

Thakur Institute of Management Studies, Career Development & Research, Mumbai

(Autonomous Institute Affiliated to University of Mumbai, Approved by AICTE and
Government. of Maharashtra)

ISO 20001:2018 Certified

Accredited by National Board of Accreditation

Accredited with A+ Grade by National Assessment and Accreditation Council,



Integrated Master of Computer Applications (MCA)

Choice Based Credit System with Multiple Entry and Multiple Exit Option

First Year with Effect from AY 2025-26 (Sem. I)

SYLLABUS SEM I

Under

FACULTY OF SCIENCE & TECHNOLOGY

(As per AICTE, NEP 2020 & Government of Maharashtra Guidelines with effect from the
Academic Year 2025-26)

Preamble

In response to the growing demand for industry-ready professionals equipped with a strong foundation in computing and applications, the Integrated Master of Computer Applications (MCA) program is designed to provide a seamless academic pathway combining undergraduate and postgraduate studies in computer science and information technology.

As an autonomous institute, we leverage academic flexibility, industry collaboration, and curriculum innovation to prepare students for dynamic roles in the tech ecosystem. The Integrated MCA program blends fundamental knowledge, advanced computing concepts, and practical exposure through projects, internships, and hands-on laboratory work.

The curriculum is structured to foster analytical thinking, problem-solving abilities, software development skills, and ethical professional conduct, aligned with the needs of the global IT industry. Emphasis is also placed on interdisciplinary learning, research orientation, and entrepreneurial capabilities.

This program aspires to create competent computing professionals who can contribute meaningfully to societal and technological advancement while upholding the values of lifelong learning, innovation, and leadership.

State-of-art infrastructure and highly competent faculty members backed by highly energetic administration creates perfect conducive environment for teaching-learning process. The mission of the patrons and top management to disseminate knowledge and create responsible citizens in fast-paced developing India, propels all the staff to give their best to accomplish the mission.

Integrated MCA (5 years Master of Computer Applications program)

The Integrated MCA (Master of Computer Applications) is a comprehensive 5-year program designed for students who have completed their 10+2 education and are looking to build a strong foundation in computer science, software development, and IT management. This program combines the undergraduate and postgraduate curriculum into a streamlined and focused academic journey, eliminating the need for separate entrance procedures for a master's degree.

Program Highlights

- **Duration:** 5 Years (10 Semesters)
- **Eligibility:** 10+2 in any stream
- **Degree Awarded:** After 5 years successful completion - MCA (Master of Computer Applications)
- **Curriculum:** A blend of theory, practical, projects, and industry exposure

Benefits of Integrated MCA

- **Early Specialization:** Start your IT career path right after high school.
- **Industry-Aligned Curriculum:** Courses are regularly updated in line with current tech trends like AI, Data Science, Cybersecurity, Cloud Computing, and more.
- **Cost and Time Efficient:** One continuous program reduces the time and cost of pursuing separate degrees.
- **Internships & Projects:** Hands-on training through real-world projects and internships in leading IT firms.
- **Career-Ready Graduates:** Equips students with skills in software development, database management, system design, mobile and web applications, and more.

| Course Code | | Course Name | | | |
|--|---------------------------|---|---------------------------|-----------|---------------|
| CC103 | | Mathematics Foundation to Computer Science - II | | | |
| Teaching Scheme: Contact Hours (Per Week) | | | Credits Assigned | | |
| Theory | Tutorial | Total | Theory | Tutorial | Total |
| 3 | - | 3 | 3 | - | 3 |
| Examination Scheme (Marks) | | | | | |
| In Sem Assessment (ISA) | | | End Sem Examination (ESE) | Term Work | Total (Marks) |
| Continuous Assessment (CA) | Mid Sem Examination (MSE) | ISA (CA+MSE) | | | |
| 25 | 25 | 50 | 50 | - | 100 |

Prerequisite: Basic Mathematics and Programming Logic

Course Objectives: Course aim at

| Sr. No. | Course Objective |
|---------|---|
| 1 | To understand logical reasoning, methods of proof, and foundational mathematical principles. |
| 2 | To gain familiarity with algebraic structures essential for abstract thinking in data science. |
| 3 | To develop problem-solving skills using numerical methods for interpolation, integration, and equation solving. |
| 4 | To apply optimization and operational research techniques to practical data science problems. |

Course Outcomes (CO): On successful completion of the course, the learner/student will be able to

| Sr.No. | Course Outcome | Bloom Level |
|--------|---|-------------|
| CO1 | Apply logical reasoning and proof techniques to solve computational and abstract problems. | Apply |
| CO2 | Analyze algebraic structures to understand group theory applications in data science. | Analyze |
| CO3 | Implement numerical methods for solving equations, interpolation, and integration in data science applications. | Apply |

| | | |
|------------|--|-------|
| CO4 | Solve optimization problems using linear programming, transportation, and assignment models. | Apply |
|------------|--|-------|

COPO Mapping

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|
| CO1 | 3 | 2 | – | 2 | – | – | – | 2 |
| CO2 | 3 | 2 | – | – | – | – | – | – |
| CO3 | 3 | 2 | 2 | 3 | – | – | – | 2 |
| CO4 | 3 | 3 | 3 | 2 | – | 3 | – | 2 |

Course Contents:

| Module No. | Detailed Contents | Hrs. | CO No. | Ref No. |
|------------|--|------|--------|---------|
| 1 | Logic and Methods of Proofs: Propositions, logical operations (basic connectives), compound statements, construction of truth table, quantifiers, conditional statements, tautology, contradiction, contingency, logical equivalence. Conjunctive Normal Forms (CNF) and Disjunctive Normal Forms (DNF). Methods of proofs: Rules of inference for propositional logic, modus ponens, modus tollens, syllogism, proof by contradiction, and Mathematical Induction. | 8 | 1 | 1,4,5 |
| 2 | Algebraic Structures: Semi-group, Monoid, Group, Subgroup, Cyclic group. | 6 | 2 | 1,4 |
| 3 | Numerical Methods: Concept and importance of errors in numerical methods. Solution of algebraic and transcendental equations: Bisection method and Newton-Raphson methods. Numerical Interpolation: Newton's Forward and Newton's Backward interpolation formula and Lagrange's formula. Numerical Integration: Trapezoidal rule and Simpson's 1/3 rule Only formula and problem solving for all the topics mentioned above. | 6 | 3 | 2 |

| Module No. | Detailed Contents | Hrs. | CO No. | Ref No. |
|------------|--|------|--------|---------|
| 4 | Optimization Techniques: Linear programming: Introduction, LP formulation, Graphical method for solving LPs with two variables, Special cases in graphical methods, Simplex method, Duality. | 8 | 4 | 3,6,7 |
| 5 | Transportation problem: Definition, Linear form, North-west corner method, Least cost method, Vogel's approximation method for finding feasible solution, MODI method for finding optimum solution. | 6 | 4 | 3,7 |
| 6 | Assignment problem: Definition, solving assignment problem using hungarian method | 6 | 4 | 3,7 |

Reference Books:

| Reference No | Reference Name |
|--------------|---|
| 1 | Kolman B., Busby R. and Ross S., Discrete Mathematical Structures, 6th Edition, Pearson Education, 2015. |
| 2 | Sastry S. S., Introductory Methods of Numerical Analysis, Fifth Edition, PHL, 2022. |
| 3 | Taha Hamdy A., Operations Research: An Introduction, Eighth Edition, Pearson Prentice Hall, 2003. |
| 4 | S.B. Singh, Discrete Structures, Khanna Book Publishing, 2023 (AICTE Recommended Textbook) |
| 5 | Rosen Kenneth H. and Krithivasan Kamala, Discrete Mathematics and its Applications, McGraw Hill, India, 2019. |
| 6 | Chakravorty J. G. and Ghosh P. R., Linear Programming and Game Theory, Moulik Library, 2017. |
| 7 | Sharma J. K., Operations Research: Theory and Applications, Fourth Edition, Macmillan Publishers, 2007. |

Web References:

| Reference No | Reference Name |
|--------------|---|
| 1 | https://nptel.ac.in/courses/111107127 |
| 2 | https://www.math.iitb.ac.in/~siva/si50716/SI507lecturenotes.pdf |

| Course Code | | Course Name | | | |
|--|----------|----------------------------|-------------------------|--------------|---------------|
| CC105 | | Database Management system | | | |
| Teaching Scheme: Contact Hours (Per Week) | | | Credits Assigned | | |
| Theory | Tutorial | Total | Theory | Tutorial | Total |
| 3 | - | 3 | 3 | - | 3 |
| Examination Scheme (Marks) | | | | | |
| In Semester Assessment (ISA) | | | End Sem. Examination | Term Work | Total (Marks) |
| Continuous Assessment (CA) | MSE | Total (ISA) (CA + MSE) | | | |
| 25 | 25 | 50 | 50 | - | 100 |

Prerequisite: NA

Course Objectives: Course aim to

| Sr. No. | Course Objective |
|---------|---|
| 1 | Explain fundamental database concepts, architectures, data models, and ER/EER modeling for effective data management. |
| 2 | Design and optimize relational schemas using relational algebra, normalization, and functional dependency concepts. |
| 3 | Apply techniques of query processing, indexing, concurrency control, and recovery to ensure efficient and reliable database operations. |
| 4 | Analyze and evaluate advanced and emerging database technologies such as distributed, object-oriented, NoSQL, and multimedia databases. |

Course Outcomes (CO): On successful completion of course learner/student will be able to

| Sr. No. | Course Outcome | Bloom Level |
|---------|---|---------------|
| CO1 | Explain database concepts, models, and ER/EER design. | Understand |
| CO2 | Design relational schemas using algebra and normalization. | Apply/Analyze |
| CO3 | Apply query processing, indexing, concurrency, and recovery techniques. | Apply/Analyze |
| CO4 | Explore emerging database technologies and applications. | Evaluate |

CO PO Mapping:

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| CO1 | 3 | 3 | 3 | - | - | - | - | - |
| CO2 | 3 | 3 | 3 | - | - | - | - | - |
| CO3 | 3 | 3 | 3 | - | - | - | - | - |
| CO4 | 3 | 3 | 3 | - | - | - | - | - |

Course Contents:

| Module No. | Detailed Contents | Hrs. | CO No. | Ref No. |
|------------|--|------|--------|---------|
| 1 | <p>Module 1: Introduction To Database System:</p> <p>Introduction to Databases: Definition of Data, Database, and DBMS, Overview of Database Applications, Advantages and Disadvantages of DBMS, Roles of Database Users and Administrators Data Models: Introduction to Data Models, Types of Data Models (Hierarchical, Network, Relational, Object-oriented), Importance of Data Models in DBMS Database Design:Keys: Primary Key, Candidate Key, Super Key, Foreign Key, Composite Key, Alternate Key, Unique Key, Surrogate Key,Constraints in a table: Primary Key, Foreign Key,Unique Key, NOT NULL, CHECK, Entity-Relationship (ER) Model,Entities and Entity Sets, Attributes and Relationships,ER Diagrams,Key Constraints and Weak Entity Sets, Extended ER Features,Introduction to the Relational Model and Relational Schema</p> <p>Self-Learn Topic : Advantages of DBMS over File System</p> | 08 | 1 | 1,2 |
| 2 | <p>Module 2: Relational Database Concept and Design:</p> <p>Relational Algebra and Calculus: Introduction to Relational Algebra, Operations: Selection, Projection, Set Operations, Join Operations, Division,Tuple and Domain Relational Calculus Structured Query Language (SQL): SQL Basics: DDL and DML, Aggregate Functions (Min(), Max(), Sum(), Avg(), Count()), Logical operators (AND, OR, NOT), Predicates (Like, Between, Alias, Distinct), Clauses(Group By, Having, Order by, top/limit), Inner Join, Natural Join, Full Outer Join, Left Outer Join, Right outer Join, Equi Join Advanced SQL: Analytical queries, Hierarchical queries, Recursive queries, Views, Cursors, Stored Procedures and Functions, Packages, Triggers, Dynamic SQL Normalization and Database Design: Functional Dependencies: Armstrong's</p> | 08 | 1,2 | 1,2 |

| | | | | |
|---|--|----|---|-----|
| | <p>Axioms, Definition, Properties (Reflexivity, Augmentation, Transitivity), Types (Trivial, Non-Trivial, Partial and Full Functional Dependency), Closure of Functional Dependencies, Normal Forms (1NF, 2NF, 3NF, BCNF), Denormalization.</p> <p>Self-Learn Topic : Entity-Relationship to Relational Mapping (Case Study).</p> | | | |
| 3 | <p>Module 3: Database storage and querying:</p> <p>Storage and Indexing: Data on External Storage, File Organizations and Indexing, Index Data Structures, Comparison of File Organizations, Indexes and Performance Tuning, Guidelines for Index Selection, Basic Examples of Index Selection</p> <p>Self-Learn Topic: Difference between Indexing and Hashing</p> | 06 | 3 | 1,2 |
| 4 | <p>Module 4: Transaction and Concurrency:</p> <p>Transaction Management: ACID Properties, Transactions and Schedules, Concurrent Execution of Transactions, Lock-Based Concurrency Control, Performance of Locking, 2PL, Serializability, and Recoverability, Introduction to Lock Management, Dealing with Deadlocks Database</p> <p>Self-Learn Topic : Real-world examples of multi-version concurrency control (MVCC).</p> | 06 | 3 | 2,3 |
| 5 | <p>Module 5: Recovery and Security: validation Recovery concepts, Shadow paging, Log Based Recovery, Elementary concepts of Database security: system failure, Backup and Recovery Techniques, authorization and authentication</p> <p>Self-Learn Topic : Database Failures in real-world incidents (e.g., airline booking failures).</p> | 06 | 3 | 4 |
| 6 | <p>Module 6 NoSQL Databases and Big Data: Introduction to NoSQL, Data Models: Document, Key value, Column family, Graph. Uses and Features of NO/SQL document databases. CAP theorem, BASE vs ACID, CRUD operations, MongoDB operators, Overview of Big Data Technologies: Hadoop, MongoDB, Cassandra. Database Security and Advanced Topics: Introduction to Database Security, Access Control, Discretionary Access Control, Introduction to Data Warehousing, OLAP, Data Mining .</p> <p>Self-Learn Topic : Comparative Study: SQL vs NoSQL performance in real-time applications</p> | 06 | 4 | 5 |

Reference Books:

| Reference No | Reference Name |
|--------------|--|
| 1 | Fundamentals of Database Systems – Ramez Elmasri & Shamkant B. Navathe, Pearson Education. <i>Covers: ER modeling, Relational Model, Relational Algebra, Normalization, Concurrency, Recovery, and Advanced Databases.</i> |
| 2 | Database System Concepts – Abraham Silberschatz, Henry F. Korth, and S. Sudarshan, McGraw Hill. <i>Covers: DBMS Architecture, Relational Concepts, Query Processing, Concurrency Control, Recovery, and Distributed Databases.</i> |
| 3 | Database Management Systems – Raghu Ramakrishnan & Johannes Gehrke, McGraw Hill. <i>Covers: Indexing & Hashing, Query Processing & Optimization, Transaction Management, Storage Management.</i> |
| 4 | An Introduction to Database Systems – C. J. Date, Pearson Education. <i>Covers: Relational Model, Functional Dependencies, Normalization Theory, Relational Algebra & Calculus.</i> |
| 5 | Principles of Distributed Database Systems – M. Tamer Özsu & Patrick Valduriez, Springer. <i>Covers: Distributed Databases, Client-Server Models, Advanced Database Trends.</i> |

Web References:

| Reference No | Reference Name |
|--------------|--|
| 1 | <input type="checkbox"/> Oracle Database Documentation 🔗 https://docs.oracle.com/en/database/ <i>Official documentation for relational concepts, SQL, indexing, security, recovery, and database architecture.</i> |
| 2 | <input type="checkbox"/> MySQL Reference Manual (Oracle/MySQL) 🔗 https://dev.mysql.com/doc/ <i>Detailed guide on relational model, joins, normalization, indexing, query processing, and transactions.</i> |
| 3 | <input type="checkbox"/> PostgreSQL Documentation 🔗 https://www.postgresql.org/docs/ <i>Covers relational design, query optimization, concurrency control, recovery, and advanced database features.</i> |
| 4 | <input type="checkbox"/> W3Schools SQL Tutorial 🔗 https://www.w3schools.com/sql/ <i>Beginner-friendly reference for relational concepts, queries, joins, normalization basics.</i> |
| 5 | <input type="checkbox"/> GeeksforGeeks – Database Management System (DBMS) 🔗 https://www.geeksforgeeks.org/dbms/ <i>Concepts explained simply: ER models, normalization, indexing, query processing, concurrency, recovery.</i> |
| | <input type="checkbox"/> TutorialsPoint DBMS 🔗 https://www.tutorialspoint.com/dbms/ <i>Comprehensive notes covering all DBMS modules with examples.</i> |

| Course Code | Course Name | | | | | |
|--------------------------|--------------------------------|----------------------------|-----------|------|-------|--|
| | Database Management System Lab | | | | | |
| Contact Hours (Per Week) | Credits Assigned | Examination Scheme (Marks) | | | | |
| | | Term Work | Practical | Oral | Total | |
| 2 | 1 | 50 | 30 | 20 | 100 | |

Examination Scheme (Marks)

Pre-requisite: Database management system

Lab Course Objectives: Course aim to

| Sr. No. | Course Objective |
|---------|--|
| 1 | To provide practical exposure to database design, implementation, and management. |
| 2 | To strengthen SQL programming skills through hands-on experiments. |
| 3 | To introduce database storage, indexing, transaction management, recovery, and security. |
| 4 | To explore NoSQL databases and Big Data technologies. |

Lab Course Outcomes (CO): On successful completion of course learner/student will be able to

| Sr. No. | Course Outcome | Bloom Level |
|---------|--|-------------|
| CO1 | Design ER models and convert them into relational schemas. | Evaluate |
| CO2 | Implement SQL queries using DDL, DML, joins, and constraints. | Evaluate |
| CO3 | Develop database solutions with PL/SQL, triggers, and functions. | Evaluate |
| CO4 | Apply NoSQL operations using MongoDB and explore Big Data tools. | Evaluate |

CO PO Mapping-

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| CO1 | 3 | 3 | 3 | 3 | - | - | - | - |
| CO2 | 3 | 3 | 3 | 3 | - | - | - | - |
| CO3 | 3 | 3 | 3 | 3 | - | - | - | - |

| | | | | | | | | |
|-----|---|---|---|---|---|---|---|---|
| CO4 | 3 | 3 | 3 | 3 | - | - | - | - |
|-----|---|---|---|---|---|---|---|---|

Course Contents:

| Module No. | Detailed Contents | Hrs. | CO No. | Ref No. |
|------------|--|------|--------|---------|
| 1 | <p>Module 1: Introduction to Database System & ER Modeling</p> <ul style="list-style-type: none"> • Installation and setup of DBMS (MySQL/Oracle/PostgreSQL). • Creating databases, tables, and applying constraints. • Designing ER diagrams and mapping to relational schemas. <p>Self-Learning Topics: Design an ER diagram for a <i>Library Management System</i> and convert it into relational tables.</p> | 3 | 1 | 1 |
| 2 | <p>Module 2: Relational Database Concepts & SQL</p> <ul style="list-style-type: none"> • Implementation of DDL and DML queries. • Aggregate functions, predicates, and clauses. • Joins (Inner, Outer, Natural, Equi). • Views, Cursors, Stored Procedures, Functions, Triggers. • Normalization up to BCNF with examples. <p>Self-Learning Topic: Write SQL queries using GROUP BY and HAVING clauses for sales or student database.</p> | 2 | 2 | 2 |
| 3 | <p>Module 3: Database Storage & Indexing</p> <ul style="list-style-type: none"> • Demonstration of file organizations. • Creating clustered and non-clustered indexes. • Query execution plan analysis with and without indexes. <p>Self-Learning Topic: Compare query performance using Indexing vs No Indexing on a large dataset.</p> | 3 | 3 | 2 |
| 4 | <p>Module 4: Transaction Management & Concurrency Control</p> <ul style="list-style-type: none"> • Implementation of transactions with COMMIT and ROLLBACK. • Demonstration of ACID properties. • Simulation of concurrency problems (Lost Update, Dirty Read, Phantom Read). • Implementing isolation levels. <p>Self-Learning Topic: Implement Concurrent Transactions and check serializability using SQL scripts</p> | 2 | 3 | 3 |
| 5 | <p>Module 5: Recovery & Security</p> | 2 | 3 | 4 |

| Module No. | Detailed Contents | Hrs. | CO No. | Ref No. |
|------------|--|------|--------|---------|
| | <ul style="list-style-type: none"> • Backup and restore operations. • Log-based recovery and shadow paging concepts. • User management, authorization, and authentication. • Role-based and discretionary access control. <p>Self-Learning Topic: simulate a system crash and restore data using backup/recovery methods.</p> | | | |
| 6 | <p>Module 6: NoSQL Databases & Big Data</p> <ul style="list-style-type: none"> • Installation and use of MongoDB. • Performing CRUD operations in MongoDB. • MongoDB queries using operators. • Overview of Cassandra and Hadoop (HDFS exploration). <p>Self-Learning Topic: Create a MongoDB collection for a shopping cart system and perform aggregation queries.</p> | 2 | 4 | 5 |

Reference Books:

| Reference No | Reference Name |
|--------------|---|
| 1 | Abraham Silberschatz, Henry F. Korth, S. Sudarshan – <i>Database System Concepts</i> , 7th Edition, McGraw Hill. |
| 2 | Raghu Ramakrishnan, Johannes Gehrke – <i>Database Management Systems</i> , 3rd Edition, McGraw Hill. |
| 3 | Ramez Elmasri, Shamkant B. Navathe – <i>Fundamentals of Database Systems</i> , 7th Edition, Pearson. |
| 4 | Ivan Bayross – <i>SQL, PL/SQL: The Programming Language of Oracle</i> , BPB Publications. |
| 5 | Kristina Chodorow – <i>MongoDB: The Definitive Guide</i> , O'Reilly. |

Web References:

| Reference No | Reference Name |
|--------------|--|
| 1 | W3Schools – SQL Tutorial https://www.w3schools.com/sql/ (SQL basics, queries, joins, constraints, aggregation with examples) |
| 2 | TutorialsPoint – DBMS Tutorial https://www.tutorialspoint.com/dbms/index.htm (Covers DBMS concepts, ER modeling, normalization, indexing, transactions) |
| 3 | GeeksforGeeks – DBMS, SQL, PL/SQL https://www.geeksforgeeks.org/dbms/ |

| | |
|---|--|
| | <i>(Comprehensive notes & practice questions on DBMS, normalization, concurrency control, recovery, SQL queries)</i> |
| 4 | Oracle PL/SQL Documentation https://docs.oracle.com/en/database/oracle/oracle-database/19/lnpls/index.html <i>(Reference for PL/SQL programming, cursors, triggers, procedures, functions)</i> |
| 5 | MongoDB Official Documentation https://www.mongodb.com/docs/ <i>(CRUD operations, aggregation pipeline, operators, indexing, NoSQL data modeling)</i> |
| 6 | Hadoop Official Documentation (Apache) https://hadoop.apache.org/ <i>(Overview of Big Data ecosystem and Hadoop components)</i> |
| 7 | IBM Developer – Database Security https://developer.ibm.com/articles/database-security-basics/ <i>(Covers basics of database security, access control, authorization & authentication)</i> |

Suggested list of experiments:

| Practical No | Problem Statement |
|--------------|--|
| 1 | Draw an ER Diagram for Registrar’s Office and convert it into relational tables. |
| 2 | Draw an ER Diagram for Hospital Management System and convert it into relational tables. |
| 3 | Create tables (Supplier, Part, Supplies) with appropriate constraints (PK, FK, UNIQUE, CHECK, DEFAULT). |
| 4 | Insert at least 10 records into Supplier, Part, and Supplies tables and display the contents. |
| 5 | Queries using DML & operators: selection, projection, LIKE, BETWEEN, IN, AND/OR. |
| 6 | Aggregation & grouping queries: MIN, MAX, AVG, COUNT with GROUP BY, HAVING, ORDER BY. |
| 7 | Perform Join operations: Inner Join, Natural Join, Outer Joins. |
| 8 | Set operations: UNION, INTERSECT, MINUS, Cartesian Product. |
| 9 | Demonstrate TCL Commands: Commit, Rollback, and Savepoints. |
| 10 | Analytical/recursive query: Find the Nth highest salary using SQL. |
| 11 | PL/SQL program: Fibonacci series (loop & condition control). |
| 12 | Cursor program: Display supplier details and count suppliers. |
| 13 | Trigger: Write an AFTER UPDATE trigger on Supplier table. |
| 14 | MongoDB CRUD Operations: Create collection, insert documents, query, update, delete, and sort. |

| Course Code | | Course Name | | | |
|--|----------|-------------------------|-------------------------|--------------|------------------|
| CC105 | | Operating Systems | | | |
| Teaching Scheme: Contact Hours (Per Week) | | | Credits Assigned | | |
| Theory | Tutorial | Total | Theory | Tutorial | Total |
| 3 | 1 | 4 | 3 | 1 | 4 |
| Examination Scheme (Marks) | | | | | |
| Internal Assessment (IA) | | | End Sem. Examination | Term Work | Total (Marks) |
| Continuous Assessment CA) | Test | Total (IA) (CA+Test) | | | |
| 25 | 25 | 50 | 50 | 25 | 125 |

Prerequisite:

- Computer Organization, Data structure

Course Objectives: Course aim at

| Sr. No. | Course Objective |
|---------|--|
| 1 | Providing foundational knowledge of operating system concepts, structures, services, and types. |
| 2 | Introducing students to process management, including process scheduling, multithreading, and synchronization. |
| 3 | Enabling understanding of memory management techniques, virtual memory, and performance implications. |
| 4 | Developing the ability to analyze and implement I/O and storage management mechanisms including disk scheduling. |

Course Outcomes (CO): On successful completion of course learner/student will be able to

| Sr.No. | Course Outcome | Bloom Level |
|--------|---|--------------------|
| CO1 | Explain the structure, services, and various types of operating systems. | Explain, Describe |
| CO2 | Analyze and compare various CPU scheduling and process synchronization algorithms. | Analyze, Compare |
| CO3 | Apply memory management strategies like paging, segmentation, and virtual memory to optimize performance. | Apply, Demonstrate |

| | | |
|------------|--|---------------------|
| CO4 | Evaluate and implement I/O and storage management techniques such as disk scheduling algorithms. | Evaluate, Implement |
|------------|--|---------------------|

COPO Mapping

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|
| CO1 | 3 | 2 | 1 | 2 | - | - | - | 2 |
| CO2 | 3 | 3 | 2 | 2 | 3 | - | - | 2 |
| CO3 | 3 | 3 | 2 | 3 | - | - | - | 2 |
| CO4 | 3 | 2 | 2 | 3 | - | - | - | 2 |

Course Contents:

| Module No. | Detailed Contents | Hrs. | CO No. | Ref No. |
|------------|---|------|--------|---------|
| 1 | Operating Systems Overview: Definition, Components & Services of OS, Structure, Architecture, types of Operating Systems, Batch Systems, Concepts of Multiprogramming and Time Sharing, Parallel, Distributed and Real time Systems. | 8 | 1 | 1,2 |
| 2 | Operating Systems Structures: Operating system services and systems calls, system programs, operating system structure, operating systems generations. | 6 | 2 | 1,3 |
| 3 | Process Management: Process Definition, Process states, Process State transitions, Process Scheduling, Process Control Block, Threads, Concept of multithreads, Benefits of threads, Types of threads. Process Scheduling: Definition, Scheduling objectives, Scheduling algorithms, CPU scheduling Preemptive and Non-preemptive Scheduling algorithms (FCFS, SJF and RR), Performance evaluation of the scheduling Algorithms. | 8 | 3 | 1,2,3 |
| 4 | Process Synchronization: Introduction, Inter-process Communication, Race Conditions, Critical Section Problem, Mutual Exclusion, Semaphores, Monitors. Deadlocks: System model, deadlock characterization, deadlock prevention, avoidance, Banker's algorithm, Deadlock detection, and recovery from deadlocks. | 6 | 3 | 1,2,3 |

| Module No. | Detailed Contents | Hrs. | CO No. | Ref No. |
|------------|---|------|--------|---------|
| 5 | Memory Management: Logical and Physical address map, Swapping, Memory allocation, MFT, MVT, Internal and External fragmentation and Compaction, Paging, Segmentation. | 6 | 4 | 1,2,3 |
| 6 | Virtual Memory and I/O Management Virtual Memory: Demand paging, Page Replacement algorithms, Allocation of frames, thrashing. I/O Management: I/O Hardware, Disk structure, Disk scheduling algorithms. | 6 | 4 | 1,2,3 |

Reference Books:

| Reference No | Reference Name |
|--------------|--|
| 1 | Abraham Silberschatz, Peter Baer Galvin, Greg Gagne (2006), Operating System Principles, 7th edition OR Later edition, Wiley India Private Limited, New Delhi. |
| 2 | Stallings (2006), Operating Systems, Internals and Design Principles, 5th edition, Pearson Education, India. |
| 3 | Andrew S Tanenbaum, Modern Operating Systems, Third Edition, Prentice Hall India. |
| 4 | Ekta Walia, Operating Systems Concepts, Khanna Publishing House, 2022 (AICTE Recommended Textbook) |
| 5 | Sumitabha Das, UNIX Concepts and Applications, 4th Edition, Tata McGraw-Hill. |

Web References:

| Reference No | Reference Name |
|--------------|---|
| 1 | https://onlinecourses.nptel.ac.in/noc23_cs101/preview?utm_source=chatgpt.com |
| 2 | https://onlinecourses.nptel.ac.in/noc24_cs108/preview?utm_source=chatgpt.com |
| 3 | https://onlinecourses.nptel.ac.in/noc20_cs04/preview?utm_source=chatgpt.com |

| Course Code | Course Name |
|-------------|----------------------|
| CC106L | Operating System Lab |

| Contact Hours (Per Week) | Credits Assigned | Examination Scheme (Marks) | | | |
|-----------------------------|---------------------|----------------------------|-----------|------|-------|
| | | Term Work | Practical | Oral | Total |
| 2 | 1 | 50 | 30 | 20 | 100 |

Prerequisite: Basic knowledge of Computer Organization, Data structure concepts

- **Lab Course Objectives:** Course aim to

| Sr. No. | Course Objective |
|---------|--|
| 1 | Understand core operating system concepts through hands-on experience. |
| 2 | Develop skills to work with system calls, process and memory management. |
| 3 | Compare OS-level operations across Linux, Windows, Android, and iOS. |
| 4 | Apply security and resource management techniques in real-time environments. |

Lab Course Outcomes (CO): On successful completion of course learner/student will be able to

| Sr. No. | Course Outcome | Bloom Level |
|---------|---|-------------|
| CO1 | Demonstrate Linux command-line operations and scripting for OS-level tasks. | Apply |
| CO2 | Illustrate process and memory management using system calls in Linux and Windows. | Analyze |
| CO3 | Compare system security and user management across different OS platforms. | Analyze |
| CO4 | Evaluate mobile OS behavior through Android and iOS simulation tools. | Evaluate |

COPO Mapping

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| CO1 | 3 | - | - | 3 | 3 | - | - | - |
| CO2 | 3 | 3 | 3 | 3 | 3 | - | - | 3 |
| CO3 | - | - | - | - | - | - | 3 | - |
| CO4 | - | - | 3 | 3 | - | - | - | 3 |

Assessment:

Term Work: Will be based on Continuous Assessment

- Laboratory work will be based on the syllabus with a minimum of 10 experiments. The experiments should be completed in the allotted time duration.
 - Experiments 20 marks
 - Attendance 5 marks
- Practical will be evaluated by the subject teacher and documented according to a rubric

End Semester Practical Examination:

Practical and oral examination will be based on the suggested practical list and entire syllabus.

Reference Books:

| Reference No | Reference Name |
|--------------|---|
| 1 | Silberschatz, A., Galvin, P. B., & Gagne, G. – Operating System Concepts, Wiley. |
| 2 | Love, R. – Linux System Programming, O'Reilly. |
| 3 | Andrew S Tanenbaum, Modern Operating Systems, Third Edition, Prentice Hall India. |
| 4 | Russinovich, M. – Windows Internals, Microsoft Press. |
| 5 | Meier, R. – Professional Android, Wrox. |
| 6 | Apple Developer Documentation – iOS Security Guide. |

Web References:

| Reference No | Reference Name |
|--------------|---|
| 1 | https://onlinecourses.nptel.ac.in/noc21_cs72/ |
| 2 | https://onlinecourses.nptel.ac.in/noc24_cs108/ |
| 3 | https://archive.nptel.ac.in/courses/117/106/117106113/ |
| 4 | https://onlinecourses.nptel.ac.in/noc25_cs78/ |

Suggested list of experiments:

| Practical No | Problem Statement | Hrs |
|--------------|--|-----|
| 1 | Shell, Redirection, Processes Introduction to Linux: Shell commands, process handling, piping, redirection | 2 |
| 2 | Bash scripting, I/O, File permissions Bash scripting for automation: conditionals, loops, and file operations | 2 |

| | | |
|----|---|---|
| 3 | System Calls, Process Management, IPC Process creation using fork(), exec() and IPC using pipes | 3 |
| 4 | Multithreading, Synchronization, Mutex Thread creation and synchronization using Pthreads | 3 |
| 5 | File Systems, File Descriptors, Buffering File system exploration using system calls (open(), read(), write()) | 2 |
| 6 | Paging, Page Faults, LRU/FIFO Simulation Virtual memory simulation: Page replacement algorithms in C | 3 |
| 7 | WinAPI, Threads, Process Priority Windows Process and Thread Management using WinAPI | 3 |
| 8 | Registry, Group Policy, User Roles Windows Registry and Security Policy Management | 2 |
| 9 | Permissions, Lifecycle, Intent Android OS internals: Manifest structure, permissions, and lifecycle (via emulator) | 3 |
| 10 | App Sandbox, File Access, Permission Handling iOS App sandboxing and resource restrictions (via Xcode simulator) | 3 |

| Course Code | Course Name |
|-------------|--|
| SEC102 | Object Oriented Programming using Java |

| Teaching Scheme: Contact Hours (Per Week) | | | Credits Assigned | | |
|--|----------|-------------------------|-------------------------|--------------|------------------|
| Theory | Tutorial | Total | Theory | Tutorial | Total |
| 3 | - | 3 | 3 | - | 3 |
| Examination Scheme (Marks) | | | | | |
| Internal Assessment (IA) | | | End Sem. Examination | Term Work | Total (Marks) |
| Continuous Assessment CA) | Test | Total (IA) (CA+Test) | | | |
| 25 | 25 | 50 | 50 | - | 100 |

Prerequisite:

Basic understanding of programming concepts, logic building, and fundamental knowledge of C or C++

Course Objectives: Course aim at

| Sr. No. | Course Objective |
|---------|---|
| 1 | To understand OOP concepts and Java, including its evolution and real-world applications. |
| 2 | To analyze Java features, program structure, and control structures. |
| 3 | To apply OOP principles using classes, objects, inheritance, and exception handling. |
| 4 | To explore advanced Java concepts like packages for real-world applications. |

Course Outcomes (CO): On successful completion of course learner/student will be able to

| Sr.No. | Course Outcome | Bloom Level |
|--------|---|-------------|
| CO1 | Understand fundamental OOP concepts and Java. | Understand |
| CO2 | Analyze Java language features, data types, and control structures. | Apply |
| CO3 | Apply OOP principles using Java classes and methods. | Create |
| CO4 | Analyze and apply exception handling, packages, and advanced Java concepts. | Apply |

COPO Mapping

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| CO1 | 3 | 3 | 3 | 3 | - | - | - | - |
| CO2 | 3 | 3 | 3 | 3 | - | - | - | - |
| CO3 | 3 | 3 | 3 | 3 | - | - | - | - |
| CO4 | 3 | 3 | 3 | 3 | - | - | - | - |

Course Contents:

| Module No. | Detailed Contents | Hrs. | CO No. | Ref No. |
|------------|--|------|--------|-----------|
| 1 | <p>Module 1: Fundamentals of Object-Oriented Programming Basic Concepts of Object-Oriented Programming (OOP), Benefits and Applications of OOP, Java Evolution, Features of Java, Difference between Java, C, and C++, Java and the Internet, Java Environment.</p> <p>Self-Learning: Latest advancements in Java and OOP applications in real-world scenarios.</p> | 4 | 1 | 1,2,3,5 |
| 2 | <p>Module 2: Java Language Basics Introduction to a Simple Java Program, Use of Comments and Math Functions, Application of Two Classes, Java Program Structure, Java Tokens and Statements, Implementing Java Program and JVM, Command Line Arguments.</p> <p>Self-Learning: Best coding practices in Java programming.</p> | 6 | 2 | 1,2,3,5,6 |
| 3 | <p>Module 3: Data Types, Operators, and Control Structures Constants, Variables, and Data Types, Declaration of Variables and Assigning Values, Symbolic Constants and Typecasting, Operators in Java including Arithmetic, Relational, Logical, Assignment, Increment/Decrement, Conditional, Bitwise, Arithmetic Expressions and Evaluation, Type Conversions and Operator Precedence, Decision Making and Branching including If-Else and Switch, Looping using For, While,</p> | 6 | 2 | 1,2,3,4,6 |

| Module No. | Detailed Contents | Hrs. | CO No. | Ref No. |
|------------|---|-----------|----------|------------------|
| | Do-While, Jump Statements including Break, Continue, Return, and Labeled Loops. Self-Learning: Performance optimization in Java loops and expressions. | | | |
| 4 | Module 4: Classes, Objects, and Inheritance Defining Classes and Creating Objects, Method Declaration and Calling Methods, Constructors and Method Overloading, Overriding Methods, Inheritance including Defining and Extending Classes, Implementing Interfaces, Multiple Inheritance, and Polymorphism. Self-Learning: Real-world applications of inheritance and polymorphism in Java. | 8 | 3 | 1,2,3,5, |
| 5 | Module 5: Arrays, Strings, and Exception Handling Arrays including 1D and 2D Arrays, Creating and Using Arrays, Strings including String Class and String Methods, Vectors and Wrapper Classes, Enumerated Types, Exception Handling including try, catch, throw, throws, and finally, Nested Try Blocks and Multiple Catch Statements, Creating User-Defined Exceptions. Self-Learning: Debugging and handling runtime errors effectively in Java. | 10 | 4 | 1,2,3,4,5 |
| 6 | Module 6: Packages and Advanced Java Concepts Basics of Packages, System Packages, Creating and Accessing User-Defined Packages, Adding Classes to a Package, Introduction to Advanced Java Concepts, Case Studies on Java Applications. Self-Learning: Exploring Java frameworks like Spring and Hibernate. | 6 | 4 | 1,2,3,5,6 |

Reference Books:

| Reference No | Reference Name |
|--------------|---|
| 1 | Balaguruswamy E. (2023). Programming with JAVA: A Primer. 7th edition. India: McGraw Hill Education |
| 2 | Schildt, H. (2022). Java: The Complete Reference. 12th edition. McGraw-Hill Education. |

| | |
|---|--|
| 3 | Y. Daniel Liang, Introduction to Java Programming, 7th Edition, Pearson,2008. |
| 4 | Arunesh Goyal, The Essentials of JAVA, Khanna Book Publishing Company Private Limited, 2012. |
| 5 | Tanweer Alam, Core JAVA, Khanna Book Publishing Company Private Limited, 2015. |
| 6 | S. Malhotra and S. Choudhary, Programming in Java, 2nd Edition, Oxford University Press, 2014. |

Web References:

| Reference No | Reference Name |
|--------------|---|
| 1 | https://www.w3schools.com/java/ . |
| 2 | http://www.java2s.com/ . |
| 3 | https://onlinecourses.nptel.ac.in/noc22_cs47/preview |

| Course Code | Course Name |
|-------------|-------------|
|-------------|-------------|

| | | | | | |
|-------------------------------------|---|-----------------------------------|------------------|------------------|--------------|
| SEC102 | Object Oriented Programming using Java LAB | | | | |
| Contact Hours (Per Week) | Credits Assigned | Examination Scheme (Marks) | | | |
| | | Term Work | Practical | Ora l | Total |
| 2 | 1 | 50 | 30 | 20 | 100 |

Prerequisite: Basic understanding of programming concepts, logic building, and fundamental knowledge of C or C++

- **Lab Course Objectives:** Course aim to

| Sr. No. | Course Objective |
|----------|---|
| 1 | To provide hands-on experience with OOP concepts and Java, including its evolution and practical applications in lab exercises. |
| 2 | To analyze and implement Java features, program structure, and control structures through coding assignments and experiments. |
| 3 | To apply OOP principles by working with classes, objects, inheritance, and exception handling. |
| 4 | To analyze case studies on Java applications, highlighting the use of packages and advanced features in real-world scenarios. |

Lab Course Outcomes (CO): On successful completion of course learner/student will be able to

| Sr. No. | Course Outcome | Bloom Level |
|------------|--|----------------------|
| CO1 | Understand OOP concepts and Java, including its evolution, and apply them in lab exercises through practical coding tasks. | Understand and Apply |
| CO2 | Implement Java features, program structure, and control structures by solving coding assignments and experiments. | Analyse |
| CO3 | Apply OOP principles, including the use of classes, objects, inheritance, and exception handling, in the development of Java applications. | Apply |
| CO4 | Analyze case studies and apply advanced Java concepts, including packages and other features. | Analyze |

Assessment:

Term Work: Will be based on Continuous Assessment

- Laboratory work will be based on the syllabus with a minimum of 10 experiments. The experiments should be completed in the allotted time duration.
 - Experiments 20 marks

- Attendance 5 marks
- Practical will be evaluated by the subject teacher and documented according to a rubric

End Semester Practical Examination:

Practical and oral examination will be based on the suggested practical list and entire syllabus.

Reference Books:

| Reference No | Reference Name |
|--------------|---|
| 1 | Balaguruswamy E. (2023). Programming with JAVA: A Primer. 7th edition. India: McGraw Hill Education |
| 2 | Schildt, H. (2022). Java: The Complete Reference. 12th edition. McGraw-Hill Education. |
| 3 | Y. Daniel Liang, Introduction to Java Programming, 7th Edition, Pearson, 2008. |
| 4 | Arunesh Goyal, The Essentials of JAVA, Khanna Book Publishing Company Private Limited, 2012. |
| 5 | Tanweer Alam, Core JAVA, Khanna Book Publishing Company Private Limited, 2015. |
| 6 | S. Malhotra and S. Choudhary, Programming in Java, 2nd Edition, Oxford University Press, 2014. |

Web References:

| Reference No | Reference Name |
|--------------|---|
| 1 | https://www.w3schools.com/java/ . |
| 2 | http://www.java2s.com/ . |
| 3 | https://onlinecourses.nptel.ac.in/noc22_cs47/preview |

| Course Code | Course Name |
|-------------|---------------------|
| VAC102 | Indian Constitution |

| Teaching Scheme: | | | Credits Assigned | | |
|-----------------------------------|-----------------|-----------------------------|-----------------------------|------------------|----------------------|
| Contact Hours (Per Week) 2 | | | | | |
| Theory | Tutorial | Total | Theory | Tutorial | Total |
| 2 | 0 | 2 | 2 | 0 | 2 |
| Examination Scheme (Marks) | | | | | |
| Internal Assessment (IA) | | | End Sem. Examination | Term Work | Total (Marks) |
| Continuous Assessment CA) | Test | Total (IA) (CA+Test) | | | |
| 25 | 25 | 50 | 50 | 0 | 100 |

Prerequisite:

Basic understanding of Indian history, political science, and governance structure.

Course Objectives: Course aim at

| Sr. No. | Course Objective |
|----------------|--|
| 1 | To understand the historical evolution and making of the Indian Constitution. |
| 2 | To analyze the structure and functioning of the Union and State governments. |
| 3 | To study the roles and responsibilities of local administration in India. |
| 4 | To comprehend the significance of the Election Commission and its functioning in Indian democracy. |

Course Outcomes (CO): On successful completion of course learner/student will be able to

| Sr.No. | Course Outcome | Bloom Level |
|---------------|---|--------------------|
| CO1 | Describe the history, structure, and interpretation of the Indian Constitution. | Understand |
| CO2 | Explain the roles and powers of the Union and State Governments. | Understand |
| CO3 | Analyze the functioning of local administration and governance. | Analyse |
| CO4 | Evaluate the significance of the Election Commission in democratic processes. | Evaluate |

COPO Mapping

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| CO1 | 3 | | | | | | 3 | 3 |
| CO2 | 3 | 3 | | | | | 3 | |
| CO3 | 3 | 3 | | | | | 3 | |
| CO4 | | 3 | | | | | 3 | |

Course Contents:

| Module No. | Detailed Contents | Hrs. | CO No. | Ref No. |
|------------|--|------|--------|---------|
| 1 | <p>Module 1: Introduction to the Indian Constitution The Constitution - Introduction, The History of the Making of the Indian Constitution, Preamble and the Basic Structure, and its interpretation, Fundamental Rights and Duties and their interpretation, State Policy Principles.</p> <p>Self-Learning: Contemporary debates on constitutional amendments and their impact.</p> | 8 | CO1 | 1 |
| 2 | <p>Module 2: Union Government Structure of the Indian Union, President – Role and Power, Prime Minister and Council of Ministers, Lok Sabha and Rajya Sabha.</p> <p>Self-Learning: Comparative analysis of presidential and parliamentary systems globally.</p> | 8 | CO2 | 2 |
| 3 | <p>Module 3: State Government Governor – Role and Power, Chief Minister and Council of Ministers, State Secretariat.</p> <p>Self-Learning: Case studies on state governance models and their effectiveness.</p> | 8 | CO2 | 2 |
| 4 | <p>Module 4: Local Administration District Administration, Municipal Corporation, Zila Panchayat.</p> <p>Self-Learning: Impact of Panchayati Raj system on rural development.</p> | 10 | CO3 | 3 |
| 5 | <p>Module 5: Election Commission</p> | 10 | CO4 | 3 |

| Module No. | Detailed Contents | Hrs. | CO No. | Ref No. |
|------------|---|------|--------|---------|
| | Role and Functioning, Chief Election Commissioner, State Election Commission. Self-Learning: Electoral reforms and challenges in Indian democracy. | | | |
| 6 | Module 6: Governance and Contemporary Issues Judicial Review and Judicial Activism, Role of Media in Governance, Right to Information (RTI) Act, E-Governance and Digital Initiatives in India. Self-Learning: Analysis of landmark judicial verdicts influencing governance. | 8 | CO4 | 1 |

Reference Books:

| Reference No | Reference Name |
|--------------|---|
| 1 | Ethics and Politics of the Indian Constitution by Rajeev Bhargava, Oxford University Press, New Delhi, 2008 |
| 2 | The Constitution of India by B.L. Fadia Sahitya Bhawan; New edition (2017) |
| 3 | Introduction to the Constitution of India by DD Basu Lexis Nexis; Twenty-Third, 2018 edition |

Web References:

| Reference No | Reference Name |
|--------------|---|
| 1 | https://www.constitution.org/cons/india/const.html |
| 2 | http://www.legislative.gov.in/constitution-of-india |
| 3 | https://www.sci.gov.in/constitution |
| 4 | https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-of-india/ |

| Course Code | Course Name |
|-------------|-------------|
|-------------|-------------|

| | | | | | |
|--|----------------------------------|---------------------------------|---------------------------------|----------------------|--------------------------|
| AEC 103 | Foreign Language (German) | | | | |
| Teaching Scheme: Contact Hours (Per Week) | | | Credits Assigned | | |
| Theory | Tutorial | Total | Theory | Tutorial | Total |
| 1 | 1 | 2 | 1 | 1 | 2 |
| Examination Scheme (Marks) | | | | | |
| Internal Assessment (IA) | | | End Sem. Examination | Term Work | Total (Marks) |
| Continuous Assessment CA) | Test | Total (IA) (CA+Test) | | | |
| - | - | - | 25 | 25 | 50 |

Prerequisite:

Course Objectives: Course aim at

| Sr. No. | Course Objective |
|----------------|---|
| 1 | Build intermediate listening and speaking skills for workplace discussions and small talk. |
| 2 | Acquire grammar (past/future tenses, modals, subordinate clauses) and related vocabulary. |
| 3 | Develop professional transactional skills (phone calls, scheduling, meetings) using polite forms. |
| 4 | Strengthen reading and writing of simple emails, reports, and authentic texts. |

Course Outcomes (CO): On successful completion of course learner/student will be able to

| Sr.No. | Course Outcome | Bloom Level |
|---------------|--|--------------------|
| CO1 | Demonstrate comprehension of intermediate German grammar (Perfekt/Präteritum, Futur I, modals, subordinate clauses), core vocabulary, and functional expressions in workplace & everyday contexts. | Understand |
| CO2 | Engage in sustained spoken and written communication for professional scenarios—phone calls, meeting exchanges, appointment scheduling, and transactional dialogues. | Apply |
| CO3 | Apply knowledge of German cultural norms and workplace etiquette (formal vs. informal address, polite conditional/subjunctive forms) appropriately in role-plays and tasks. | Apply |
| CO4 | Evaluate and utilize digital platforms and printed resources (audio, apps, articles) to plan and manage continued German learning and autonomous skill development. | Evaluate |

COPO Mapping

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| CO1 | 3 | 2 | - | - | - | - | - | 2 |
| CO2 | 2 | 3 | 2 | - | 3 | - | 2 | 2 |
| CO3 | - | 2 | 3 | - | 2 | - | 3 | 2 |
| CO4 | - | - | - | 3 | - | - | - | 3 |

| Module No. | Detailed Contents | Hrs. | CO No. | Ref No. |
|------------|--|------|--------|---------|
| 1 | Personal details & daily life Review and extend introductions; talk about family, education, hobbies, work/study routines. Grammar: Present vs. perfect tenses – describing past activities using <i>Perfekt</i> (ich habe gespielt), separable verbs (aufstehen, einkaufen); modal verbs (können, wollen). | 5 | 1,2 | |
| 2 | People, home & environment Describe the physical appearance and personality of others; describe one's home, city and neighborhood. Grammar: Adjective endings in nominative/accusative (ein großer Hund; die große Stadt) and comparative/superlative forms (groß, größer, am größten) two-way prepositions (in, an + cases). | 5 | 1,2,3 | |
| 3 | Everyday errands Shopping for clothing, groceries; using services – bank, post office; making appointments. Grammar: Modal verbs for requests (möchten, können, dürfen – <i>Ich möchte..., Kann ich...?</i>); dative-case objects (dem Kunden, der Ärztin) and simple question formation. | 4 | 1,2,3 | |
| 4 | Travel & directions Public transport, buying tickets, booking a hotel; giving and asking directions on street/map). Grammar: Subordinate clauses with <i>weil/dass</i> to explain (Ich gehe nach Hause, weil es spät ist) review of Perfekt vs. Präteritum (Ich bin gefahren vs. Ich fuhr). | 4 | 2,3 | |
| 5 | Work & communication Talking about jobs, daily tasks, schedules; telephone dialogues and simple email/text greetings. Grammar: Simple conditional/polite forms (<i>möchte, könnte</i>) and the subjunctive II (Konjunktiv II) for requests; comparative adverbs (schneller, langsamer); introduction to future <i>werden</i> + Infinitiv (Ich werde kommen). | 4 | 1,2,3 | |
| 6 | Health Emergencies and Future Plans Visiting a doctor, describing symptoms; talking about plans or intentions). Grammar: Future tense with <i>werden</i> (Ich werde morgen kommen); review of key tenses (present, Perfekt, plus-simple future) and sentence connectors to link ideas. | 4 | 3,4 | |

Reference Books:

| Reference No | Reference Name |
|---------------------|---|
| 1 | Hallo Deutsch! 1, Giorgio Motta 1st edition (2015) Published Goyal Publishers |
| 2 | Gute Idee! A1.1 (Kursbuch), Wilfried Krenn; Herbert Puchta Published by Hueber Verlag 1st edition, 2020 |
| 3 | Menschen A1.1, Sandra Evans, Published by Hueber Verlag, 1st edition (2019). |
| 4 | Netzwerk Neu A1 (Kursbuch) by Stefanie Dengler et al., Published by Goyal Publishers, 1st Edition (2021) |
| 5 | Let's Learn German A1: Grammar for Beginners by Gourav Vivek Kulkarni, Published by Notion Press |
| 6 | Collins Easy Learning German Grammar & Practice by Collins Dictionaries, Published by Collins, 2nd edition (2016) |

Web References:

| Reference No | Reference Name |
|---------------------|---|
| 1 | NPTEL Course lectures (IIT Madras) https://onlinecourses.nptel.ac.in/noc23_hs98/preview |
| 2 | https://learngerman.dw.com/en/learn-german/s-9528 |
| 3 | https://www.goethe.de/en/spr/ueb.html |
| 4 | https://www.easygerman.org/ |