LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)
DEPARTMENT OF CSE-DATA SCIENCE
SCHEME OF INSTRUCTION & EXAMINATION [LR-24]
(W.E.F Academic Year 2025-26)
B.E. III-Semester (Tentative)

S. No.	Course Code	Course Category	Course Title	Scheme of Instructions				Scheme of Examination			CREDITS
				L	T	P/ D	Contact Hours/Week	CIE	SEE	Duration in Hours	
Theory Course											
1	U24CD301	PCC	Basics of Data Science	2	-	-	2	40	60	3	2
2	U24CD302	PCC	Exploratory Data Analysis	3	1	-	4	40	60	3	3
3	U24EC304	ESC	Digital Electronics and Computer Organization	3	-	-	3	40	60	3	3
4	U24IT301	PCC	Database Management System	3	-	-	3	40	60	3	3
5	U24CS302	PCC	Data Structures*	3	-	-	3	40	60	3	3
Practical/ Laboratory Course											
6	U24CD3L1	PCC	Data Science using R lab	-	-	3	3	25	50	3	1.5
7	U24IT3L1	PCC	Database Management System Lab	-	-	3	3	25	50	3	1.5
8	U24CS3L1	PCC	Data Structures Lab	-	-	3	3	25	50	3	1.5
9	U24EP3L1	HSMC	Design Thinking Lab	-	-	3	3	25	50	3	1
Bridge Courses*											
10	U24CS3L2	ESC	C Programming Lab	-	-	2	2	50	-	-	-
11	U24CD3L2	ESC	Python Programming Lab	-	-	2	2	50	-	-	-
Total				**14**	**1**	**12 (*16)**	**27 (*31)**	**300 (*400)**	**500**	**-**	**19.5**

L: Lecture (Hrs/Wk/Sem) **T:** Tutorial (Hrs/Wk/Sem) **P:** Practical **D:** Drawing (Hrs/Wk/Sem)
CIE: Continuous Internal Evaluation **SEE:** Semester End Examination **BSC:** Basic Science Course
ESC: Engineering Science Course Including Management Course **PCC:** Program core course **MA:** Mathematics **HSMC:** Humanities & Social Sciences **EN:** English
CM: CSE-AIML **PH:** Physics **EC:** Electronics Communication
CD: CSE-Data Science **AM:** AI&ML **IT:** Information Technology

Note:

1. Each contact hour is a Clock Hour.
2. The duration of the practical class is three hours, however it can be extended wherever necessary, to enable the student to complete the experiment.

* **Term Work:** Assignments/seminars/micro projects/industrial visits/any other student activities.

Course Code	Course Title						Core/Elective
U24CD301	BASICS OF DATA SCIENCE						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
DBMS	2	-	-	-	40	60	2

Course Objectives

1. To understand the foundational concepts and scope of Data Science.
2. To understand & apply R for performing basic and advanced mathematical operations.
3. To understand the fundamental concepts, scope, and significance of data mining in modern data analysis.
4. To understand the importance and purpose of data visualization in data analysis and decision-making.
5. To understand the fundamentals of creating and customizing plots using R.

Course Outcomes

Students will be able

1. To define, illustrate the types, Flavors, and measurement levels of data with practical examples.
2. To perform basic arithmetic, exponential, and logarithmic calculations in R.
3. To define and classify different types of data objects, data types, and attributes used in data mining processes.
4. To use common data visualization tools & data optimization techniques to enhance the quality and usability of datasets.
5. To develop the ability to choose appropriate visual representations for different types of datasets and analytical goals.

UNIT-I

Introduction to Data Science: Data Science Definition - The Data Science Venn Diagram, Types of Data, Flavors of Data, Four Levels of Data, Evolutionary Five Steps of Data Science, Explore the Restaurant Dataset & Titanic Data set.

Overview of R: History of R, Basic Features of R, Design of the R System, R Packages, R Libraries, Editor Panes, R- Conventions, R – Help Files.

UNIT-II

R - Calculations: R for Basic Math- Arithmetic- Logarithms and Exponentials, Assigning Objects, Creating a Vector, Defining a Matrix, Bindings, Matrix Dimensions, Subletting, Diagonal Extractions, Omitting and Overwriting, Matrix Transpose, Identity Matrix, Matrix Addition and Subtraction, Matrix Multiplication, Matrix Inversion, Multidimensional Arrays.

Logical Values- Relational Operators- Characters- Creating a String-Concatenation- Escape Sequences- Substrings and Matching- Factors- Identifying Categories- Defining and Ordering Levels- Combining and Cutting.

Unit III:

Basics of Data Mining: Data Objects, data types and Attributes, What Is Data Mining, What Kinds of Data Can Be Mined, Architecture of data mining, Data Warehouses, Transactional Data – OLTP, OLAP & Other Kinds of Data, Types of databases in data mining.

Unit IV:

Working on Data: Data Visualization & its tools, Data Optimization & its techniques, Data Pre-processing - Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization.

Unit V:

Basic Data Plotting: Using plot with Coordinate Vectors - Graphical Parameters: Title, Axis Labels, Color, Line and Point Appearances, Plotting Region Limits - Adding Points, Lines, and Text to an Existing Plot,

Basic Plots: Bar Graph, Line Graph, Pictogram Graph, Dot Graph, Pie Chart, Area Chart, Bubble Chart, Rader Chart, Spline Chart, Box plot, Scatter Plot, Histogram, Heat Map.

Suggested Readings:

1. Introduction to Data Science 2nd edition 2024
2. Han, Jiawei, Micheline Kamber, and Jian Pei. "Data mining concepts and techniques third edition. "The Morgan Kaufmann Series in Data Management Systems 5.4 (2011).
3. Nina Zumel, Practical Data Science with R, Manning Publications, 2014.
4. Sinan Ozdemir Principles of Data Science: Mathematical techniques and theory to succeed in data driven industries, Packet Publishing Limited (13 December 2016)

Course Code	**Course Title**						Core/Elective
U24CD302	**Exploratory Data Analysis**						**Core**
	Hours Per Week				**CIE**	**SEE**	**Credits**
Prerequisite	**L**	**T**	**D**	**P**			
Python	**3**	**_**	**_**	**_**	**40**	**60**	**3**

Course-objectives:

1. To outline an overview of exploratory data analysis.
2. To implement data visualization using Matplotlib.
3. To perform uni-variate data exploration and analysis.
4. To apply bivariate data exploration and analysis.
5. To use Data exploration and visualization techniques for multivariate and time series data.

Course Outcomes:

At the end of the course, student would be able to

1. Understand the basic concepts and importance of Exploratory Data Analysis (EDA).
2. Apply Python libraries like Pandas for data manipulation and cleaning.
3. Analyse single-variable data using visual and statistical methods.
4. Examine relationships between two variables using correlation and regression.
5. Exploring Data Visualization.

UNIT – I

INTRODUCTION: EDA fundamentals, Understanding data science, Significance of EDA, EDA vs Classical & Bayesian, EDA vs Summary, EDA Goals, The Role of Graphics, reshaping and pivoting, An EDA/Graphics Example.

UNIT – II

EDA ASSUMPTIONS: Introduction and types of Data Manipulation, Data Manipulation using Pandas, Data Cleaning, Data Indexing and Selection, Underlying Assumptions, Importance, Techniques for Testing Assumptions.

UNIT – III

INTRODUCTION TO DATA EXPLORATION: Introduction to Single Variable, Distribution Variables, Inequality, Data Visualization Techniques, Quantitative Techniques, Probability Distributions, Data Transformation Methods.

UNIT – IV

UNDERSTANDING DEPENDENCIES IN DATA: Relationships between Two Variables, Correlation Analysis, Regression Analysis, Simple Linear Regression, Multiple Regression, Covariance, Residual Analysis, Introducing a Third Variable.

UNIT – V

DATA VISUALIZATION: The process creating visualizations and selecting the appropriate visual display, designing effective digital presentations, Visualization as exploration, visualizing multiple variables, Visualizing geospatial data, Dashboard design, Web-based visualizations, Interactive visualizations and motion.

Suggested Readings:

1. Suresh Kumar Mukhiya, Usman Ahmed, “Hands-On Exploratory Data Analysis with Python”, Packt Publishing, 2020.
2. Jake Vander Plas, "Python Data Science Handbook: Essential Tools for Working with Data", First Edition, O Reilly, 2017.
3. Catherine Marsh, Jane Elliott, “Exploring Data: An Introduction to Data Analysis for Social Scientists”, Wiley Publications, 2nd Edition, 2008.

Course Code	Course Title						Core/Elective
U24EC304	**Digital Electronics & Computer Organization**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**0**	**0**	**0**	**40**	**60**	**3**

Course Objectives:

The objectives of this course are

1. To understand the basic building blocks of digital hardware and various minimization techniques.
2. To analyze and design the Combinational and Sequential circuits.
3. Describe the basic structure and operation of digital computer and understand various memory types.

Course Outcomes:

On Successful completion of this course, student will be able to

1. Demonstrate the number system conversions and simplify Boolean functions.
2. Analyze and simplify Boolean expressions using karnaugh-maps, tabulation method and design combinational circuits.
3. Analyze and design various Sequential circuits.
4. To illustrate the operation of digital computer and to understand its organization.
5. Understand the various memory types.

UNIT – I

Number Systems: Number systems, Complements of Numbers, Codes- Weighted and Non-weighted codes and its Properties, Parity check code and Hamming code. Boolean algebra: Basic Theorems and Properties, Switching Functions- Canonical and Standard Form, Algebraic Simplification, Fundamentals of Digital Logic Gates.

UNIT – II

Combination Circuits: Implementation of logic functions using K-Map Quine- McCluskey Tabular method, Adders: half adder, full adder, Subtractors, Comparators, Multiplexers, De-multiplexers, Encoders and Decoders.

UNIT-III

Sequential circuits: Basic Architectural Distinctions between Combinational and Sequential circuits, SR Latch, Flip Flops: SR, JK, JK Master Slave, D and T Type Flip Flops. Excitation Table of all Flip Flops, Conversion from one type of Flip-Flop to another.

UNIT-IV

Basic Structure of Computers: Computer Types, Block diagram of Digital computer, Basic Operational Concepts, Bus Structures, Stored program organization and computer registers, Instruction formats, Input/output Organization: Block diagram of I/O organization, Interrupts, direct memory access. Asynchronous data transfer: strobe control and hand shaking.

UNIT -V

The Memory System: Basic concepts, Semiconductor RAM memories, read-only memories, Speed, Size and Cost, Primary memory, Auxiliary memory, Associative memory, Cache memories, Virtual Memories, Memory management requirements.

Suggested Readings:

1. Morris Mano M. and Michael D. Ciletti, "Digital Design, With an Introduction to Verilog HDL", Pearson 5 th edition, 2013.
2. RP Jain " Modern Digital Electronics" , Fourth Edition Mcgraw hill education (India) Pvt Limited, 2003
3. Carl Hamacher, ZvonkoVranesic, SafwatZaky, Computer Organization, 5th Edition, McGraw Hill, 2002.

Course Code	Course Title						Core/Elective
U24IT301	**Database Management Systems**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives:

The objectives of this course is to impart knowledge

1. Understand the role of database management system in an organization and learn the database concepts.
2. Design databases using data modeling and Logical database design techniques.
3. Construct database queries using relational algebra and calculus and SQL.
4. Understand the concept of a database transaction and related concurrent, recovery facilities.
5. Understand the concepts of Triggers and Stored Procedures.

Course Outcomes

At the end of the Course, Student would be:

1. Design ER-models to represent simple database application scenarios and Construct database queries using SQL.
2. Construct database queries using relational algebra and calculus.
3. Recognize and identify the use of normalization and functional dependency in database design.
4. Apply the concept of a database transaction and related concurrent, recovery facilities
5. Apply and relate how to evaluate a set of queries in query processing.

UNIT - I

CONCEPTUAL MODELING INTRODUCTION: Introduction to Data bases: Purpose of Database systems, view of data, data models, Database languages, Database users, various components of overall DBS architecture, various concepts of ER model, basics of Relational Model.

SQL QUERY – BASICS:SQL – Data Definition commands, Queries with various options, Data manipulation commands, Views, Joins, views, integrity and security.

UNIT – II

RELATIONAL APPROACH

Relational algebra and calculus: Relational algebra, selection and projection, set operations, renaming, joins, division, examples of algebra queries, relational calculus: Tuple relational calculus, Domain relational calculus, expressive power of algebra and calculus.

UNIT - III

INTRODUCTION TO NoSQL: Introduction, Overview and History of NoSQL Databases – The Definition of the Four Types of NoSQL Databases, differences between SQL and NoSQL .

NORMALIZATION: Pitfalls of RDBD, Lossless join decomposition, functional dependencies, Armstrong axioms, normalization for relational databases 1st, 2nd and 3rd normal forms, BCNF, Basic definitions of MVDs and JDs, 4th and 5th normal forms.

UNIT - IV

TRANSACTION MANAGEMENT: Transaction processing: Transaction concept, transaction State, implementation of atomicity and durability, concurrent executions, serializability, recoverability. Concurrency Control: Lock-based protocols, timestamp-based protocols, validation-based protocols, multiple granularities, multi-version schemes, deadlock handling.

UNIT – V

DATA STORAGE: Overview of physical storage media, magnetic disks, storage access, file organization, organization of records in files.Indexing and Hashing: Basic concepts, types of indexing, difference between B and B+ Indexing, static hashing, Dynamic Hashing.

Suggested Readings:

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", McGraw-Hill, 6th Edition, 2017.
2. Ramez Elmasri, Shamkant B. Navathe, "Fundamental Database Systems", Pearson Education, 6th Edition, 2014.
3. Raghu Ramakrishnan, "Database Management System", Tata McGraw-Hill Publishing Company, 3rd Edition, 2007.

Course Code	**Course Title**						Core/Elective
U24CS302	**DATA STRUCTURES**						**Core**
Prerequisite	**Hours Per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
PPS	**3**	**_**	**_**	**_**	**40**	**60**	**3**

Course Objectives:

Develop ability to

1. Develop skills to design and analyze simple linear and nonlinear data structures, such as stacks, queues and lists and their applications.
2. Gain programming skills to implement sorting and searching algorithms
3. Strengthen the ability to identify and apply the suitable data structures for the given real worl problem.
4. Gain knowledge in practical applications of data structures
5. Understand essential for future programming and software engineering courses.

Course Outcomes:

At the end of the course, student would be able to

1. Implement various data structures using arrays, linked lists
2. Develop ADT necessary for solving problems based on Stacks and Queues
3. Implement binary trees, general tree structures, advanced search trees, heaps, graphs.
4. Implement hash functions and handle collisions.
5. Implement various kinds of sorting techniques and apply appropriate techniques for solving a given problem

UNIT – I

Introduction Data Structures and Algorithms:

Introduction to data structures, classification of data structures, operations on data structures; Algorithm Specification, Recursive algorithms, Data Abstraction, Performance analysis- Time Complexity and Space Complexity, Asymptotic Notation-Big O, Omega, and Theta notations.

UNIT – II

Stacks and Queues:

Stacks: Stack ADT, definition and operations, Implementations of stacks using array, applications of stacks, Arithmetic expression conversion and evaluation.

Queues: Queue ADT, definition and operations, Implementation of queues using Arrays, applications of linear queue, circular queue and double ended queue (deque).

UNIT – III

Linked Lists: Introduction, Singly linked list, representation of a linked list in memory, operations on a Singly Linked List, Implementation of Singly Linked List.

Doubly Linked Lists; Operations on Doubly Linked List, Implementation of Doubly Linked List , Circular linked list, Implementation of Stack and Queue using linked list.

UNIT – IV

Searching Techniques: Linear search and Binary Search algorithms.

Sorting Techniques: Bubble Sort, Insertion sort, Selection Sort, Merge Sort, and Quick Sort. Comparison among sorting techniques.

Hashing: Static Hashing, Hash Tables, Hash Functions, Overflow Handling, Theoretical Evaluation of Overflow Techniques

UNIT – V

Trees: Introduction, Binary Trees, Tree Traversals, Threaded Binary Trees, Binary Search Tree, Heap Tree, AVL Tree.

Graphs: Graph Abstract Data Type, Representation of Graph, Graph Traversals -DFS and BFS, Spanning Tree, Prim‘s and Kruskal‘s Algorithms.

Suggested Readings:

1. “Fundamentals of Data Structures in C”, Ellis Horowitz, Sartaj Sahani, Susan Anderson Freed, Computer Science Press, 2004
2. S. Lipschutz, “Data Structures”, Tata McGraw Hill Education, 1st Edition, 2008
3. D. Samanta, “Classic Data Structures”, PHI Learning, 2nd Edition, 2004..

Course Code	Course Title						Core/Elective
U24CD3L1	Data Science Using R lab						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
DBMS			-	3	25	50	1.5

Course Objectives

1. Understand the R Programming Language.
2. Exposure on solving of data science problems.
3. Understand the classification and Regression Model.
4. To understand the importance and purpose of data visualization in data analysis and decision-making.
5. To understand the fundamentals of creating and customizing plots using R.

Course Outcomes

The student will be able to:

1. Work with Data Science applications using R Programming environment.
2. Implement various mathematical concepts in R such as Arithmetic Logical operations, Vector, Matrices.
3. Apply various visualization by plotting various graphs in R.
4. To use common data visualization tools & data optimization techniques to enhance the quality and usability of datasets.
5. To develop the ability to choose appropriate visual representations for different types of datasets and analytical goals.

1. INSTALLATION OF R- Console & R- Studio

a) Installation of R-Console and Editor Panes- Comments- Installing and Loading R Packages, Saving Work and Exiting.
b) Installation of R- Studio and Editor Panes

2. CALCULATOR APPLICATION

Write an R scrip to create R objects for calculator application and save in a specified location in disk.

3. READING AND WRITING DIFFERENT TYPES OF DATASETS

a) Using the Restaurant dataset, perform the following tasks:
- Load the dataset and summarize the structure (column names, data types, and missing values).
- Identify the most frequently visited restaurants and the distribution of ratings.
- Group the data to find: Average rating per city, most common cuisine types offered
- Clean the dataset by handling duplicates and irrelevant columns.

b) Using the Titanic dataset, perform the following tasks:
- Load the dataset and display the first 10 rows.
- Identify and handle missing values in the 'Age' and 'Embarked' columns.
- Create visualizations to analyse the relationship between **Survival** and the following variables:
  - Gender
  - Passenger class
  - Age
- Create a new column Child that classifies passengers as 'Child' if Age < 12, otherwise 'Adult'.
- Calculate the survival rate for each group (Male/Female, Child/Adult).
- Build a basic logistic regression model to predict survival using Pclass, Sex, and Age

4. BASIC & ADVANCE MATHEMATICAL OPERATIONS IN R

a) Write an R script for to perform basic arithmetic operations and assign results to objects.
b) Write an R script to create and manipulate vectors.
c) Write an R script to define a matrix, check dimensions, and perform sub setting.
d) Write an R script to perform diagonal extraction, transpose, and identity matrix creation.
e) Write an R script to perform matrix addition, subtraction, multiplication, and inversion.
f) Write an R script to create and access a multidimensional array.
g) Write an R script to create strings, use concatenation, escape sequences, and substrings.
h) Write an R script to create factors, define levels, and combine/cut categories.

5. WORKING DATA OBJECTS, TYPES & ATTRIBUTES IN R

a) Write an R script to explore different data types and attributes using a sample dataset.
b) Write a short report and code example on types of data mining and datasets that can be mined.
c) Write an R script to demonstrate basic concepts of OLTP and OLAP.
d) Explore different types of databases in mining using examples and dataset previews.

6. BASIC DATA PLOTTING IN R

a) Create a basic line plot using coordinate vectors.
b) Customize plot with title, axis labels, colors, and point styles.
c) Set custom limits on the plot region.
d) Enhance a plot by adding new points, lines, and text annotations.
e) Write an R script for plotting a

- Bar Graph
- Line Graph
- Dot Graph
- Pie Chart
- Area Chart
- Bubble Chart
- Radar Chart
- Spline Chart
- Box Plot
- Scatter Plot
- Histogram

Heat Map

Course Code	Course Title						Core/Elective
U24IT3L1	Database Management Systems Lab						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	-	-	-	3	25	50	1.5

Course Objectives:

1. Introduce ER data model, database design and normalization
2. Learn SQL basics for data definition and data manipulation
3. To understand the basic concepts and the applications of database systems.
4. Be acquainted with the basics of transaction processing and concurrency control.
5. Learn the concepts of Views, Stored Procedure and Triggers.

Course Outcomes

After completing this course, the student will be able to:

1. Design database schema for a given application and apply normalization
2. Gather skills in using SQL commands for data definition and data manipulation.
3. Demonstrate creation and usage of Views and Stored Procedures using SQL.
4. Develop solutions for database applications using procedures, cursors and triggers
5. To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.

LIST OF EXPERIMENTS

Scenario: Product-Sales database: South wind database is a sample database used by Organization. The database contains the sales data for South wind Traders; it is foods export-import Company. Using this schema to demonstrate the how customer can choose and order products, how orders are placed and how those products get delivered to the customer. Products: This Entity will have all the products details where suppliers will supply products based on customers demand. Supplies: This Entity will supply the products demanded by the customers. Shippers: This Entity will take the orders from suppliers and deliver to customers. Employees: Employees will monitor the orders placed by customers. Invoices: This Entity will take care of billing process based on customer order. Etc...Identify some more entities and find out relationship between them. Product-sales the above process involves many steps like

1. Analyzing the problem and identifying the Entities and Relationships,
2. E-R Model
3. Relational Model
4. Normalization
5. Creating the database
6. Querying.

Experiment 1: E-R Model

Analyze and come up with the entities in it. Identify what data has to be persisted in the database. This contains the entities, attributes etc. Identify the primary keys for all the entities. Identify the other keys like Foreign Key and constraints like NULL, NOT NULL, CHECK etc. Example to create for products, customers, suppliers, orders, , employees, order details, categories, among others. Students should submit E-R diagrams using the above tables.

Experiment 2: DDL

How to create tables, altering the database or tables, dropping tables if not required. You will also try truncate, rename commands etc. Data Definition Language (DDL) : create , alter, drop.

Experiment 3: DML

Data Manipulation Language Commands (DML) commands are used to for managing data within schema objects. Exercising the commands using DML: insert, delete, update on the following tables : products, customers, suppliers, orders, , employees, order details, categories.

- INSERT – insert data into a table.
- UPDATE – updates existing

Experiment 4: Querying

Data within a table.
● DELETE – deletes single or all records from a table.
Data Query Language – Select Populate all the tables designed in experiment: 2 with appropriate data. Practice queries on Aggregate functions like count, max , min ,avg ,sum Practice queries like nested queries/co-related queries using ANY, ALL, IN, Exists, NOT EXISTS, UNION, INTERSECT, groupby ,having etc.
Joins: Join , Left Outer Join, Right Outer Join, Self Join

Experiment 5 : Querying(continued…)
Some example to practice the queries:
1. Display all the order details of given a customer.
2. Display all the products.
3. Get the highest sold product from given supplier ID
4. List all products grouped by category
5. List the products, whose products unit price is greater then all the products of average.
6. List Details of order and customer of each order
7. List the products which were sold in year 1997
8. Display the total amount for each order
9. Display Order Details for given an order ID
10. Order Details: product name and unit price for given order ID Exercising Simple to complex
11. Queries using joins, nested and co-related queries.

Experiment 6 : Programs on pl/sql
1. Write a PL/SQL program to swap two numbers.
2. Write a PL/SQL program to find the largest of three numbers
3. Write a PL/SQLprogramtofindthetotalandaverageof6subjectsanddisplaythegrade.
4. Write a PL/SQL program to find the sum of digits in a given number.
5. Write a PL/SQL program to display the number in reverse order.
6. Write a PL/ SQL program to check whether the given number is prime or not.
7. Write a PL/SQL program to find the factorial of a given number.

Experiment 7 : Stored Procedures :
1. Create a stored procedure, Alter and Drop a procedure, IN, OUT, IN & OUT parameters
2. Create a Procedure to display order details of given customer ID like ordered, order Date , Required Date, Shipped Date
3. Create a procedure to accept a customer ID and display the customer order history (product name and how much quantity ordered for that particular product)
Ex: product name, Total quantity he/she ordered.
4. Create a procedure to display Ten Most Expensive Products Columns should be displayed Product name & Unit price

Experiment 8: Views
1. Create a view to display the current product list which is available (not discontinued)
2. Create a view to display the products by category
3. Display product name, quantity Per Unit, units In Stock, Discontinued
4. Create a view as ―Invoices‖ to display all the information from order, customer, and shipper for each Order Details

Experiment 9: Triggers
Demonstrate Create Trigger, Alter Trigger, Drop Trigger, Row Level, Table Level triggers, Before Insert, After Insert, Before Update, After Update, Before Delete, After Delete

Experiment 10: Case study: Book Publishing Company
A publishing company produces scientific books on various subjects. The books are written by authors who specialize in one particular subject. The company employs editors who, not necessarily being specialists in a particular area, each take sole responsibility for editing one or more publications.
A publication covers essentially one of the specialist subjects and is normally written by a single author. When writing a particular book, each author works with on editor, but may submit another work for publication to be supervised by other editors. To improve their competitiveness, the company tries to employ a variety of authors, more than one author being a specialist in a particular subject for the above case study, do the following:

a. Analyze the data required.

b. Normalize the attributes.

Create the logical data model using E-R diagrams.

Experiment 11: Case Study: General Hospital

A General Hospital consists of a number of specialized wards (such as Maternity, Pediatric, Oncology, etc). Each ward hosts a number of patients, who were admitted on the recommendation of their own GP and confirmed by a consultant employed by the Hospital. On admission, the personal details of every patient are recorded. A separate register is to be held to store the information of the tests undertaken and the results of a prescribed treatment. A number of tests may be conducted for each patient. Each patient is assigned to one leading consultant but may be examined by another doctor, if required. Doctors are specialists in some branch of medicine and may be leading consultants for a number of patients, not necessarily from the same ward. For the above case study

For the above case study, do the following.

a. Analyze the data required.

b. Normalize the attributes.

Create the logical data model using E-R diagrams.

Suggested Readings

1. Raghurama Krishnan, Johannes Gehrke, ―Database Management Systems‖, Tata McGraw Hill, 3rd Edition, 2008.
2. Silberschatz, Korth, ―Database System Concepts‖, McGraw Hill, V edition, 2005.
3. Rick F. Vander Lans, ―Introduction to SQL‖, Pearson education, 2007.
4. B. Rosenzweig and E. Silvestrova, ―Oracle PL/SQL‖, Pearson education, 2004.
5. Dr. P. S. Deshpande, ―SQL & PL/SQL for Oracle 10g‖, Black Book, Dream Tech, 2006.
6. M. Mc Laughlin, ―Oracle Database 11g PL/SQL Programming‖, TMH, 2017

Course Code	**Course Title**						Core
U24CS3L1	**DATA STRUCTURES LAB**						**Core**
Prerequisite	**Hours Per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
PPS Lab	**-**	**-**	**-**	**3**	**25**	**50**	**1.5**

Course Objectives:

Develop ability to

1. Understand essential concepts of simple linear and nonlinear data structures.
2. Analyze and implement programming skills to implement sorting and searching algorithms
3. Apply the suitable data structures for the given real world problems.
4. Acquire knowledge in practical applications of data structures.
5. Provide solutions for various graphical concepts.

Course Outcomes:

At the end of the course, student would be able to

1. Write programs in various data structures using arrays and linked lists.
2. Develop ADT necessary for solving problems based on Stacks and Queues
3. Evaluate binary trees, general tree structures, advanced search trees, heaps, graphs.
4. Apply hash functions and handle collisions
5. Implement various kinds of sorting techniques and apply appropriate techniques for solving a given problem.

List of Experiments:

1. Implementation of Stacks and Queues using Arrays.
2. Solving Towers of Hanoi problem
3. Implementation of Circular Queue.
4. Solving tic-tac -toe problem
5. Implementation of Infix to Postfix Conversion, Postfix Expression Evaluation.
6. Implementation of Singly Linked List
7. Implementation of Doubly Linked List.
8. Implementation of Circular Linked List.
9. Implementation of Stacks, Queues using Linked Lists.
10. Implementation of Binary Search and Hashing
11. Implementation of Operations on Binary Tree (Delete Entire Tree, Copy Entire Tree, Mirror Image, Level Order, Search for a Node etc.)
12. Implementation of Tree Traversals on Binary Trees.
13. Implementation of Binary Search Tree. (Insertion, Deletion and Search operations)
14. Implementation of operations on AVL Trees.
15. Implementation of Traversal on Graphs.
16. Implementation of Selection, Merge, Quick and Insertion Sort.
17. Implementation of Prims and Kruskals Algorithm.

Suggested Readings:

1. S. Lipschutz, “Data Structures”, Tata McGraw Hill Education, 1st Edition, 2008.
2. D. Samanta, “Classic Data Structures”, PHI Learning, 2nd Edition, 2004.
3. Mark A Weiss, Data Structures and Algorithm Analysis In C, Second Edition (2002), Pearson

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)
DEPARTMENT OF CSE-DATA SCIENCE
SCHEME OF INSTRUCTION & EXAMINATION [LR-23]
(W.E.F Academic Year 2025-26)
B.E. IV-Semester

S. No.	Course Code	Course Category	Course Title	Scheme of Instructions				Scheme of Examination			CREDITS
				L	T	P / D	Contact Hours/Week	CIE	SEE	Duration in Hours	
Theory Course											
1	U24CD401	PCC	Operating Systems	3	-	-	3	40	60	3	3
2	U24IT402	PCC	Java Programming*	3	-	-	3	40	60	3	3
3	U24ME404	ESC	Operations Research	3	-	-	3	40	60	3	3
4	U24CS401	PCC	Design and Analysis of Algorithms	3	-	-	3	40	60	3	3
5	U24MA402	BSC	Mathematics – III (Mathematics for Data Science)	3	-	-	3	40	60	3	3
6	U24EN401	HSMC	English for Technical Communication	2	-	-	2	40	60	3	2
Practical / Laboratory Course											
7	U24CD4L1	PCC	Operating Systems Lab	-	-	3	3	25	50	3	1.5
8	U24IT4L2	PCC	Java Programming Lab	-	-	3	3	25	50	3	1.5
9	U24EN4L1	HSMC	Soft Skills & Employability Skills Lab	-	-	3	3	25	50	3	1.5
Total				**17**	**-**	**9**	**26**	**315**	**510**	**-**	**21.5**

L: Lecture *(Hrs/Wk/Sem)* **T**: Tutorial *(Hrs/Wk/Sem)* ***P*:** Practical **D**: Drawing *(Hrs/Wk/Sem)*
CIE: Continuous Internal Evaluation **SEE**: Semester End Examination
BSC: Basic Science Course **ESC**: Engineering Science Course **PCC:** Program core course
HSMC: Humanities & Social Sciences Including Management Course **AM:** AI&ML
MA: Mathematics **EN:** English **PH**: Physics
CM: CSE-AIML **EC:** Electronics Communication
CD: CSE-Data Science **IT:** Information Technology
Note:

1. Each contact hour is a Clock Hour.
2. The duration of the practical class is three hours, however it can be extended wherever necessary, to enable the student to complete the experiment.

*** Term Work:** Assignments/seminars/micro projects/industrial visits/any other student activities

Course Code	Course Title						Core/Elective
U24CD401	**Operating Systems**						**Core**
	Hours Per Week				**CIE**	**SEE**	**Credits**
Prerequisite	**L**	**T**	**D**	**P**			
PPS	**3**	**_**	**_**	**_**	**40**	**60**	**3**

Course Objectives:

1. To understand the services provided by and the design of an operating system.
2. To understand the structure and organization of the file system.
3. To understand what a process is and how processes are synchronized and scheduled.
4. To understand different approaches to memory management.
5. To Understand Virtual machine concepts, calls for managing processes, memory and the file system

Course Outcomes:

At the end of the course, the students will be able to:

1. Understand the fundamental concepts and Functions of operating system.
2. Analyze various scheduling algorithms.
3. Understand deadlock, prevention and avoidance algorithms.
4. Compare and contrast various memory management schemes.
5. Understand the functionality of file systems and perform administrative tasks on Linux Servers

UNIT-I

Introduction: What Operating system do, Defining operating system, Computer System Operation, Storage Structure, Operating system Structure, Operating System Operations, Computer system architecture: Single Processor, Multi-Processor, Multiprogramming, Multitasking, Process, Memory and Storage Managements, Protection and Security.

System Structures: System calls, Types of System Calls, System Programs, System boot

UNIT-II

Processes: Process concepts, Process Scheduling, Operations on Processes, Inter process communication, Communication in Client/Server Systems

CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms (FCFS, SJF, Priority, Round Robin) **Synchronization**: Background, The Critical-Section Problem, Peterson‟s Solution, Synchronization, Dining Philosophers problem Monitors. **Deadlocks**: System Model, Deadlock characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

UNIT-III

Memory-Management Strategies: Background, Swapping, Contiguous Memory Allocation, Paging, Structure of the Page Table, Segmentation.

Virtual Memory Management: Background, Demand paging, Copy-on-write, Page Replacement, Allocation of Frames, Thrashing, Memory-Mapped Files, Allocating Kernel Memory.

Storage Management: File System, File Concept, Access Methods, Directory Structure, File-System Mounting, File sharing, Protection.

UNIT-IV

Implementing File Systems: File System-Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management, Efficiency and Performance, Recovery, Log- Structured File Systems, NFS.

Secondary Storage Structure: Overview of Mass-Storage Structure, Disk Structure, Disk Attachment, RAID Structure, Stable-Storage Implementation, Tertiary-Storage Structure.

UNIT-V

Protection and Security: Goals of Protection, Principles of Protection, Domain of protection, Access Matrix, Implementation of Access Matrix, Access control, Revocation of access rights,

System Security: The security problem, program Threats, System and System Network Threats, Cryptography as a Security tool, User Authentication, Implementing Security Defences, firewalling to protect Systems and Networks, Case Studies- Linux System

Suggested Readings:

1. Modern Operating Systems by Andrew S. Tanenbaum& Herbert Bos , 5th Edition 2022

2. Operating System Concepts, Siliberchatz, Galvin & Gagne, 10th Edition 2023.

Course Code	Course Title						Core/Elective
U24IT402	Java Programming						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
PPS	3	-	-	-	40	60	3

Course Objectives:

Develop ability to

1. Understand fundamentals of object-oriented programming in Java which includes defining classes, invoking methods, difference between applet and application programs, using class libraries
2. Create Java application programs using sound OOP practices such as interfaces, exception handling, multi-threading.
3. Understand fundamentals of object-oriented programming in Java.
4. Define classes, invoking methods, difference between applet and application programs, using class libraries
5. Use Collection framework, AWT and event handling to solve real world problems.

Course Outcomes

At the end of the Course, Student would be:

1. Achieve proficiency in object-oriented concepts and also learns to incorporate the same into the Java programming language.
2. Create Java application programs using sound OOP practices e.g. Inheritance, interfaces and proper program structuring by using packages, access control specifiers.
3. Understand and implement the concepts of Exception Handling in JAVA.
4. Develop the ability to solve real-world problems through software development in high-level programming language using Large APIs of Java as well as the Java standard class library.
5. Understand File, Streams, Input and Output Handling in java.

UNIT – I

Object Oriented Programming: Benefits of Object-Oriented Programming.

Introduction to Java: Java buzzwords, bytecode. Java Programming Fundamentals, data types, variables, arrays, operators, expressions, control statements, concepts of classes, objects, constructors, methods, access control, overloading methods and constructors, introducing access control, static, final, exploring string class.

Principles of OOPS: Data Abstraction, Data Encapsulation, Polymorphism, and Inheritance.

UNIT – II

Interfaces: Defining an interface, implementing interfaces, extending interface. **Packages:** Defining, Creating and Accessing a Package, importing packages

Exception handling: Benefits of exception handling, classification, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally, rethrowing exceptions, built in exceptions, creating own exception sub classes

UNIT – III

Multithreading: Java Thread Model, The Main Thread, creating a Thread, creating multiple threads, using is Alive() and join(), thread priorities, synchronization, inter thread communication, deadlock

Collections: Overview of Java Collection frame work, commonly used Collection classes.

Other Utility classes: String Tokenizes, Scanner Java Input/output: exploring java.io, Java I/O classes and interfaces, File, Stream classes, byte stream, character stream, serialization.

UNIT – IV

GUI Programming with java: The AWT class hierarchy, MVC architecture. Applet Revisited: Basics, architecture and skeleton, simple applet program.

Event Handling: Delegation Event Model, Event Classes, Source of Events, Event Listener Interfaces. Handling mouse and keyboard events, Adapter classes.

Database Programming using JDBC: Introduction to JDBC, JDBC Drivers & Architecture, CURD operation Using JDBC.

UNIT – V

Exploring Swing: JLabel, ImageIcon, JTextField, the Swing buttons, JTabbedpane, JScrollPane, JList, JComboBox.

Servlet: Life cycle, using tomcat, simple servlet, servlet API, javax. servlet package, reading servlet parameters,

javax. servlet. http package, handling HTTP requests and responses

Text Books:

1. Herbert Scheldt, "The Complete Reference Java, 7th Edition, Tata McGraw Hill,2006.
2. James M Slack, Programming and Problem Solving with JAVA, Thomson Learning,2002.

Reference Books:

1. C Thomas Wu, An Introduction to Object Oriented Programming with Java 5th Edition, McGraw Hill Publishing,2010.
2. H. M. Dietel and P. J. Dietel, Java How to Program, Sixth Edition, Pearson Education /PHI

Course Code	Course Title						Core/Elective
U24ME404	OPERATIONS RESEARCH						Core
Prerequisite	Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
Basic Maths	3	-	-	-	40	60	3

Course Objectives:

Develop ability to

1. Explain with examples, the basic terminology of functions, relations, and sets.
2. Perform the operations associated with sets, functions, and relations.
3. Relate practical examples to the appropriate set, function, or relation model, and interpret the associated operations and terminology in context.
4. Describe the importance and limitations of predicate logic.
5. Use Graph Theory for solving problems.

Course Outcomes:

At the end of the course, student would be able to

1. Understand the ideas of mathematical induction to recursion and recursively defined structures.
2. Prepare the students to have the knowledge of Linear Programming Problem in Operations
3. Research at the end students would be able to understand the concept and develop the models for different applications.
4. Make students understand the concept Replacement models at the end students would able to explain various features and applications of replacement models in real time scenario.
5. Prepare the students to understand theory of Game in operations research at the end students would able to explain application of Game theory in decision making for a conflict

UNIT – I

Introduction: Definition and Scope of Operations Research.

Linear Programming: Introduction, Formulation of linear programming problems, graphical method of solving LP problem, simplex method, maximization methods and minimization, Degeneracy in LPP, Unbounded and, Infeasible solutions.

UNIT – II

Transportation Models: Finding an initial feasible solution - North West corner method, least cost method, Vogel‘s, Approximation method, Finding the optimal solution, optimal solution by stepping stone and MODI methods,Special cases in Transportation problems - Unbalanced Transportation problem.

Assignment Problems: Hungarian method of Assignment problem, Maximization in Assignment Problem, unbalanced problem, problems with restrictions, travelling salesman problems.

UNIT – III

Network Fundamentals- scheduling the activities -Fulkerson’s Rule –CPM- earliest and latest times -determination of ES and EF in the Forward Pass - LS and LF in backward pass determination of Critical Path, Crashing, time cost trade off. PERT-Beta Distribution, probabilistic models, Calculation of CP, resource analysis and allocation.

UNIT – IV

Replacement Models: Introduction, replacement of items that deteriorate ignoring change in money value, replacement of items that deteriorate considering change in money value with time, replacement of items that fail suddenly - Individual replacement policy, Group replacement policy.

Game Theory: Introduction, 2 person zero sum games, Maximin - Minimax principle, Principle of Dominance, Solution for mixed strategy problems, Graphical method for 2 x n and m x 2 games.

UNIT – V

Sequencing Models: Introduction, General assumptions, processing n jobs through 2 machines, processing n jobs through m machines, Processing 2 jobs through m machines

Queuing Theory: Introduction, single channel - Poisson arrivals - exponential service times with infinite population & finite population, Multi-channel - poison arrivals - Exponential service times with infinite population.

Introduction to Optimization Techniques: Single objective & Multi objective optimization Techniques like G.A, NSGA, P.Q.O & MPSO Techniques.

Suggested Readings:

1. Hamdy, A. Taha, ―Operations Research-An Introduction‖, Sixth Edition, Prentice Hall of India Pvt. Ltd.,1997
2. S.D. Sharma, Operations Research, Kedarnath, Ramnath & Co., Meerut,2009
3. J.B. Gupta, ―Utilization of Electric Power and Electric Traction‖ S.K. Kataria & Sons Publications, 2010 Hrvey M. Wagner, Principles of Operations Research, Second Edition, Prentice Hall of India Ltd., 1980.
4. V.K. Kapoor, Operations Research, S. Chand Publishers, New Delhi,2004 R. Paneer Selvam, Operations Research, Second Edition, PHI Learning Pvt. Ltd., New Delhi,2008.

Course Code	Course Title						Core/Elective
U23CS401	DESIGN AND ANALYSIS OF ALGORITHMS						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Data Structures	3	1	-	-	40	60	3

Course Objectives:

This course will enable students to

1. Acquire the knowledge of Algorithm and problem-solving technique, limitations of algorithms.
2. Understand different techniques like divide and conquer, transfer and conquer etc., to solve problems.
3. Understand different techniques like greedy method and dynamic programming
4. Understand the concepts of Np-Hard and Np-Complete.
5. Illustrating the methods of backtracking and branch bound techniques to solve the problems like N-queens problem, graph coloring

Course Outcomes:

On completion of this course, the students are able to :

1. Identify asymptotic notations and basic efficiency classes.
2. Solve problems using various techniques like divide-and-conquer and transfer-and-conquer.
3. Use different algorithms like TSP, Floyd's etc. to solve real world problems.
4. Introduce the P and NP classes.
5. Develop solutions for n - Queens problem, Subset – Sum Problem, Assignment problem, Knapsack problem etc.

UNIT - I

Introduction: Algorithm, Fundamentals of algorithmic problem solving,Fundamentals of the analysis of algorithm efficiency, Asymptotic Notations and basic efficiency classes, Mathematical Analysis of Non-Recursive and Recursive Algorithms, The substitute method, Recursion tree method, Master method.

UNIT - II

Divide and conquer: Divide and Conquer: General Method, Binary Search, finding minimum and maximum MergeSort analysis, Quick Sort analysis, Strassen's matrix multiplication.

Transfer and conquer: Introduction, Balanced search trees, Heap and Heap sort.

UNIT - III

The greedy method: The General Method, Knapsack problem, Job Sequencing with Deadlines, Minimum- Cost Spanning Trees: Prim's Algorithm, Kruskal's Algorithm, Single Source Shortest Paths.

Dynamic programming: The General Method, multistage graph, Warshall's Algorithm, Floyd'sAlgorithm for the All-Pairs Shortest Paths Problem, single source shortest path, The Travelling Salesperson problem, optimal binary search,0/1 knapsack.

UNIT – IV

Pattern Matching: The naïve string-matching algorithm, Brute Force String Matching, KMP algorithm.

Np-Hard and Np-Complete Problems: Basic concepts: non-deterministic algorithms, the classes NP - Hard and NP, NP Hard problems, clique decision problem, chromatic number decision problem, Cook's theorem.

UNIT V

Backtracking: n - Queens Problem, Subset – Sum of Subsets Problem, graph coloring.

Branch and bound: Assignment problem, Knapsack problem, 15 puzzle problem, travelling salesman problem

Tries: Standard Tries, Compressed Tries, Suffix Tries, Search Engine Indexing.

Suggested Readings:

1. "Introduction to The Design and Analysis of Algorithms", Anany Levitin (Chapters 1-5,7,9,11), Pearson Education, Delhi, 2nd Edition, 2007, ISBN: 9780321358288.
2. "Fundamentals of Computer Algorithms", Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran: (Chapters 1,3-8,10-12), Universities Press, Hyderabad, 2nd Edition, 2007, ISBN: 10: 8173716129.
3. "Introduction to Algorithms", Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein: PHI, London, England, 3rd Edition, 2010, ISBN: 9780262033848.
4. "Introduction to the Design and Analysis of Algorithms A Strategic Approach", R.C.T. Lee, S.S. Tseng, R.C. Chang and Y.T. Tsai: McGraw-Hill Higher Education, USA, International Edition, 2005, ISBN-13: 978-0071243469.

Course Code	Course Title						Core/Elective
U23MA402	**Mathematics-III (Mathematics for Data Science)**						**Core**
Prerequisite	**Contact Hours per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
-	**3**	**1**	**-**	**-**	**40**	**60**	**3**

Course Objectives:

This course will enable students to

1. Interpret the measures of central tendency and dispersion.
2. Distinguish between explanatory and response variables and analyze data using correlation and regression.
3. Familiar with various probability distributions.
4. Acquire the concept of tests of hypothesis.
5. Employ basic analysis of time series data.

Course Outcomes:

On completion of this course, the students are able to :

1. Compute and interpret descriptive statistics.
2. Evaluate random processes which occur in engineering applications governed by the Binomial, Poisson, Normal and Exponential distributions.
3. Apply Inferential Statistics to make predictions or judgments about the population from which the sample data is drawn.
4. Analyze and check the validity of statement using testing of hypothesis for various parameters and ANOVA technique.
5. Interpret Time series data.

Unit-I:

Random Variables, Basic Statistics, Correlation and Regression Random variables – Discrete and Continuous, Probability mass function and density function, Mean, Variance, and Correlation: Karl-Pearson‟s correlation coefficient and Spearman‟s Rank correlation, Simple and Multiple Linear Regression (three variables case only), Statements of properties of Regression coefficients and problems.

Unit-II:

Probability Distributions Discrete Distributions: Binomial and Poisson distributions - definition, real life examples, Statements of their Mean and Variance, related problems, evaluation of statistical parameters. Continuous Distributions: Normal - definition, real life examples, Statements of their Mean and Variance and related problems, evaluation of statistical parameters for Normal distribution

Unit-III:

Testing of Hypothesis-1 (Large sample) Concept of Sampling distribution and Standard error, tests for single proportion, difference of proportions, single mean, difference of means and Chi-square test for independence of attributes

Unit-IV:

Testing of Hypothesis-2 (Small Sample) Tests for single mean, difference of means, Population variance, ratio of variances, ANOVA 1-way and 2- way. Estimation of confidence interval for Population mean.

Unit-V:

Time Series analysis Components of Time series, measuring trend by method of Moving averages, Straight line and Second-degree parabola, measuring seasonal variation by ratio to Trend method and Ratio to Moving averages method.

TEXT BOOKS:

1. S. C.Gupta&V.K.Kapoor, “Fundamentals of Mathematical Statistics”, S.Chand.
2. Richard A. Johnson,” Probability and Statistics for Engineers”, Pearson Education.
3. Jay Devore, “Probability and Statistics for Engineering and the Sciences”, engage learning.

REFERENCE BOOKS:

1. Murat Kulahci,“Time series analysis and forecasting by example”, John Wiley & Sons
2. S. C.Gupta&V.K.Kapoor, “Fundamentals of Applied Statistics”, S.Chand.

Course code	Course title						Core/Elective
U24EN301	ENGLISH FOR TECHNICAL COMMUNICATION						--
Pre-requisites	Contact Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
English for Professional Communication	2	-	-	-	40	60	2

Course Objectives:

To expose the students to:

1. Understand the significance of Technical Writing.
2. Different types of official correspondence.
3. Various styles of technical report writing.
4. Designing, creating and developing technical manual.
5. Familiarize with the technical features of information transfer.

Course Outcomes:

On successful completion of the course, the students would be able to:

1. Apply technical communication skills effectively.
2. Adapt different types of official correspondence successfully.
3. Construct report writing productively using various techniques.
4. Develop the skills of manual writing adequately.
5. Interpret the information transfer from verbal to non-verbal data and vice-versa completely

UNIT-I

Definition and Features of Technical communication: Definition, Types and Process of Communication, Definition and features of technical communication (precision, relevance, format, style, use of visual aids), Difference between general writing and technical writing, Types of technical communication.

UNIT-II

Technical Writing-I (Official correspondence): Emails, Business letters (all types), Business proposals.

UNIT-III

Technical writing-II (Reports): Definition, Importance, Types of Report - Memo, Letter & Manuscript, Feasibility report, Project report, Progress report, Evaluation report.

UNIT-IV

Technical writing- III (Manuals): Types of manuals, User manual, Product manual, Operations manual

UNIT-V

Information Transfer and Presentations: Non-verbal (bar diagram, flow chart, pie chart, tree diagram) to verbal (writing), Verbal (written) to non-verbal, Important aspects of oral and visual presentations.

Reference Books:

1. Kumar, Kulbhushan, (2019), *Effective Communication Skills*, Khanna Publishing House.
2. Raman, Meenakshi & Sharma, Sangeeta. (2017). *Technical Communication: Principles and Practice*, OUP (3rd Ed.), New Delhi.
3. Rizvi, Ashraf, M. (2018). *Effective Technical Communication* (2nd Ed.). Tata McGraw Hill Education. New Delhi.
4. Sharma, R. C., & Mohan, Krishna. (2017). *Business Correspondence and Report Writing: A Practical Approach to Business &Technical Communication* (4th Ed.). Tata McGraw Hill Education. New Delhi.
5. Tyagi, Kavita & Misra, Padma, (2011), *Advanced Technical Communication*. New Delhi, PHI Learning.

Course Code	**Course Title**						Core/Elective
U24CD4L1	**OPERATING SYSTEMS LAB**						**Core**
Prerequisite	**Hours Per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
	-	**–**	**–**	**3**	**25**	**50**	**1.5**

Course Objectives:

1. Work with unix/linux commands.
2. Learn working with files and use file access permissions.
3. Implement process scheduling algorithms & deadlock management.
4. Implement page replacement algorithms.
5. Implement disk scheduling algorithms.

Course Outcomes:

At the end of the course, student would be able to

1. Work with UNIX commands and Shell Programming.
2. Implement and analyze the performance of different algorithm of operating.
3. Implement CPU scheduling algorithm,
4. Implement Page Replacement Algorithm
5. Implement Deadlock handling mechanism.

List of Experiments

1. Practice of Linux Commands.
i) File Commands
ii) Process Management commands
iii) File Permissions
iv) System Information
2. Implementation of Fork() system call of Unix operating system.
3. Implementation of two process communication for the following
i) Pipes ii) Shared Memory
4. Implementation of Processor Scheduling Algorithms for the following
i) FCFS ii) SJF iii) Priority iv) Round Robin
5. Implementation of Producer Consumer Problem
6. Implementation of Dining Philosophers problem.
7. Simulation of Bankers algorithm for deadlock avoidance
8. Simulation of Bankers algorithm for deadlock Prevention.
9. Implementation of Page Replacement Algorithm for the following
i) FIFO ii) LRU
10. Implementation of Disk Scheduling Algorithm for the following
i) FCFS ii) SCAN iii) C-SCAN

Suggested Readings:

1. Abraham Silberschatz, Peter Galvin, Greg Gagne, Operating System Principles, Ninth Edition, John Wiley & Sons Publication,2012
2. The Design of Unix Operating System, Maurice Bach, Prentice Hall.

Course Code	Course Title						Core/Elective
U24IT4L2	JAVA PROGRAMMING LAB						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
PPS	-	-	-	3	25	50	1.5

Course Objectives:

Develop ability to

1. Build software development skills using java programming for real world applications.
2. Implement frontend and backend of an application
3. Create Java application programs using sound OOP practices such as interfaces, exception handling multi-threading.
4. Understand fundamentals of object-oriented programming in Java.
5. Implement classical problems using java programming.

Course Outcomes

After completing this course, the student will be able to:

1. Develop Java applications using the concepts of Inheritance, interfaces, packages, access control specifies.
2. Implement the concepts of Exception Handling in java Applications.
3. Read and write data using different Java I/O streams.
4. Create graphical user interfaces and Applets by applying the knowledge of Event Handling.
5. Create robust applications using Java standard class libraries and retrieve data from a database with JDBC.

List of Experiments:

1. a) Write a Java sample program to implement class and object concepts.
   b) Write a Java program to illustrate types of constructors.

2. a) Write a Java program to illustrate the concept of Single level and Multi level Inheritance.
   b) Write a Java program to illustrate the concept of class with method overloading and method overriding

3. a) Write a Java program to demonstrate the Interfaces & Abstract Classes.
   b) Write a Java program to implement the concept of exception handling.
   c) Write a Java program to illustrate the concept of threading using Thread Class and runnable Interface.

4. Write a Java program to illustrate the concept of Thread synchronization.

5. Write a Java Program that reads a line of integers, and then displays each integer, and the sum of all the integers (Use String Tokenizer class of java.util)

6. a) Write a Java program that reads a file name from the user, and then displays inform action about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.
   b) Write a Java program to illustrate the concept of I/O Streams.

7. a) Write a Java applet program to implement Color and Graphics class
   b) Write a Java program to implement AWT class

8. Write a Java applet program for handling mouse & key events

9. Write a Java applet program to implement Adapter classes

10. Write a JDBC program to implement CURD operation

11. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -, *, % operations. Add a text field to display the result.

12. Write Servlet application for following
    i. Html & Servlet Communication
    ii. Select record from database
    iii. Application for login page
    iv. Insert record into database

Suggested Readings:

1. Herbert Scheldt, "The Complete Reference Java, 7th Edition, Tata McGraw Hill,2006.
2. James M Slack, Programming and Problem Solving with JAVA, Thomson Learning,2002.
3. C Thomas Wu, An Introduction to Object Oriented Programming with Java 5th Edition, McGraw Hill Publishing,2010.
4. H. M. Dietel and P. J. Dietel, Java How to Program, Sixth Edition, Pearson Education.

Course code	Course Title						Core/Elective
U24EN4L1	Soft Skills & Employability Skills Lab [Common to all branches]						Core
Pre-requisites	Contact Hours Per Week				CIE	SEE	Credits
Basic English	L	T	D	P			
	-	-	-	3	25	50	1.5

Course Objectives:

To expose the students to:

1. Apply soft skills at professional level.
2. Foster leadership skill with a mature outlook for effective functioning at work front.
3. Develop confidence through interpersonal skills.
4. Exhibit their ability and skills to write Resume/CV and cover letter
5. Boost skills of group discussion and interview.

Course Outcomes:

On successful completion of the course the students would be able to:

1. 1.Utilise soft skills at professional level effectively.
2. Function efficiently in multidisciplinary settings by using leadership skills.
3. Build confidence through interpersonal skills utterly.
4. Write Resume/CV and cover letter comprehensively.
5. 5. Enhance the skills of group discussion and interview perfectly.

List of Activities

1. Soft Skills

Introduction to Soft Skills and Types; Time Management, Team work

2. Leadership Skill

Decision Making, Critical Thinking, Conflict Resolution, Adaptability Skills

3. Interpersonal Skills

Stress Management, Emotional Intelligence, Motivation, Presentation Skills

4. Job Skills

Resume/CV writing, Cover letter writin

5. Interview Skills

Dynamics of Group Discussion, Types; Interview, Types, Interview Etiquettes, Mock Interviews,

Suggested Readings:

1. Bhardwaj, Kumkum, (2019), *Fundamentals of Business Communication*, Wiley, India
2. Kapoor Shikha, (2020), *Personality development and Soft Skills-Preparing for Tomorrow*, Wiley India
3. Koneru, Arun, (2017), *Professional Communication*, Tata McGraw-Hill Publishing Company. Ltd, New Delhi
4. Mitra K. Barun. (2016). *Personality Development and Soft Skills*. Oxford University Press.
5. Raman Meenakshi & Sharma Sangeeta, (2017), *Technical Communication: Principles and Practice*, OUP (3rd Ed.). New Delhi.
6. Sharma, Prashant, (2019). *Soft Skills-Personality development for Life Success*, BPB Publications
7. Tyagi, Kavita & Misra, Padma. (2011). *Advanced Technical Communication*, PHI Learning, New Delhi.