**DAA**

**Unit I: Introduction**

Time complexity of an algorithm, Pseudo code for expressing algorithms, Performance analysis (Space complexity and Time complexity), Asymptotic notations, Growth of functions, Recurrence methods (Substitution, Recursion tree and Master’s method).

**Unit II: Divide-and-Conquer & Greedy Strategy**

Divide and Conquer: Binary search, Merge sort, Quick sort, Performance Measurement: Best Case and Worst-Case Analysis. Greedy Strategy: Overview of the greedy paradigm, Huffman coding, Activity selection problem, Fractional knapsack problem.

**Unit III: Dynamic Programming and Graphs-Trees**

Dynamic Programming: Principles of dynamic programming, Matrix multiplication, 06 Hours 4 5 longest common sequence. Graphs-Trees: Single source shortest path algorithm, All pair shortest path, algorithm, Minimum spanning tree.

**Unit IV: Back Tracking and Branch-Bound**

Back Tracking: Overview, 8-queen problem, and Knapsack problem, Traveling Salesman problem. Branch-Bound: LC searching Bounding, FIFO branch and bound, LC branch and bound.

**Unit V: String Matching**

String Matching: Naïve String-matching Algorithms, KMP algorithm, Rabin-Karp Algorithm, String matching with Finite Automata.

**Unit VI: NP-Complete and Approximation Algorithms**

NP Complete: The Class P, Class NP-Reducibility, NP-Hard class, NP-complete class, Circuit Satisfiability problem-SAT 3CNF, Hamiltonian Cycle, Clique.

**AI**

**Unit I: Introduction to intelligence and Problem Solving**

Problems of AI, AI technique, Tic - Tac - Toe problem. Intelligent Agents, Agents & environment, nature of environment, structure of agents, goal based agents, utility based agents, learning agents, 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: Problem Solving and Search Strategies**

Problem-Solving as State Space Search, Production Systems and Problem Characteristics, Problem solving agents, uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search, comparing uniform search strategies. Inform Search strategies/Heuristic search strategies: 06 Hours 7 8 Greedy best-first search, A\* search, AO\* search, memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search, local beam search,Constraint Satisfaction Problems (CSP),Game Playing: Minimax Algorithm, Alpha-Beta Pruning.

**Unit III: Knowledge & reasoning**

Knowledge representation methods: Propositional Logic, First-Order Logic (FOL), Semantic Networks, Frames, Ontologies, Reasoning Techniques: resolution, natural deduction. forward and backward reasoning, Probabilistic Reasoning: Bayesian Networks, Dempster-Shafer theory, Markov Models, Handling Uncertainty: Fuzzy Logic, Non-Monotonic Reasoning.

**Unit IV: Automated Planning & Decision Making**

Introduction to Planning in AI, Components of a planning system, Goal stack planning, Hierarchical planning, other planning techniques, State-Space and STRIPS Representation, Classical Planning Algorithms: Forward State-Space Planning, Backward State-Space Planning, Graph Plan Algorithm, Decision-Making in AI: Markov Decision Processes (MDPs), Reinforcement Learning Basics

**Unit V: Expert Systems & AI Applications**

Introduction to Expert Systems, Components of Expert Systems, Rule-Based Expert Systems, Fuzzy Expert Systems, Decision Support Systems and AI-Based Decision Making, expert system shells, and knowledge acquisition.

**Unit VI: AI Ethics, Applications, and Future Trends**

AI in Healthcare, Finance, Robotics, Autonomous Vehicles, AI and Society, Ethical Issues in AI, AI and Society, Emerging Trends: Explainable AI (XAI), Quantum AI, Generative AI, Case Studies: Successful AI Implementations and Real-World Impact

**DT**

**Unit I: Introduction**

What is Design Thinking? Recognize the importance of Design Thinking , Why is Design Thinking important for business and for you?Identify the steps in the DT process, Empathize (search for rich stories and find some love), Define (user need and insights — their POV), Ideate (ideas, ideas, ideas), Prototype (build to learn), Test (show, don't tell).

**Unit II: Empathy Phase**

What is empathy?Ask What ? How ? Why ? Recognize the steps in the empathize phase of DT, Different types to developing Empathy towards People, Introduction to Immersion Activity,Identify the steps required to conduct an immersion activity, How to empathize?,Conduct an immersion activity and fill up the DT question template.

**Unit III: Define Phase**

What is a persona and how do I create one? Creating personas: Recognize the 06 Hours 10 11 steps to create personas in the define phase of DT, Four Different Perspectives on Personas 1) Goal-directed Personas 2) Role-Based Personas 3) Engaging Personas 4) Fictional Personas, 10 steps to Create Engaging Personas , User Persona- BAG Framework, Value Proposition Canvas, Define the problem statements in the define phase ofDT, Recognize the steps to create problem statements in the define phase of DT

**Unit IV: Ideate Phase**

How to Ideate? What is the purpose of ideation? Recognize the steps in the ideate phase of DT, Ideation games: Game 1: Six Thinking Hats, Game 2: Million-dollar idea, Ideate to find solutions, Characteristics Required for Successful Ideation, Recognize how doodling can help to express ideas,What is Storytelling in DT? Recognize the importance of storytelling in presenting ideas and prototypes.

**Unit V: Prototype Phase**

What is the prototype phase in DT, Purpose of Prototyping, Prototype your idea, Create a prototype: Types of Prototyping l)Low-Fidelity Prototyping 2)Medium Fidelity Prototyping 3)High-Fidelity Prototyping,Activities in Prototyping, Classification of Prototyping, Guidelines for Prototyping, Recognize the importance of service value proposition, Create a value proposition statement.

**Unit VI: Testing Phase**

Testing in Design Thinking, Test the Prototype, Role of DT in your work, discuss How DT can help me to become a better coder?, Steps of conducting a user test, How Agile and DT complement each other to deliver customer satisfaction.

**IOT**

**Unit I: Introduction Internet of Things**

Introduction to Internet of Things (IoT): Definition, Characteristics of IoT, Vision, Trends in Adoption of IoT, IoT Devices, IoT Devices Vs Computers, Societal Benefits of IoT, Technical Building Blocks, Applications in IoT.

**Unit II: IoT: Design Methodology**

IoT Design Methodology: Steps, Basics of IoT Networking, Networking Components, Internet Structure, Connectivity Technologies, IoT Communication Models and IoT Communication APIs, Sensor Networks, Four pillars of IoT: M2M, SCADA, WSN, RFID.

**Unit III: IoT Protocols**

Protocol Standardization for IoT, M2M and WSN Protocols, RFID Protocol, Modbus Protocol, Zigbee Architecture. IP based Protocols: MQTT (Secure), 6LoWPAN, LoRa.

**Unit IV: Cloud Platforms for IoT**

Introduction to Cloud Storage Models, Communication API, Python Web Application Framework: Django Architecture and application development with Django, Amazon Web Services for IoT, SkyNet IoT Messaging Platform, RESTful Web Service.

**Unit V: Security in IoT**

Introduction, Vulnerabilities of IoT, Security Requirements, Challenges for Secure IoT, Threat Modeling. Key elements of IoT Security: Identity establishment, Access control, Data and message security, Security model for IoT, Challenges in designing IOT applications.

**Unit VI: Introduction to Industrial IoT (IIoT)**

Evolution of Industrial IoT ,Key differences between IoT and Industrial IoT, Components of IIoT, IIoT Architecture, Benefits and Challenges of IIoT, Applications of IIoT in Various Industries.

**STQA**

**Unit I: SOFTWARE TESTING -CONCEPTS, ISSUES, AND TECHNIQUES**

Quality revolution, verification and validation, failure, error, fault, and defect, objectives of testing, testing activities, test case selection white-box and black, test planning and design, test tools and automation, Power of test. Test team organization and management-test groups, software quality assurance group, system test team hierarchy, team building

**Unit II: SYSTEM TESTING**

System testing - system integration techniques-incremental, top down bottom up sandwich and big bang, software and hardware integration, hardware design verification tests, hardware and software compatibility matrix test plan for system integration. Built- in testing. Functional testing - testing a function in context. Boundary value analysis, decision tables.Acceptance testing selection of acceptance criteria, acceptance test plan, test execution test. Softwarereliability fault and failure, factors influencing software, reliability models.

**Unit III: SYSTEM TEST CATEGORIES**

24 System test categories taxonomy of system tests, interface tests functionality tests. Gui tests, security tests feature tests, robustness tests, boundary value tests power cycling tests interoperability tests, scalability tests, stress tests, load and stability tests, reliability tests, regression tests, regulatory tests. Test generation from fsm models- state-oriented model. Finite-state machine transition tour method, testing with state verification. Test architectures- local,distributed, coordinated, remote. System test design- test design factors requirement identification, modeling a test design process test design preparedness,metrics, test case design effectiveness. System test execution- modeling defects, metrics for monitoring test execution .defect reports, defect causal analysis, beta testing, measuring test effectiveness.

**Unit IV: SOFTWARE QUALITY**

Software quality - People‘s Quality Expectations, Frameworks and ISO-9126, McCall‘s Quality Factors and Criteria – Relationship. Quality Metrics. Quality Characteristics ISO 9000:2000 Software Quality Standard. Maturity models- Test Process Improvement, Testing Maturity Model.

**Unit V: SOFTWARE QUALITY ASSURANCE**

Quality Assurance - Root Cause Analysis, modeling, technologies, standards and methodologies for defect prevention. Fault Tolerance and Failure Containment - Safety Assurance and Damage Control, Hazard analysis using fault-trees and event trees. Comparing Quality Assurance Techniques and Activities. QA Monitoring and Measurement

**Unit VI: SOFTWARE TEST AUTOMATION**

What is Test Automation.Terms used in automation, Skills needed for automation. What to automate, scope of automation .Design and Architecture of automation. Generic requirements for a test tool. Process Model for Automation Selecting test tool. Automation for XP/Agile model, challenges in automation, Data-driven Testimg Automation Tools like JUnit, Jmeter