, life cycle of an applet, passing parameters to applets.

Text Books :

1. Java: A Beginner's Guide, Herbert Schildt
2. Head First Java, Kathy Sierra & Bert Bates 2nd Edition Publisher – Shroff/O'Reilly

Reference Books :

1. Java the Complete Reference, Herbert Schildt

List of Assignments :

1. WAP in java that calculates the grade of N students based on the marks entered by user in each subject. Program prints the grade based on this logic. If the average of marks is >= 80 then prints Grade 'A' If the average is <80 and >=60 then prints Grade 'B' If the average is <60 and >=40 then prints Grade 'C' else prints Grade 'D'
2. Develop an object oriented program in java to create a database of Covid_Patient information system containing the following information: Name, ID, Date of Birth, Blood group, Test_Report, Contact address, telephone number, Aadhar Number etc using 1.Constructor,2 Constructor Overloading
3. Derive a subclass called Student from the superclass Computer_Engg. The class Student inherits all the member variables (Name,Roll_Number, GR_Number, hobbies,etc) and methods (getGR(), getName(), among others) from its superclass Computer_Engg, also further defines a variable called area_of_interest, marks & two public methods getmarks() and getarea_of_interest().

4 Rahul, Rohit. Rohan wants to take a loan from Banks; they approach different banks having differ ROI rates of interest. Rahul approached SBI where Rohit and Rohan approached HDFC and ICICI respectively the ROI of SBI,HDFC,ICICI is 8.4%, 7.3%, 9.7%. While each bank has a class which provides a common method getrateofinterest(). Calculate the rate of interest Rahul, Rohit and Rohan pays to banks for the loan of 5 Lakh Rs. Each. Assume the required variable for calculating ROI

5 Create User defined exception to check the following conditions and throw the exception if the criterion does not meet. A. User stays in Pune/ Mumbai/ Bangalore / Chennai b. User has 4-wheeler City, Vehicle from the user and check for the conditions mentioned above. If any of the condition not met then throw the exception. If user does not enter proper input throw the exception.

6 Write a program to create an Arraylist and perform following operations on it : a) add b) remove c) display d) Sort e) Reverse

Universal Human Values 2

Teaching Scheme
Credits : 3
Lectures : 2 Hrs/week
Tutorial : 1 Hr/week

Examination Scheme
Continuous Internal Evaluation(CIE): 20 Marks
In-Semester Examination(ISE): 30 Marks
Skills and Competency Exam(SCE): 20 Marks
End Semester Examination(ESE): 30 Marks
TW: 25 Marks

Prerequisites :

- Universal Human Values – I

Course Objectives :

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding of the harmony in the human being, family, society and nature/existence.
- Strengthening of self-reflection.
- Development of commitment and courage to act.

Course Outcomes :

After completion of the course, student will be able to

1. Perform self-exploration on human values to ensure fulfillment of basic universal human aspirations.
2. Commit to lead a life of responsibility by becoming aware of their individual reality
3. Apply understanding of human- human relationship in family and society to behave ethically and professionally
4. Demonstrate awareness and sensitivity towards nature/existence leading to ethical and sustainable solution to engineering problem

Unit I : Introduction — Need, Basic Guidelines, Content and Process for Value Education

Purpose and motivation for the course,
Self-Exploration–what is it? — Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration,
Continuous Happiness and Prosperity- A look at basic Human Aspirations,
Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority,
Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

Unit II : Understanding Harmony in the Human Being — Harmony in Myself!

Understanding human being as a co-existence of the sentient 'I' and the material 'Body',
Understanding the needs of Self ('I') and 'Body' — happiness and physical facility,
Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer),
Understanding the characteristics and activities of 'I' and harmony in 'I',
Understanding the harmony of I with the Body, correct appraisal of Physical needs, meaning of Prosperity in detail.

Unit III : Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness, Trust and Respect as the foundational values of relationship
Understanding the meaning of Trust; Difference between intention and Competence,
Understanding the meaning of Respect, Difference between respect and Differentiation; the other salient values in relationship,
Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals,
Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Unit IV : Understanding Harmony in the Nature and Existence — Whole existence as Coexistence with Implications of the Holistic Understanding of Harmony on Professional Ethics

Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature, Exploring the Four Orders of Nature, Realizing Existence as Co-existence at All Levels,
The Holistic Perception of Harmony in Existence, Exploring Co-existence in Existence
Discussion on the conduct as an engineer or scientist.

Text Book:

1 Human Values and Professional Ethics by R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

Reference Books:

1 Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2 Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3 The Story of Stuff (Book).
4 The Story of My Experiments with Truth — by Mohandas Karamchand Gandhi
5 Small is Beautiful — E. F Schumacher
6 Slow is Beautiful — Cecile Andrews
7 Economy of Permanence -J C Kumarappa
8 Bharat Mein Angreji Raj – Pandit Sunderlal
9 Rediscovering India — by Dharampal

10 Hind Swaraj or Indian Home Rule -by Mohandas K. Gandhi
11 India Wins Freedom — Maulana Abdul Kalam Azad
12 Vivekananda — Romain Rolland (English)
13 Gandhi — Romain Rolland (English)

List of Assignments : (Any 7 for Tutorial)

1 Practice session to discuss natural acceptance in human being.
2 Practice session to discuss the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking- disliking.
3 Practice session to discuss the role others have played in making material goods available to me. Identifying from one's own life.
4 Practice session to differentiate between prosperity and accumulation.
5 Practice session to discuss program for ensuring health vs dealing with disease.
6 Practice session to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc.
7 Practice session to reflect on Gratitude as a universal value in relationships. Discuss with scenarios.
8 Practice session to reflect on Gratitude Elicit examples from students' lives.
9 Practice session to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.
10 Case Study session e.g. to discuss the conduct as an engineer or scientist etc.

Data Storytelling and Visualization

Teaching Scheme	**Examination Scheme**
Credits : 3	**Continuous Internal Evaluation(CIE): -**
Lectures : 2 Hr/week	**In-Semester Examination(ISE): -**
Practical : 2 Hrs/week	**Skills and Competency Exam(SCE): 50 Marks**
	End Semester Examination(ESE): -
	TW: -

Prerequisites :

- Fundamentals of programming

Course Objectives :

- To enable the students to get acquainted with the context of the data
- To learn various approaches to gain data insights
- To enable transformation of insights to story and its presentation
- To learn various tools and techniques of data visualization.
- To understand components of data visualization

Course Outcomes :

After completion of the course, student will be able to

1 Understand the data analysis with context of the data
2 Explore and create insights for target audience
3 Summarize the metrics towards desired performance
4 Design and create data visualizations.
5 Apply data visualization techniques in various domains.
6 Apply Design Thinking techniques to solution choices

Unit I : Introduction to data storytelling

Need of storytelling, the psychology and anatomy of storytelling, how data is communicated, understanding the target audience, impact of storytelling, Exploring and discovering data, types of data, ways of data analysis with respect to audience, context of the audience, problems, action and impact, case studies.

Unit II : Designing and delivering the storyline

Capturing the insights, valuable insights, focus of data points, evaluation of the data for better insights, defining the structure of the storyline, creation of the storyline for analysis, Format of the story, determining best visualization, selection of appropriate design, Ways of delivering the storyline, the narration, visuals: setting the scenes, polishing the scenes.

Unit III: Foundations of Data Visualization

Overview of Data Visualization, Need of data visualization, The Human Brain and Data Visualization, The Shapes of Data, Inputs for data visualization, Types of Visualizations: Cognitive vs Perceptual Design Distinction, Examples of the Types of Visualizations, 5 big data visualization categories: temporal, hierarchical, network, multi-dimensional and geospatial, Practicing Good Ethics in Data Visualization, Ineffective Visuals and How to

Improve Them, Principles of Visual Perception, Color as a Pre-Attentive Attribute, Strategic Use of Contrast, Tools for Visualizing: PowerBI, Tableau etc., case study.

Unit IV: Best Practices of Data Visualization

Gestalt Principle: Proximity, Accessible Visualizations, Aesthetic, Design and Exploratory Analysis Introduction, Exploratory and Explanatory Analysis, Data, Relationships and Design Static Versus Interactive Visualizations, Bringing everything together in a dashboard, Moving from Foundational to Advanced Visualizations: Bar charts, Gantt charts, Stacked bars, Tree maps, Area charts, Pie charts; Visualizing distributions: Circle charts, Jittering, Box and whisker plots, Histograms.

Text Books :

1. Storytelling with data, cole nussbaumer knaflic, Wiley
2. Ben Crothers, "Design Thinking Fundamentals", O'Reilly
3. Fundamentals of Data Visualization by Claus O. Wilke, April 2019, O'Reilly Media, Inc., ISBN: 9781492031086
4. Communicating Data with Tableau: Designing, Developing, and Delivering Data Visualizations, Ben Jones

Reference Books :

1. Effective Data Storytelling: How to Drive Change with Data, Narrative and Visuals, Brent Dykes, Wiley
2. Data Story: Explain Data and Inspire Action Through Story, Nancy Duarte
3. The Big Book of Dashboards, Steve Wexler, Jeffrey Haffer, Andy Cotgreave
4. Practical Tableau, Ryan Sleeper
5. https://www.tableau.com/learn/articles/interactive-map-and-data-visualization-examples
6. Tableau for Beginners – Data Visualisation made easy: https://www.analyticsvidhya.com/blog/2017/07/data-visualisation-made-easy/
7. https://rafalab.github.io/dsbook/ggplot2.html#aesthetic-mappings

List of Assignments :

1. Study/generation/summarization of the data, understanding audience and framing the problems with action and impact.
2. Formulating the insights with presentation/static charts and defining the structure of storyline.
3. Analyzing, Designing and delivering the story.
4. Case study: Compare various data visualization tools. Study any one of the tools in detail.
5. Download any free dataset (from Kaggle/tableau etc.) in excel format. Explore and analyse this data using Excel or simply by hand (drawing pictures is fine).
6. Visualize the downloaded dataset from assign2 by applying following graph types: (select any 8)
   1. Bar Chart
   2. Line Chart
   3. Scatterplot

4. Sparkline
5. Pie Chart
6. Gauge
7. Waterfall Chart
8. Funnel Chart
9. Heat Map
10. Histogram
11. Box Plot
12. Maps
13. Tables
14. Indicators
15. Area Chart
16. Radar or Spider Chart
17. Tree Map

7 Download any free dataset (from Kaggle/ tableau etc.) and visualize using temporal category: Scatter plots, Polar area diagrams, Time series, sequences, Line graphs.

8 Visualize the dataset using temporal category and Timelines tools

9 Visualize the dataset using hierarchical category: Tree diagrams and Ring charts

10 Visualize the dataset using multidimensional category: Scatter plots, Pie charts, tograms

11 Plot the visualization graph using aesthetics, labels and titles, categories as colours

12 Illustrate a density map for any geospatial dataset. (source:https://data.world/datasets/geospatial)

13 Mini-project: Create a dashboard by applying maximum learnt visualization techniques.

14 Visualization of dataset using Python/R

Soft Skills

Teaching Scheme
Credits : 2
Lectures : 1 Hr/week
Practical : 2 Hrs/week

Examination Scheme
Continuous Internal Evaluation(CIE): -
In-Semester Examination(ISE): -
Skills and Competency Exam(SCE): 50 Marks
End Semester Examination(ESE): -
TW: -

Prerequisites:

- Basic knowledge in communication and a good understanding of English

Course Objectives:

- To encourage the all-round development of students by focusing on soft skills.
- To make the engineering students aware of the importance, the role and tl content of soft skills through instruction, knowledge acquisition, demonstratic and practice.
- To develop and nurture the soft skills of the students through individual anc group activities.
- To expose students to right attitudinal and behavioral aspects and to build the same through activities

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

1. Effectively communicate through verbal/oral communication and improve the listening skills
2. Write precise briefs or reports and technical documents.
3. Actively participate in group discussion / meetings / interviews and prepare & deliver presentations.
4. Become more effective individual through goal/target setting, self-motivation and Practicing creative thinking.
5. Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership quality.

Unit I: Self-Awareness &self-Development

a) **Self-Assessment**, Self-Appraisal, SWOT, Goal setting — Personal & career — Self-Assessment, Self-Awareness, Perceptions and Attitudes, Positive Attitude, Values and Belief Systems, Self-Esteem, Self-appraisal, Personal Goal setting,
b) **Career Planning**, Personal success factors, Handling failure, Depression and Habit, relating SWOT analysis & goal setting, prioritization.
c) **Other Skills**

- **Time management**- The Time management matrix, apply the Pareto Principle (80/20 Rule) to time management issues, to priorities using decision matrices, to beat the most

common time wasters, how to plan ahead, how to handle interruptions, to maximize your personal effectiveness, how to say "no" to time wasters, develop your own individualized plan of action

- **Stress management**- understanding the stress & its impact, techniques of handling stress
- **Problem solving skill**, Confidence building Problem solving skill, Confidence building

Corporate / Business Etiquettes — Corporate grooming & dressing, Email & telephone etiquettes, etiquettes in social & office setting Understand the importance of professional behaviour at the work place, Understand and Implement etiquettes in workplace, presenting oneself with finesse and making others comfortable in a business setting. Importance of first impression, Grooming, Wardrobe, Body language, Meeting etiquettes (targeted at young professionals who are just entering business environment) Introduction to Ethics in engineering and ethical reasoning, rights and responsibilities..

Unit II: Communication Skill

a) **Importance of communication**, types, barriers of communication, effective communication
b) **Speaking Skills** – Public Speaking, Presentation skills, Group discussion- Importance of speaking effectively, speech process, message, audience, speech style, feedback, conversation and oral skills, fluency and self expression, body language phonetics and spoken English, speaking techniques, word stress, correct stress patterns, voice quality, correct tone, types of tones, positive image projection techniques.
c) **Listening Skills:** Law of nature- you have 2 ears and 1 tongue so listen twice and speak once is the best policy, Empathic listening, Avoid selective listening
d) **Group Discussion** — characteristics, subject knowledge, oral and leadership skills, team management, strategies and individual contribution and consistency.
e) **Presentation skills** — planning, preparation, organization, delivery.
f) **Written Skills** – Formal & Informal letter writing, Report writing, Resume writing — Sentence
structure, sentence coherence, emphasis. Paragraph writing. Letter writing skills — form and structure, style and tone. Inquiry letters, Instruction letters, complaint letters,
Routine business letters, Sales Letters etc.

Reference Books:

1 Soft skills Training – A workbook to develop skills for employment by Fredrick H. Wentz 2. 3. 4
2 Personality Development and Soft skills, Oxford University Press by Barun K. Mitra
3 The Time Trap: the Classic book on Time Management by R. Alec Mackenzie
4 Interview skills that win the job: Simple Techniques for answering all the tough questions , Allen & Unwin

List of Assignments:

1 SWOT analysis

2	Personal & Career Goal setting – Short term & Long term
3	Presentation Skill
4	Letter/Application writing
5	Report writing
6	Listening skills
7	Group discussion
8	Resume writing
9	Public Speaking
10	Stress management
11	Team Activity—Use of Language laboratory

SEMESTER – IV

Artificial Intelligence

Teaching Scheme
Credits : 4
Lectures : 3 Hrs/week
Practical : 2 Hr/week

Examination Scheme
Continuous Internal Evaluation(CIE): 20 Marks
In-Semester Examination(ISE): 30 Marks
Skills & Competency Exam(SCE): 20 Marks
End Semester Examination(ESE): 30 Marks
TW: 25 Marks

Prerequisites: .

- Discrete Mathematics, Data Structures, basic probability theory and statistics, Knowledge of any programming language- (Python, GO)

Course Objectives:

- To understand the various characteristics of intelligent agents and AI domain.
- To learn the different search strategies in AI.
- To learn how to represent knowledge in solving AI problems.
- To introduce the concepts of Expert Systems and Machine Learning.
- To know about the various applications of AI.

Course Outcomes :

After completion of the course, student will be able to

1. Recognize the characteristics of AI agents.
2. Apply various AI search algorithms to typical AI problems.
3. Recognize the importance of knowledge representation and planning.
4. Explain working knowledge of reasoning in presence of incomplete and or uncertain information.
5. Identify different learning techniques to make the system intelligent.
6. Design and Develop AI application.

Unit I : Introduction to AI and Intelligent Agents

Introduction–Human Intelligence, comparison between Man and Machine, Definition -The Turing Test – Characteristics of Intelligent Agents–Typical Intelligent Agents – Environment, Environment Types, Problem Solving Approach to Typical AI problems, Domains of AI, Brief of Application of AI. Introduction to Basic concept of Machine Learning (ML), Deep Learning (DL) and Data Science (DS). AI vs ML vs DL vs DS.
Case Study- 1 : AI for everyone/ Building AI Projects
Case Study- 2 : AI and Society / Ethics for AI

Unit II : Heuristics Search and Game Playing

Defining the problem as a state space search, problem characteristics, Problem solving Methods - Search Strategies- Uninformed - Informed - Heuristics - Local Search Algorithms and Optimization Problems - Searching with Partial Observations - Constraint Satisfaction Problems – Constraint Propagation - Backtracking Search. (Uninformed Search Strategies: Breadth-first search, Uniform-

cost search, Depth-first search, depth-first search, Informed (Heuristic) Search Strategies: Greedy best first search, A* search, Minimizing the total estimated solution cost, Heuristic search techniques-Generate and test, Hill Climbing, Best-First Search, Constraint satisfaction problems (CSP), Game Playing – Alpha Beta Pruning, Minimax search procedure.
Case Study - 3 : State of Art Game Programs and Analysis

Unit III : Knowledge Representation

Basic Concepts, Storage representation, Adjacency matrix, adjacency list, Traversals-depth first search and-breadth first search, Minimum spanning Tree: Prims and Kruskal Algorithm, Dikjtra's Single source shortest path.

Unit IV : Knowledge Inference and Planning

Production based system, Frame based system. Inference - Backward chaining, Forward chaining, Rule value approach, Fuzzy reasoning - Certainty factors, Bayesian Theory-Bayesian Network-Dempster – Shafer theory. Planning – Block world problem, components of a planning systems, Goal stack planning, Non-linear planning, Hierarchical planning, least commitment strategy.

Unit V : Learning and Expert System

Definition of learning, Forms of learning, Rote learning, learning by taking advice, Learning in problem solving, Induction leaning, Explanation based learning, Formal learning theory. Connectionist models- learning in Neural network Expert systems - Intelligent System Vs Expert system, Architecture of expert systems, Roles of expert systems - Knowledge Acquisition –Meta Expert systems shells, Typical expert systems - MYCIN, DART, XOON, RI.

Unit VI : AI Applications and Advanced AI

Natural Language Processing- Introduction, Steps in the process, Spell checking, Language Models – Information Retrieval- Information Extraction - Machine Translation – Speech Recognition , Image formation, Image processing operations, Extracting 3D information, Object Recognition, Using vision for manipulation and navigation. Robot – Hardware – Perception – Planning – Moving Case Study : Applications of AI

Text Books :

1. Artificial Intelligence: A Modern Approach by Peter and Norvig ISBN-0-13103805-
2. Artificial Intelligence by Elaine Rich, Kevin Knight and Nair ISBN-978-0-07008770-5, TMH
3. Artificial Intelligence by Patrick Henry Winston, Addison-Wesley Publishing Company,ISBN 0-201-53377-4

Reference Books :

1. Prolog Programming for A.I. by Bratko, TMH
2. Artificial Intelligence by Saroj Kausik ISBN:- 978-81-315-1099-5, Cengage Learning
3. Artificial Intelligence and Intelligent Systems by Padhy, Oxforfd University Press
4. Deepak Khemani, "A First Course in Artificial Intelligence", McGraw Hill Education(India), 2013, ISBN : 978-1-25-902998-1
5. Deepak Khemani —Artificial Intelligence, Tata Mc Graw Hill Education 2013

List Of Assignments

1. Study Assignment: Compare different algorithms and evaluate their performance/cost. E.g. depth-first search (DFS) to heuristic algorithms such as Monte Carlo tree search (MCTS. Since all of the studied algorithms converge to a solution from a solvable deal, effectiveness of each approach to be measured by how quickly a solution was reached, and how many nodes were traversed until a solution was reached.
2. Assignment on Heuristic Search Techniques: **Implement Best-** first search (Best-Solution but not always optimal)
3. Implementation of A* algorithm (Always gives optimal solution) for solving Puzzle problems.
4. Implementation of Min-Max Search Procedure with alpha beta pruning for finding the solutions of games.
5. Assignment on Constraint Satisfaction Problem: Implement graph coloring problem. OR Implementation of Constraint Satisfaction Problem for solving Crypt-arithmetic Problems. Solve any one of the follow: Backtracking: Constraint Satisfaction Problem – 1) Seating Arrangement or Computer CPU utilization 2) Analyze data from twitter or news to categorize them useful reading list out of the whole clutter 3) Read data from images using OCR (optical character recognition) and OMR (optical mark recognition) techniques – use open source libs
6. Implementation of Unification algorithm by considering Resolution concept.
7. Discuss a sample architecture of sensors/actuators, which are operated by IA, agent function and characteristics, types of agents (model-based, goal-based…), optimization of agent functions by feedback learning. Support by suitable examples or practical case studies.
8. Mini-project on any one of the following concept (PBL): 1. Expert system 2. Game development 3. NLP or Text Processing 4. Solving problem with AI.

Probability and Statistics

Teaching Scheme
Credits : 4
Lectures : 3 Hrs/week
Tutorial : 1Hr/week

Examination Scheme
Continuous Internal Evaluation(CIE): 20 Marks
In-Semester Examination(ISE): 30 Marks
Skills & Competency Exam(SCE): 20 Marks
End Semester Examination(ESE): 30 Marks
TW: 25 Marks

Prerequisites: .

- Expected to know the following concepts:
  Basics of Derivatives, Integration, Trigonometry, Vector algebra and complex number, Introduction of Statistics and Probabilities

Course Objectives:

- Engineers with the ability to analyse the data for a given problem and represent in the mathematical and statistical form
- Engineers with ability to systematically solve the problems using knowledge of probability, distributions, sampling and formulating hypothesis
- Engineers with the ability to carry out test of hypothesis, and apply the concept of correlation and regression, goodness of fit and distributions
- Engineers with the ability to infer the data using inference methods
- Engineers with the ability to understand the hypothesis testing
- Engineers with the ability to solve the problems on regression analysis

Course Outcomes :

After completion of the course, student will be able to

1. Learn the concepts of descriptive and inferential statistics, and levels of data measurement and basic statistics that will be used to summarize data.
2. Apply statistical concepts and probability theory to analyze data that can assist present and future business managers in making better decisions.
3. Estimate the population mean with a known and an unknown population standard deviation with the z statistic, and t statistic respectively and population variance using the chi-square distribution.
4. Understand confidence intervals and perform statistical inference
5. Perform hypothesis testing with theory of estimation
6. Perform regression analysis on a data set

Unit I : Basic Probability and Statistics Concepts

The concept of a discrete sample space in probability theory. The definition of an event. The definition of a probability distribution.,Measures of central tendency, Random variables, expectation and variance. Coefficient of Variation, Moments, Skewness and Kurtosis.

Unit II : Probability Distributions

Discrete distributions: Bernoulli trials, Geometric, Binomial and Hypergeometric and Negative Binomial distributions, Poisson distribution. Continuous distributions: normal, uniform and exponential continuous distributions Exercises based on the analysis of applications to computer science.

Joint probability distributions. Linearity of expectation. Higher moments of a random variable, moment generating function. Computing the moments of geometric, binomial, normal and Poisson distributions.

Conditional Probability, Conditional expectation of a random variable with respect to an event. Bayes' Theorem and examples of applications in computer science.

Unit III : Probability Inequalities and Markov Chains

Markov's Inequality, Chebyshev's inequality, Weak Law of Large Numbers, Central Limit Theorem

Markov Chains, Estimating Properties of Markov Chains, Hidden Markov Models and Dynamic Programming, Introduction to Stochastic Processes – Markov process classification of states – Examples of Markov Chains, Stochastic Matrix, limiting probabilities

Unit IV: Non-parametric and Parametric Inferences

Basics of inference Simple examples, Empirical PMF, Sample mean, bias, se, MSE, Empirical Distribution Function (or eCDF), Kernel Density Estimation (KDE), Statistical Functionals, Plug-in estimator

Confidence Intervals: Percentiles, quantiles, Normal-based confidence intervals, DKW inequality

Parametric Inferences: Consistency, Asymptotic Normality, Basics of parametric inference, Method of Moments Estimator (MME), Properties of MME, Basics of Maximum Likelihood Estimator (MLE), Properties of MLE

Unit V : Hypothesis Testing

Statistical hypothesis, Null and Alternate hypothesis, test of hypothesis and significance, Type I and Type II errors, Level of Significance, Tests involving the Normal distribution, One-Tailed and Two-Tailed tests, P value. Special tests of significance for large samples and small samples (F, chi- square, z, t- test), ANOVA

Unit VI: Correlation and Regression

Correlation: Coefficient of Correlation

Regression Analysis, Linear and Non-linear Regression, Multiple regression

Bayesian Inferencing : Bayesian reasoning, Bayesian inference, Priors, Conjugate priors

Text Books :

1 William Feller, An introduction to probability theory and its applications.
2 Douglas C. Montgomery, George C. Runger,Applied Statistics and Probability for Engineers, Wiley, Year- 2018, ISBN- 1119409535
3 Sheldon Ross, A first course in probability.

Reference Books :

1 Douglas C. Montgomery, Elizabeth A. Peck, G. Geoffrey Vining, Introduction to Linear Regression Analysis, Wiley, 2012
2 Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.).(*ISBN* 978-0-470-45836-5.)
3 Ken Black, Business Statistics for Contemporary Decision Making, 6th Edition, Wiley
4 David Stirzaker, Elementary probability
5 All of Statistics: A Concise Course in Statistical Inference" by Larry Wasserman (Springer publication).

List of Assignments for Tutorial:

1 Assignment of central tendency and dispersion.
2 Assignment on Regression and Correlation.
3 Assignment on probability distributions
4 Assignment on testing of hypothesis
5 Assignment on C.F & P.I, Method of Variation of Parameters, Cauchy's and Legendre's DE
6 Assignment onFourier Transform (FT)
7 Assignment on Z-Transform
8 Assignment on Line integral, Greens Theorem, Gauss divergence Theorem.

Advanced Data Structure

Teaching Scheme
Credits : 4
Lectures : 3 Hrs/week
Practical : 2 Hrs/week

Examination Scheme
Continuous Internal Evaluation(CIE): 20 Marks
In-Semester Examination(ISE): 30 Marks
Skills & Competency Exam(SCE): 20 Marks
End Semester Examination(ESE): 30 Marks
PR/OR: 25 Marks

Prerequisites :

- Fundamentals of Data Structure, Object Oriented Programming, Computer Programming Fundamentals

Course Objectives :

- To explain fundamentals of data structures and their applications essential for programming/problem solving
- To familiarize students with basic data structures and their use in fundamental algorithms
- To understand advanced data structures to solve problems in various domains.
- To enable students to write algorithms for solving problems with the help of fundamental data structures

Course Outcomes :

After completion of the course, student will be able to

1. Understand trees data structure and their implementation with basics of algorithm analysis.
2. Apply effective and efficient searching data structure.
3. Implement graph data structures using sequential and linked organization for problem solving and programming.
4. Understand the data structure required for compiler design.
5. Understand different file organization in JAVA.
6. Select appropriate non linear data structure for problem solving and programming.

Unit I : Trees

Difference between linear and non-liner data structure, Trees and Binary trees- basic terminology, representation using linked organization, Binary tree- properties, converting general tree to binary tree, binary tree traversals recursive and non-recursive: depth first and breadth first. Binary Search Tree (BST), BST operations

Unit II : Advanced Trees

Threaded binary tree- concepts, in order traversal of in-order threaded binary tree**.** AVL Trees, Indexing and Multiway Trees, Types of search tree, B-Tree, B+Tree, Trie Tree

Unit III : Graphs

Basic Concepts, Storage representation, Adjacency matrix, adjacency list, Traversals-depth first search and-breadth first search, Minimum spanning Tree: Prims and Kruskal Algorithm, Dikjtra's Single source shortest path.

Unit IV : Tables

Symbol Table: Notion of Symbol Table, Heap data structure, Min and Max Heap, Heap sort implementation, applications of heap.

Hash tables and scattered tables: Basic concepts, hash function, characteristics of good hash function, different key-to-address transformations techniques

Unit V : File Organization

File Handling and Organization in Java, Java I/O Classes and interfaces, Files in Java, Steam: Byte Stream, Character Stream, Util class

Unit VI : Applications of Data Structures

Applications: Use of binary tree in expression tree-evaluation and Huffman's coding, Data structure used in social networking and Google map, Applications of heap, Symbol Table, Hash Tables, and Files

Text Books :

1 Brassard and Bratley- Fundamentals of Algorithmics, Prentice Hall India/Pearson education, ISBN 13-9788120311312

2 A. Tanenbaum, Y. Langsam, M. Augenstein: Fundamentals of Data Structure, 2nd edition, Pearson Education, 2002, ISBN-81-7808-670-0.

Reference Books :

1 Introduction to Algorithms 3rd Edition by Thomas H. Cormen, Charles E.Leiserson,Ronald L Rivest,& Clifford Stein, MIT Press ,Cambridge MA USA,ISBN 978-81-203-4007-7

2 Data structures, Algorithms and Applications in Java by SatrajSahni, University Press (India) Pvt.Ltd, 2nd edition, Universities Press Orient Longman Pvt. Ltd.

3 R. Gilberg, B. Forouzan, "Data Structures: A pseudo Code Approach with C++", Cengage Learning, ISBN 9788131503140.

4 Java: The Complete Reference, Seventh Edition by Herbert Schildt

List of Assignments :

Programming Language : Java

1 Implement binary search tree and perform following operations: a. Insert, b. Delete, c. Display (Inorder) d. Search e.BFS (Level wise print)

2 Construct an expression tree from postfix/prefix expression and perform recursive and non-

recursive In-order, pre-order and post-order traversals

3 You are given an undirected weighted graph with nodes and edges. The nodes are numbered from and to. Find the total weight of the minimum spanning tree, as well as one specific minimum spanning tree using Prims/Kruskal's algorithm. Note that there may be multiple different minimum spanning trees. You need to construct any one of them.

4 A customer wants to travel from source A to destination B. He books a cab from source A to reach destination B. Calculate a shortest path by avoiding real time traffic to reach destination B.

5 Consider a friends' network on face book social web site. Model it as a graph to represent each node as a user and a link to represent the fried relationship between them. Store data such as date of birth, number of comments for each user.
1.Find who is having maximum friends
2.Find who has post maximum and minimum comments
3. Find users having birthday in this month.

6 Read the marks obtained by students of second year in an online examination of particular subject. Find out maximum and minimum marks obtained in that subject. Use heap data structure. Analyze the algorithm.

7 Implement IsSpell utility (1. Create Hashtable and write in file 2. Enter Word 3. Search word 4. Exit)

8 Implement student database (Roll number, Name of student, Gr. Number, Class etc.) using text or binary files in JAVA.

Database Management System

Teaching Scheme
Credits : 4
Lectures : 3 Hrs/week
Practical : 2 Hrs/week

Examination Scheme
Continuous Internal Evaluation(CIE): 20 Marks
In-Semester Examination(ISE): 30 Marks
Skills & Competency Exam(SCE): 20 Marks
End Semester Examination(ESE): 30 Marks
PR/OR: 25 Marks

Prerequisites :

- Discrete Mathematics, Data Structure and Algorithms

Course Objectives :

- To understand the fundamental concepts of database management
- To provide a strong formal foundation in database concepts, technology
- To give systematic database design approaches covering conceptual design, logical design and an overview of physical design
- To learn basic issues of transaction management and concurrency control
- To learn and understand various Database Architectures and Applications
- To learn a powerful, flexible and scalable general purpose database to handle big data applications.

Course Outcomes :

After completion of the course, student will be able to

1. Remember the concepts of file processing and design E-R Model for given requirements and convert the same into database tables (Remember).
2. Apply database techniques such as SQL and PL/SQL (Apply).
3. Evaluate database design concept such as normalization (Evaluate).
4. Analyze transaction management techniques in relational database System.(Analyze).
5. Comprehend various database architectures in real time environment. (Comprehend).
6. Apply advanced database programming concepts in Big Data applications.(Apply).

Unit I : Introduction to DBMS

Introduction to Database Management Systems, Advantages of a DBMS over file-processing Systems, Database-System purpose and applications, Levels of Database Systems, Database Languages, Data Models, Components of a DBMS and overall structure of a DBMS,

Database Design and ER Model: Entity, Attributes, Relationships, Constraints, types of Keys, Entity Relationship Model, ER Diagram, Design Issues, Extended E-R Features, converting E-R & EER diagram into tables.

Unit II : Relational Algebra, SQL and PL/SQL

Introduction to Relational Algebra, SQL: Characteristics and advantages, SQL Data Types and Literals, DDL, DML, DCL, TCL, SQL Operators, Tables: Creating, Modifying, Deleting, Views: Creating, Dropping, Updating using Views, Indexes, SQL DML Queries: SELECT Query and clauses, Set Operations, Predicates and Joins, Set membership, Tuple Variables, Set comparison, Ordering of Tuples, Aggregate Functions, Nested Queries, Database Modification using SQL Insert, Update and Delete Queries. PL/SQL: Concept of Stored Procedures and Functions, Cursors, Triggers

Unit III : Relational Database Design

Relational Model: Basic concepts, Attributes and Domains, CODD's Rules, Functional Dependencies: Basic concepts, closure of set of functional dependencies, closure of attribute set, canonical cover, Decomposition: lossless join decomposition and dependency preservation, The Process of normalization, 1NF, 2NF, 3NF,BCNF, 4NF, 5NF.

Unit IV : Database Transactions and Query Processing

Basic concept of a Transaction, Transaction Management, Properties of Transactions, Concept of Schedule, Serial Schedule, Serializability: Conflict and View, Testing conflict and view serializability, Recoverable and Non-recoverable Schedules, Concurrency Control: Need, Locking Methods, Deadlocks, Timestamping Methods, Different Crash Recovery methods such as ShadowPaging and Log-Based Recovery: Deferred and Immediate, Checkpoints, Introduction to Query Processing and Query Optimization

Unit V : Database architecture

Introduction to Database Architectures: Parallel Databases: Speedup and Scale up, Architectures of Parallel Databases. Distributed Databases: Architecture of Distributed Databases, Distributed Database Design, Distributed Data Storage, Distributed Transaction: Basics, Failure modes, Commit Protocols, Concurrency Control in Distributed Database

Unit VI : Advances in Databases and Big Data

Introduction to NoSQL, Structured verses Unstructured data, Different NoSQL Data Models, NoSQL using MongoDB, CAP theorem and BASE Properties, Comparative study of SQL and NoSQL, NoSQL using MongoDB, Introduction to Hadoop, Hive and HiveQL

Text Books :

1 Abraham Silberschatz ,HenryKorth, S.Sudarshan,"Database System concepts",5th Edition ,McGraw Hill International Edition.
2 Elmasri R., Navathe S., "Fundamentals of Database Systems", 4* Edition, PearsonEducation, 2003, ISBN 8129702282
3 Pramod J. Sadalage and Martin Fowler, ―NoSQL Distilled‖, Addison Wesley,

ISBN10: 0321826620, ISBN-13: 978-0321826626

4 "Managing and Using MySQL", Reese G., Yarger R., King T., Williums H, 2nd Edition, Shroff Publishers and Distributors Pvt. Ltd., ISBN 81 - 7366 - 465 – X

5 MongoDB: The Definitive Guide by Kristina Chodorow

6 Programming **Hive**: Data Warehouse and Query Language for Hadoop. by Dean Wampler, Jason Rutherglen& Edward Capriolo. O'Reilly Media

Reference Books :

1 Ramkrishna R., Gehrke J., "Database Management Systems", 3rd Edition, McGrawHill, 2003, ISBN 0-07- 123151 –X.

2 C J Date, ―An Introduction to Database Systems‖, Addison-Wesley, ISBN: 0201144719.

3 Connally T., Begg C., "Database Systems", 3rd Edition, Pearson Education, 2002, ISBN 81-7808-861-4

4 MongoDB , O'Reilly Publications.

5 Hadoop, O'Reilly Publications

6 http://docs.mongodb.org/manual/

List of Assignments :

1 Design and Develop SQL DDL statements which demonstrate the use of SQL objects such as Table, View , Index and Sequence also implement SQL DML statements with operators, functions, Set operators, Clauses.

2 Design at least 10 SQL queries for suitable database application using SQL DML statements: all types of Join, Sub-Query and View.

3 Write a PL/SQL code to implement all types of cursor and display employee number, name and salary of 5 highest paid employees using cursor.Employee(employee no, employee name, join_date, designation, salary).

4 PL/SQL Stored Procedure and Stored Function : Write a PL/SQL procedure to find the number of students ranging from 100-80%, 79-70%, 69-60%,59-50 & below 49% in each course from the Student_course table given by the procedure as parameter. Student_course(Roll_no,Course,Couse_code,Semester,Total_Marks,Percentage)

5 Database Trigger (Row level and Statement level triggers, Before and After Triggers):Write a database trigger on Employee table. The System should keep track of the records that are being updated or deleted. The old value of updated or deleted records should be added in to a new table when the Employee table is updated. Employee(employee no, employee name, join_date, designation, salary).

6 Design and Develop MongoDB Queries using CRUD operations.

7 Implement aggregation, indexing and MapReduce with suitable example using MongoDB.

8 Mini Project: Consider any database application and implement MYSQL/MongoDB database connectivity with Java/PHP/Python.

Theory of Computation

Teaching Scheme
Credits : 3
Lectures : 3 Hrs/week

Examination Scheme
Continuous Internal Evaluation(CIE): 20 Marks
In-Semester Examination(ISE): 30 Marks
Skills & Competency Exam(SCE): 20 Marks
End Semester Examination(ESE): 30 Marks

Prerequisites : Basic Mathematics, Discrete Structure

-

Course Objectives :

- Formalization of notion of problems via formal languages
- Study the abstract computing models called Automata
- Understand the hierarchy of classes of formal languages & grammars
- Study Decidability and Undecidability of problems

Course Outcomes :

After completion of the course, student will be able to

1. Design of automata or hypothetical machines as language descriptors or recognizer.
2. Construction of Regular expression & its conversion to automata and vice versa.
3. Construction of grammar for language classes.
4. Design of Pushdown Automata as language descriptor.
5. Design of Turing machine as language descriptor and as computing functions.
6. Illustrate the concept of decidability and Undecidability of problems.

Unit I : Theory of Automata:

Basic Mathematical Objects: Sets, Logic, functions, Relations, Strings.
Definition of finite Automata(FA), Description of FA, Transition Systems, Acceptability of a String by a FA , Non deterministic FA, Equivalence of DFA and NFA,FA with output: Moore and Mealy machines-Definitions, Models, inter-conversion, minimization of FA

Unit II : Regular Expressions (RE) and Languages :

Recursive definition of regular expression, regular set, identities of regular expressions, Conversion of NFA With epsilon moves to DFA, Conversion-RE to DFA , Conversion-DFA to RE, Equivalence of R.E, Equivalence of FA, Pumping lemma for regular languages, Closure properties of regular languages, Applications of R.E

Unit III : Grammar:

Grammar- Definition, representation of grammar, Chomsky hierarchy, Context Free Grammar- Definition, Derivation, sentential form, parse tree, inference, derivation, parse tree, ambiguity in grammar and language, Simplifications of context free

Grammar-Eliminating unit productions, useless symbols, and Null-productions, Normal Forms for CFG- Chomsky normal form, Greibach normal form .
Regular Grammar- Definition, left linear, right linear grammar, Interconversion between left linear and right linear regular grammar

Unit IV Push Down Automata:

Push Down Automata- Definition, Notation, acceptance by final state, acceptance byempty stack, Equivalence of PDA and CFG- Grammar to PDA, PDA to Grammar,Deterministic PDA and Non Deterministic PDA. Closure Properties of CFLs

Unit V : Turing Machines:

Turing machine Model, Representation of Turing machine, Language acceptability by Turing machine, Design of Turing machine. Types of TM. Halting Problem

Unit VI Recursively Enumerable Languages:

Recursively Enumerable and Recursive, Properties of recursive and recursively enumerable languages, Post correspondence problem,
Undecidability: Reducing one problem to another, Other unsolvable Problems. Tractable and Intractable Problems

Text Books :

1 Mishra K., Chandrasekaran N., 'Theory of Computer Science (Automata, Languages and Computation)", Second Edition, Prentice Hall of India
2 John C Martin. "Introduction to Language and Theory of Computation", Third edition, Tata McGraw- Hill

Reference Books :

1 Hopcroft J., Motwani R., Ullman J., "Introduction to Automata Theory, Languages and Computations", Third edition, Pearson Education Asia
2 Michael Sipser, "Introduction to The Theory of Computation " ISE
3 Vivek Kulkarni, "Theory of Computation", Oxford University Press

Software Engineering

Teaching Scheme
Credits: 3
Lectures: 2 Hrs/week
Practical: 2 Hrs/week

Examination Scheme
Continuous Internal Evaluation (CIE): -
In-Semester Examination (ISE): -
Skills & Competency Exam (SCE): -
End Semester Examination (ESE): -
TW: 50 Marks

Prerequisites:

- Basic programming skill

Course Objectives:

- To learn and understand the principles of Software Engineering
- To understand the nature of software complexity in various application domains, disciplined
- Way of software development and software life cycle process models.
- To introduce principles of agile software development, the SCRUM process and agile practices.
- To be acquainted with methods of capturing, specifying, visualizing and analysing software requirements.
- To know methods of capturing, specifying, visualizing and analysing software requirements.
- To understand and apply concepts and principles of software design and architecture.

Course Outcomes:

Upon completion of the course, students will be able to

1. Compare and chose a process model for a software project development
2. Identify unique features of various software applications to write in SRS also to identify domains and classify software applications.
3. Describe principles of agile development, discuss the SCRUM process and distinguish agile process model from other process models.
4. Understand importance of risk management and configuration management & apply risk management strategies and configuration management techniques to various projects.
5. To understand and develop test cases.

Unit I: Introduction to Software Engineering & Agile Methodology

Nature of Software, The Software Process, Software Myths, A Generic Process Model, Prescriptive Process Models, The Waterfall Model, Incremental Process Models, Evolutionary Process Models, Concurrent Models, Specialized Process Models, Unified Process. Agile Development: Agile manifesto, agility and cost of change, agility principles, myth of planned development, toolset for the agile process. Extreme Programming: XP values, process, industrial XP, SCRUM - process flow, scrum roles, scrum cycle description, product backlog, sprint planning meeting, sprint backlog, sprint execution, daily scrum meeting, maintaining sprint backlog and burn-down chart, sprint review and retrospective. Agile Practices: test driven development, refactoring, pair programming, continuous integration, exploratory testing versus scripted testing

Unit II: Requirement Analysis & Risk Management, Configuration Management

Requirements Capturing: requirements engineering (elicitation, specification, validation, negotiation, prioritizing requirements (Kano diagram) - real life application case study.
Requirements Analysis: basics, scenario-based modelling, UML models: use case diagram and class diagram, data modelling, data and control flow model, behavioural modelling using state diagrams – real life application case study, software Requirement Specification. Project Risk Management: Risk Analysis & Management: Reactive versus Proactive Risk Strategies, Software Risks, Risk Identification, Risk Projection, Risk Refinement, Risk Mitigation, Risks Monitoring and Management, The RMMM plan for case study project. Software Configuration Management: SCM basics, SCM repository, SCM process, SCM tools such as GitHub, CASE – taxonomy, tool-kits, workbenches, environments, components of CASE, categories (upper, lower and integrated CASE tools).

Unit III: Testing & Software Quality Assurance

Software Quality, Achieving Software Quality: Software engineering methods, Project Management techniques. Quality control and quality assurance. Software Reliability, SQA Tools, Goals and Metrics, Introduction to Software Testing: Principles of Testing, Testing Life Cycle, Phases of Testing, Types of Testing, Verification & Validation, Defect Management, Defect Life Cycle, Bug Reporting, GUI Testing, Test Management and Automation.

Software Process Improvement (SPI): What is SPI, SPI Process, The CMMI, The People CMM, Case study: SPI frameworks.

Unit IV: Advanced Software Engineering

Maintenance & Reengineering: Software Maintenance, Software Supportability, Reengineering, Business Process Reengineering, Software Reengineering, Reverse Engineering, Restructuring, Forward Engineering. Emerging software engineering trends: technology evolution, process trends, collaborative development, test-driven development, global software development challenges.

Text Books:

1 Roger S Pressman "Software Engineering: A Practitioner's Approach "7th Edition McgrawHill ISBN:0073375977
2 Ian Sommerville "Software Engineering" 9th edition Pearson Education SBN-13: 978-0- 13-703515-1, ISBN-10: 0-13-703515-2, pdf downloadable
3 Hong Zhu "Software Design Methodology", Elsevier ISBN: 978-81-312-0356-9

Reference Books:

1 Rajib Mall, "Fundamentals of Software Engineering", Prentice Hall India, ISBN-13: 978-8120348981
2 Pankaj Jalote, "An Integrated Approach to Software Engineering", Springer, ISBN 13:9788173192715.
3 Joseph Phillips, IT Project Management –On Track From Start to Finish, Tata Mc Graw-Hill,ISBN13: 978-0-07106727-0, ISBN-10: 0-07-106727-2.
4 C. Michael Pilato, Ben Collins-Sussman and Brian Fitzpatrick, Version Control with subversion,O'Relly, Shroff publishers, ISBN: 978-81-8404-728-8.

List of Assignments:

Sr.No.	Assignment
1	Write down Customer Problem Statement(CPS)
2	Identify Goals, Requirements (Functional, Non-functional, User Interface) and perform Analysis of the customer problem statement. (Note: Instead of system requirements, you may wish to write User Stories).
3	Derive the use cases based on the requirements from CPS and draw use case diagram.
4	Draw activity diagrams for major use cases.
5	Design and develop User Interface Specification using any UI Tool.
6	Identify analysis level classes and design class diagram.
7	Draw State diagram for the same.
8	List and describe the test cases that will be programmed and used for unit testing of your software.
9	Develop Software Requirement Specification

Web Technology

Teaching Scheme
Credits : 3
Lectures : 1 Hr/week
Practical : 2 Hrs/week

Examination Scheme
Continuous Internal Evaluation(CIE): -
In-Semester Examination(ISE): -
Skills & Competency Exam(SCE): -
End Semester Examination(ESE): -
TW: 50 Marks

Prerequisites:

- Fundamentals of programming

Course Objectives:

- To evaluate problems and analyse data using current technologies
- To learn how to employ Integrated Development Environment (IDE) for implementing and testing of software solution
- To acquire contemporary skills to make the students employable in computer engineering domain

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

1. Utilize current technologies in a wide variety of business and organizational contexts using modern tools
2. Identify Integrated Development Environment (IDE) for implementing and testing of software solution.
3. Apply best practices for building applications.
4. Make use of contemporary skills to make them employable

Unit I: HTML/HTML5 And CSS/CSS3

Applying Designs to WireFrames with HTML5 and CSS3, Build Your Own HTML5 Video Player, Building Responsive Websites with HTML5 and CSS3, HTML5 and CSS3 Site Design, HTML5 Mobile Game Development by Example – Educational Game, HTML5 Mobile Game Development by Example -Veggies vs Zombies, Make HTML5 Games with No Coding Required, Understanding HTML5 Input Types, Website Wireframing with HTML5 and CSS3

Unit II: Javascript Development

Fundamentals Of JavaScript, JavaScript for Beginning Web Developers, JavaScript for Absolute Beginners, Fundamentals of jQuery, Fundamentals of Ajax Development, Create a node.js Real Time Chat Application, Advanced JavaScript

Unit III: Node.Js

Introduction and Foundation, Node Projects, Working with shrink-wrap to lock the node modules versions, Working with asynchronous programming, Building a HTTP Server with Node.JS using HTTP APIs, File System, Buffers, Streams, and Events, Multi-Processing in NodeJS, ExpressJS, Express JS with MongoDB and Sqlite io, The Front-end, and A Chat App, Introduction to Task Managers with unit testing

Unit IV: Angular

What is a SPA? What is Angular?, Preparing for TypeScript, Angular-4 new features, Building with A4 Components, Bootstrap Scaffolding, Angular 4 Binding and Events, Dependency Injection and services, Directives, Pipes, Forms, HTTP, Promises, and Observables, Testing

Unit V: MongoDB

Introduction to NoSQL databases, MongoDB A Database for the Modern Web, CRUD Operations in MongoDB, Indexing and Aggregation, Replication and Sharding, Developing Java and Node JS Application with MongoDB, Administration of MongoDB Cluster Operations

Unit VI: React.js

Welcome to Starting with React, React Components, React State and Props, React Event Handling, Routing in React React flux, Styling React

Text Books:

1 Achyut Godbole & Atul Kahate, "Web Technologies: TCP/IP to Internet Application Architectures", McGraw Hill Education publications
2 Ralph Moseley & M. T. Savaliya, "Developing Web Applications", Wiley publications.

Reference Books:

1 Adam Bretz & Colin J Ihrig, "Full Stack Javascript Development with MEAN", SPD
2 Giulio Zambon, " Beginning JSP, JSF and Tomcat", Apress Publication
3 Jeremy McPeak& Paul Wilton," Beginning JavaScript", Wrox Publication, ISBN-13: 978- 0470525937
4 Robin Nixon, "Learning PHP, Mysql and Javascript with JQuery, CSS & HTML5", O'REILLY, ISBN: 13:978-93-5213-015-3
5 Black Book, "Struts 2", Dreamtech Press, ISBN 13, : 9788177228700
6 Black Book, " JDBC 4.2, Servlet 3.1 & JSP 2.3", Dreamtech Press, ISBN-13: 978-8177228700
7 Sandeep Panda, "Angular JS: Novice To Ninja", SPD, First Edition 2014, ISBN-13: 978- 0992279455
8 Brad Dayley, Brendan Dayley, Caleb Dayley, "Node.js, MongoDB and Angular Web Development", 2nd Edition, Addison-Wesley
9 Ethan Brown, "Web Dvelopment with Node and Express", O'reilly, ISBN – 978-1-491-94930-6
10 Jennifer Niederst Robbins, "Learning Web design", O'reilly, 4th Edition

List of Assignments:

1. Using HTML5/CSS3 develop informative and responsive web page for Library Management System.
2. Create a user registration form for Library Management System in HTML and write a JavaScript Program to apply form validation and to get user registration details.
3. Manipulate and design the user registration form using CSS3 selector with jQuery functions.
4. Create a CRUD application using AJAX.
5. Create HTTP server and create required API's for user registration of Library Management System form using Node.js
6. Develop dashboard for Library Management System having functionalities of Login, Book Issue and Return using Angular.
7. Develop an application for a Library Management System using Node.js and MongoDB.
8. Develop dashboard for Library Management System having functionalities of Login, Book Issue and Return using react JS.