

FIRST SEMESTER

Data Structure Using C (24M11CA111) (3 CREDITS)

Introduction to Data Structures & C: concepts of data structures, Need for data structures in programming, Functions, Arrays, Pointers, and Dynamic Memory Allocation; Arrays & Strings: One-dimensional and Multi-dimensional Arrays, Array operations, Applications of Arrays & Strings; Stack and Queue: Definition, Operations (Push, Pop, Peek), Implementation of Stack using Arrays & Linked List, Applications of Stack: Expression Evaluation (Postfix, Prefix, Infix), Recursion, Definition, Operations (Enqueue, Dequeue, Peek), Types of Queues: Circular Queue, Priority Queue, Double-Ended Queue (Deque), Linked List: Singly Linked List, Doubly Linked List (Insertion, Deletion, Traversal), Circular Linked List; Recursion: Direct and Indirect Recursion, Recursion vs Iteration; Searching and Sorting Algorithms: Linear Search, Binary Search (Iterative and Recursive), Bubble Sort, Selection Sort, Insertion Sort, Merge Sort, Quick Sort, Trees: Introduction to Trees, Terminology (Node, Root, Degree, Height, Depth), Binary Tree & BST; Hashing and Hash Tables, File Handling in C: File Operations: Read, Write, Append, File Pointers and Functions (fopen, fclose, fread, fwrite, etc.), Storing Data Structures in Files.

Data Base Management Systems (24M11CA112) (3 CREDITS)

Introduction to Databases, Overview of Data, Information, and Databases, Data Models and Database Design, Structured Query Language (SQL): DDL, DML, Subqueries, Views, and Indexes, Transaction Control (Commit, Rollback); Relational Database Design: Functional Dependencies, Normalization (1NF, 2NF, 3NF, BCNF, 4NF, 5NF); Storage and File Organization, Transactions and Concurrency Control: ACID Properties, Serializability and Recoverability, Deadlock Handling; Database Backup and Recovery Techniques, Database Security Issues and Access Control, SQL Injection and Encryption Techniques, NoSQL and Advanced Databases, Object-Oriented and Distributed Databases, Emerging Trends in Databases: Cloud Databases, Data Warehousing and OLAP, Graph Databases, Blockchain and Databases;

Object Oriented Programming using JAVA (24M11CA113) (3 CREDITS)

Introduction to Java, Fundamentals of Java, Introduction to OOP Concepts (Abstraction, Encapsulation, Inheritance, Polymorphism), Static and Instance Members, Garbage Collection & Memory Management, Inheritance (Single, Multilevel, Hierarchical, etc.), Interfaces and Multiple Inheritance in Java, Exception Handling Mechanism (try, catch, finally, throw, throws), Java Input/Output (I/O) and File Handling, Multithreading in Java, Introduction to Java Collections, List, Set, Map, and Queue Interfaces, GUI Programming with Swing & AWT: Basics of AWT, Event Handling & Listeners, Swing Components (JFrame, JButton, JLabel, etc.), Layout Managers; JDBC & Database Connectivity, Connecting Java with MySQL/Oracle Database, Java Networking & Web Technologies: Networking Basics (TCP/IP, UDP, Sockets), Introduction to Servlets and JSP, Basics of RESTful Web Services.

Machine Learning (24M11CA114) (3 CREDITS)

Introduction to Machine Learning, Types of ML (Supervised, Unsupervised, Reinforcement Learning), Applications of ML, Mathematics for Machine Learning: Linear Algebra (Vectors, Matrices, Eigenvalues), Probability & Statistics (Bayes Theorem, Probability Distributions), Optimization Techniques (Gradient Descent, Convex Optimization); Data Preprocessing & Feature Engineering, Data Cleaning & Transformation, Supervised

Learning: Regression, Classification, Performance Evaluation; Unsupervised Learning: Clustering (K-Means, Hierarchical, DBSCAN), Dimensionality Reduction (PCA, t-SNE, LDA) Association Rule Learning (Apriori, FP-Growth); Introduction to Artificial Neural Networks (ANN), Deep Learning Architectures (CNN, RNN, LSTM), Reinforcement Learning: RL, MDP, DQN; Ensemble Methods (Bagging, Boosting, Stacking), Natural Language Processing (NLP) Basics, ML Tools & Libraries: Python for ML (NumPy, Pandas, Matplotlib), Scikit-Learn, TensorFlow & Keras, PyTorch; Model Deployment with Flask/Django, Cloud ML (Google Cloud, AWS, Azure), Real-World ML Applications.

Computer System Architecture (24M11CA115) (3 CREDITS)

Introduction to Computer System Architecture, Data Representation and Number Systems: Binary, Octal, Hexadecimal number systems, Signed and Unsigned number representation, Error detection and correction codes (Parity, Hamming Code); Boolean Algebra and Digital Logic, Processor Organization and Control Unit, Memory Organization, Associative memory and cache mapping techniques, Input-Output Organization, Peripheral devices and their controllers, Pipelining and Parallel Processing, Types of parallel processing (SISD, SIMD, MISD, MIMD), Multiprocessor and Multicore architectures, RISC vs. CISC processors, Modern CPU architectures (Intel, ARM), Performance Measurement and Optimization: Performance metrics (MIPS, FLOPS, CPI), Speedup and Amdahl's Law, Optimization techniques in computer architecture, Cloud computing and server architectures.

Data Structure Using C Lab (24M15CA111) (2 CREDITS)

Basic concepts of data structures (arrays, linked lists, stacks, queues, trees, graphs, etc.), Overview of C programming (functions, pointers, dynamic memory allocation, file handling), One-dimensional and two-dimensional arrays, String manipulation (string functions, operations, and implementations), Searching (Linear Search, Binary Search), Sorting (Bubble Sort, Selection Sort, Insertion Sort, Merge Sort, Quick Sort), Linked Lists: Singly Linked List, Singly Linked List, Circular Linked List; Stack using arrays and linked lists (Push, Pop, Peek operations), Queue using arrays and linked lists (Enqueue, Dequeue operations), Circular Queue Queue, Double-ended Queue (Deque), Recursive functions (factorial, Fibonacci, Tower of Hanoi), Backtracking problems (N-Queens Problem, Rat in a Maze), Trees: Binary Tree, BST, AVL, Tree traversal using recursion and iterative methods; Hashing and File Handling, Graph Algorithms (Floyd-Warshall, Bellman-Ford).

Data Base Management Systems Lab (24M15CA112) (1 CREDITS)

Overview of DBMS, RDBMS, and SQL, SQL – Data Definition Language (DDL), SQL – Data Manipulation Language (DML), SQL – Joins and Subqueries, SQL – Functions and Aggregate Operations, SQL – Views, Sequences, and Synonyms, PL/SQL – Basics and Stored Procedures, PL/SQL – Triggers and Cursors, Transactions and Concurrency Control, Transactions and Concurrency Control, NoSQL Databases.

Object Oriented Programming using JAVA Lab (24M15CA113) (1 CREDITS)

Basic Java Programming, Control Structures and Loops, Arrays and Matrices, Demonstrating the use of constructors, Implementing inheritance and polymorphism, Creating and using packages and interfaces, Implementing try-catch blocks for exception handling, Creating and managing threads in Java applications, Performing file operations such as reading from and writing to files, Handling labels, buttons, checkboxes, lists, and scrollbars using Abstract Window Toolkit (AWT) controls.

Machine Learning Lab (24M15CA114) (1 CREDITS)

Introduction to Machine Learning & Tools: Python/R for Machine Learning, Installing and using libraries: NumPy, Pandas, Matplotlib, Scikit-Learn, TensorFlow, Data preprocessing and visualization; Supervised Learning Algorithms: Linear&Logistic Regression, Decision Trees & Random Forest, Naïve Bayes Classifier; Unsupervised Learning Algorithms: K-Means Clustering, Hierarchical Clustering, Principal Component Analysis (PCA); Perceptron Algorithm, Feedforward Neural Networks, Backpropagation Algorithm, Model Evaluation & Optimization: Train-Test Split & Cross-Validation, Hyperparameter Tuning using Grid Search, Random Search, Performance Metrics: Accuracy, Precision, Recall, F1-score, AUC-ROC.

SECOND SEMESTER

Design and Analysis of Algorithms (24M11CA116) (3 CREDITS)

Introduction to Algorithms, Divide and Conquer Algorithm, Greedy Algorithm, Dynamic Programming (DP), Difference Between Greedy and DP, Backtracking: N-Queens Problem, Graph Coloring, Subset Sum Problem; Branch and Bound, Representation of Graphs (Adjacency Matrix, Adjacency List), Graph Traversal Techniques (BFS, DFS), Complexity Theory: P, NP, NP-Complete, and NP-Hard Problems, Cook's Theorem and Reductions, Approximation Algorithms; String Matching Algorithms, Approximation and Randomized Algorithms, Parallel Algorithms, Distributed Algorithms, Quantum Algorithms.

Computer Network (24M11CA117) (3 CREDITS)

Basics of Networking: Definition, Need, and Applications, Network Types: LAN, WAN, MAN, PAN; Network Topologies, OSI and TCP/IP Models, Data Transmission and Communication, Data Link Layer and MAC Sublayer, VLANs and Virtual Networking, Network Layer and Routing: IPv4 and IPv6 Addressing, Subnetting and Supernetting, ICMP, ARP, RARP, DHCP Protocols; Transmission Control Protocol (TCP) and User Datagram Protocol (UDP), Quality of Service (QoS) and Traffic Shaping, Application Layer and Network Services, Network Security and Cryptography, Firewalls, Intrusion Detection Systems (IDS), VPN, Wireless and Mobile Networks, Internet of Things (IoT) Networking, Future Trends in Networking.

Operating System (24M11CA118) (3 CREDITS)

Introduction to Operating Systems, Types of Operating Systems (Batch, Multiprogramming, Time-Sharing, Distributed, Real-Time, Embedded), OS Structure (Monolithic, Layered, Microkernel, Hybrid), Process Management, Inter-process Communication (IPC), Threads: Single and Multi-threading, CPU Scheduling Criteria and Algorithms, Synchronization and Deadlocks, Memory Management: Logical vs. Physical Address Space, Virtual Memory and Demand Paging; File System Structure and Organization, Directory Structures (Single-level, Two-level, Tree-structured, Acyclic Graph, General Graph), File Access Methods (Sequential, Direct, Indexed), Disk Scheduling Algorithms (FCFS, SSTF, SCAN, C-SCAN, LOOK), I/O System and Device Management, Security and Protection, Cloud-based Operating Systems, Distributed Operating Systems.

Information Security (24M11CA119) (3 CREDITS)

Introduction to Information Security, Threats, Attacks, and Vulnerabilities, Security Policies and Mechanisms, Risk Management and Security Standards, Cryptography Fundamentals: Symmetric and Asymmetric Encryption, Classical Cryptography, Modern Cryptographic Algorithms, Digital Signatures and Certificates; Network Protocols and Security, Firewalls, Intrusion Detection Systems (IDS), and Intrusion Prevention Systems (IPS), Wireless Security and Wi-Fi Encryption (WPA, WPA2), Denial of Service (DoS) and Distributed Denial of Service (DDoS) Attacks, Web Application Security (OWASP Top 10), SQL Injection, Cross-Site Scripting (XSS), Cross-Site Request Forgery (CSRF), Mobile Security and Secure Coding Practices, Operating System Security, Cybersecurity Policies and Legal Aspects: Information Security Laws and Regulations (GDPR, HIPAA, IT Act), Ethical Hacking and Penetration Testing, Social Engineering Attacks and Countermeasures; Cloud and IoT Security, Security Audits and Compliance, Business Continuity Planning (BCP) and Disaster Recovery.

Professional Communication (HS) (24M31HS111) (2 CREDITS)

Introduction to Humanities and Social Sciences, Listening types, Effective and active listening, Reading comprehension techniques, Conversation and persuasive speaking, Presentation planning and delivery, Reported and modulated speech, Pronunciation and language transitions, Job applications and employment letters, CV and resume writing styles, Soft skills and personality development, Intrapersonal and interpersonal skills, Non-verbal communication, Interview preparation and etiquette, Professional grooming, Vocabulary building and error spotting, Written communication practice.

Design and Analysis of Algorithms Lab (24M15CA116) (1 CREDITS)

Basics of Time and Space Complexity, Asymptotic Notations (Big-O, Theta, Omega), Divide and Conquer Algorithms: Merge Sort, Quick Sort, Binary Search, Strassen's Matrix Multiplication; Greedy Algorithm Approach: Activity Selection Problem, Fractional Knapsack Problem, Huffman Encoding, Prim's and Kruskal's Algorithm; Dynamic Programming Techniques, Backtracking Algorithms, NP-Complete and Approximation Algorithms.

Computer Networks Lab (24M15CA117) (1 CREDITS)

Introduction to Computer Networks & Network Tools, Network Commands & Configuration, Subnetting and Supernetting exercises, TCP Socket Programming (Client-Server Communication), Implementation of Multi-threaded Server, Data Link Layer & MAC Layer Protocols, Implementing Shortest Path Routing Algorithm (Dijkstra's Algorithm), Transport Layer Protocols, Implementation of DNS using Socket Programming, Developing Simple FTP Server and Client, Simulating HTTP Communication, Implementing RSA Algorithm for Encryption & Decryption, Simulating Network Topologies using NS2/NS3, Implementing VLAN and VPN, Introduction to Cloud Networking.

Operating System Lab (24M15CA118) (1 CREDITS)

Overview of UNIX/Linux Environment, Basic Shell Scripting, Shell Commands and File Handling, Creating and Managing Processes using fork(), exec(), wait(), etc., Thread Management, Implementation of Paging and Segmentation, Virtual Memory Management (Page Replacement Algorithms - FIFO, LRU, Optimal), File System Management, File Handling System Calls (open(), read(), write(), close()), Deadlock Handling, Disk Scheduling Algorithms, Shell Scripting & Automation : Writing Shell Scripts for System Administration, Automating Backup, Process Management, and Task Scheduling, Scripting for User Management.

Information Security Lab (24M15CA119) (1 CREDITS)

Overview of Security Concepts, Introduction to Security Tools and Virtual Lab Setup (Kali Linux, VirtualBox, Wireshark, etc.), Implementing Classical Ciphers (Caesar Cipher, Vigenère Cipher, Playfair Cipher), Symmetric & Asymmetric Key Cryptography, Packet Sniffing using Wireshark, Network Scanning using Nmap, Firewall Configuration and Rules Implementation, Web Security and Ethical Hacking, File and Directory Permissions in Linux, Malware Analysis (Trojan, Virus, and Ransomware Basics), Implementing SSL/TLS for Secure Web Communication, File Recovery and Metadata Analysis, Disk Imaging and Data Extraction (Autopsy, FTK Imager), Cloud Security Threats and Hardening.

THIRD SEMESTER

Software Engineering (24M11CA211) (3 CREDITS)

Introduction to Software Engineering: Definition, scope, and importance of software engineering, Software development lifecycle models, Software Processes: Waterfall model, Agile methodologies (Scrum, Kanban), DevOps practices. Requirements Engineering: elicitation and analysis, specification and documentation, validation and management. Software Design: OOD, UML, UI and UX; Software Development and Implementation, Software Testing and Quality Assurance, Automation Testing and Tools (Selenium, JUnit, TestNG), Software Quality Metrics and Standards (ISO, CMMI), Software Maintenance and Evolution, Software Project Management, Software Security and Reliability, Cloud Computing & Software as a Service (SaaS), DevOps and Continuous Integration/Continuous Deployment (CI/CD), Artificial Intelligence (AI) in Software Development, Blockchain for Secure Software Development.

Web Technology (24M11CA212) (2 CREDITS)

Introduction to Web Technology: Client-server architecture, Basics of HTTP/HTTPS, DNS and domain name system, Web browsers and web servers; HTML, CSS, and JavaScript, Introduction to React.js, Angular, or Vue.js, State management (Redux, Vuex), Node.js and Express.js (JavaScript-based backend), PHP, Django, Flask, or ASP.NET (alternatives), Handling HTTP requests and responses, Database connectivity (MySQL, MongoDB), Database Connectivity: SQL vs NoSQL databases, Using ORMs (Mongoose, Sequelize, Hibernate); Web APIs and AJAX, JSON and XML data formats, CRUD operations using APIs, Web Security, HTTPS, CORS, Content Security Policy, Web Hosting & Deployment, Progressive Web Applications (PWA), Offline support and push notifications, Web 3.0 & Blockchain in web development, AI-powered web applications.

Advance Professional Communication (HS) (25M31HS2111) (2 CREDITS)

Strategic business communication, Technical writing and documentation, Research writing and citation styles, Advanced presentation skills with data visualization, Group discussions and leadership communication, Cross-cultural communication in global IT teams, Negotiation and conflict resolution, Email and virtual communication etiquette, Project proposal writing, Report writing and executive summaries, Communication in agile and collaborative environments, Interview strategies for technical roles, LinkedIn and digital professional presence, Resume and portfolio building for IT careers, Case studies and role plays in workplace scenarios.

Software Engineering Lab (24M15CA211) (1 CREDITS)

Theoretical software engineering principles to practical scenarios through hands-on projects and exercises. Software requirements analysis, design methodologies, implementation techniques, testing strategies, and project management. Software Development Tools, Emerging trends and technologies in software engineering.

Web Technology (Full-Stack Development) Lab (24M15CA212) (2 CREDITS)

Building dynamic and interactive web applications, client-side and server-side technologies, develop comprehensive full-stack web solutions, Develop proficiency in creating static and dynamic web pages using

HTML, CSS, and JavaScript, server-side scripting and database interactions using languages such as PHP or frameworks like Ruby on Rails, Implement form validation, session management, and other essential web functionalities, Design and manage databases to support dynamic content and user interactions.

FOURTH SEMESTER

Project Work – (Major) (24M17CA211) (20 CREDITS)