MALNAD COLLEGE OF ENGINEERING, HASSAN

(An Autonomous Institution Affiliated to VTU, Belagavi)

Autonomous programme

Bachelor of Engineering

DEPARTMENT OF

COMPUTER SCIENCE AND ENGINEERING

SCHEME and SYLLABUS

III Semester & IV Semester

(2024-25 Admitted Batch)

Academic Year 2025-2026

VISION

To become a prominent department of Computer Science & Engineering producing competent professionals with research and innovation skills, inculcating moral values and societal concerns.

MISSION

1. Impart world class engineering education to produce technically competent engineers.
2. Provide facilities and expertise in advanced computer technology to promote research.
3. Enhance Industry readiness and entrepreneurial abilities through innovative skills
4. Nurture ethical values and social responsibilities

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO 1 : Graduates will be efficient software developers in diverse fields and will be successful professionals and/or pursue higher studies.

PEO 2 : Graduates will be capable to adapt to new computing technology for professional excellence and Research and will be lifelong learners.

PEO 3 : Graduates will work productively exhibiting ethical qualities for the betterment of society.

PEO 4 : Graduates will possess leadership qualities, work harmoniously in a team with effective communication skills.

PROGRAM OUTCOMES

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, natural science, computing engineering fundamentals, and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.

2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

3. **Design/development of solutions**: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)

4. **Conduct investigations of complex problems**: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).

5. **Engineering tool usage**: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

6. **The engineer and the world:** Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).

7. **Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

8. **Individual and collaborative team work:** Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary settings.

9. **Communication:** Communicate effectively and inclusively within the community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.

10. **Project management and finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

11. **Life-long learning:** Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8

PROGRAM SPECIFIC OUTCOMES (PSOs)

Upon graduation, students with a degree B.E. in Computer Science & Engineering will be able to:

PSO – 1: To make the students industry ready by facilitating them with software tools in recent technologies

PSO – 2: To develop IT based solutions for problems in diverse domains

THIRD SEMESTER					
Course Category	**Course Code**	**Course Title**	**L-T-P**	**Credits**	**Contact Hours**
BSC	24MA301	Mathematics for Computer Science	3-2-0	4	5
PCC	24CS302	Digital Design and Computer Organization	3-0-2	4	5
PCC	24CS303	Operating Systems	3-0-2	4	5
PCC	24CS304	Data Structures and its Applications	3-0-0	3	3
PCC	24CS305	Data Structures Laboratory	0-0-2	1	2
(ESC/ETC/PLC)	24CS306X	Engineering Science Course (ESC/ETC/PLC)	2-0-2	3	4
AEC	24CS307X	Ability Enhancement Course	0-0-2	1	2
UHV	24SCR	Social Connect and Responsibility	0-0-2	1	2
BSC	24BCM301	Bridge Course Mathematics -I (Mandate Non-CreditCourse)	3(A)-0-0	AUDIT	3
MC	24NYP1	NSS, YOGA,PE	0-0-2	AUDIT	2
			Total	**21**	**33**

	Engineering Science Course (ESC/ETC/PLC)	
ESC/ETC/PLC	24CS306A	OOP with Java
ESC/ETC/PLC	24CS306B	OOP with C++

Ability Enhancement Course		
AEC	24CS307A	R Programming
AEC	24CS307B	Data Analytics with Excel
AEC	24CS307C	Data Visualization with Python
AEC	24CS307D	Version Controller with GiT

FOURTH SEMESTER					
Course Category	**Course Code**	**Course Title**	**L-T-P (Hrs)**	**Credits**	**Contact Hours**
PCC	24CS401	Design and Analysis of Algorithms	4-0-0	4	4
IPCC	24CS402	Microcontroller and Embedded Systems	3-0-2	4	5
IPCC	24CS403	Database Management Systems	3-0-2	4	5
PCC	24CS404	Algorithms Laboratory	0-0-2	1	2
PCC	24CS405	Unix and Shell Programming Laboratory	0-0-2	1	2
ESC/ETC/PLC	24CS406X	Engineering Science Course (ESC/ETC/PLC)	3-0-0	3	3
AEC	24CS407X	Ability Enhancement Course	0-0-2	1	2
BSC	24CS408	Biology for Engineers	0-0-2	1	2
UHV	24UHV	Universal Human Values	0-0-2	1	2
MC	24NYP2	NSS, YOGA,PE	0-0-2	AUDIT	2
			Total	**20**	**29**

Engineering Science Course (ESC/ETC/PLC)		
ESC/ETC/PLC	24CS406A	Optimization Techniques
ESC/ETC/PLC	24CS406B	Discrete Mathematical Structures
ESC/ETC/PLC	24CS406C	Graph Theory and Combinatorics

Ability Enhancement Course		
1	24CS407A	Computer Assembly and Networking
2	24CS407B	Introduction to Power Bi
3	24CS407C	Technical writing using Latex
4	24CS407D	UI/UX Laboratory

Course Title	DIGITAL DESIGN AND COMPUTER ORGANIZATION		
Course Code	24CS302	L-T-P-C	(3-0-2)4
Exam Hrs.	3	Hours/Week	5
CIE	50 Marks	SEE	50 Marks
		Total Hours	42L+28P+ 50ABL =120

Course Objective: Understand the organization of a computer system and design logic circuits for a given real life problem.

Course Outcomes(COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Explain architecture and functioning of a digital computer components	1	-
2.	Illustrate working of combinational and sequential logic circuits	1	-
3.	Apply arithmetic operations and cache mapping methods for a given problem	2	2
4.	Develop combinational and sequential logic circuit for a given problem.	3	2

Course Contents:

MODULE – 1	11 Hrs

Digital Logic : The Basic Gates, The Universal Gates, Boolean Laws and Theorems, Sum-of-Products Method, Truth Table to Karnaugh Map, Pairs Quads, and Octets, Karnaugh Simplifications - Overlapping, Eliminating Redundant Groups, Don't Care Condition Data-Processing Circuits: Multiplexers, Decoders.

MODULE – 2	11 Hrs

Flip-Flops: RS flip flop, Gated flip flop , Edge triggered flip-flop, D flip flop , Edge-triggered D flip flop , Edge-triggered flip flop , JK Master-slave flip flop . Various Representation of flip flops. Analysis of sequential Circuits, Conversion of flip flops, Registers: Types of Registers Counters: Counter Design as a Synthesis problem.

MODULE – 3	10 Hrs

Basic Structures of Computers: Functional units; Basic Operational Concepts: Bus Structures, Performance. Data Organization: Numbers, Arithmetic operations and characters, Memory Locations and Addresses: Byte addressability, Big-endian & Little-endianassignments, Word Alignment, Accessing Numbers, Characters & Character strings. Input/ Output Organization: Accessing I/O devices, Interrupts: Interrupt Hardware, Enabling & Disabling Interrupt, Handling Multiple devices, Controlling Device Requests, Direct Memory Access.

MODULE – 4	10 Hrs

The Memory System: Basic Concepts, Cache Memories: Mapping functions, Multiplication of Positive numbers: Booth Algorithm, Bit-pair Recoding of Multipliers; Integer division, IEEE Standard for Floating-point numbers, Arithmetic operations on Floating-point numbers, Implementing Floating-Point operations

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Digital Principles and Applications	Donald P Leach, Albert Paul Malvino & Goutam Saha	7th	Tata McGraw Hill	2011
2.	Computer Organization	Carl Hamacher, Z. Vranesic & S. Zaky	5th	McGraw Hill	2012
Reference Books:					
1.	Computer Organization and Architecture	William Stallings	9th	Pearson India	2013
2.	Digital Logic and Computer Design	M Morris Mano	1st	Pearson	2013

MOOC:
http://www.nptelvideos.in/2012/11/computer-organization.html

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching & Learning	3	14	42
2.	Integrated Lab Component	2	14	28
3.	Self-Study Hours-Self Learning	1	14	14
4.	Evaluation of Learning Process	-	-	06
5.	Activity Based Learning	-	-	30
			Total Learning Hours/Semester	**120**

Proposed Assessment Plan (for 50 marks of CIE):

Tool		Remarks	Marks
CIE	CIE1	Conducted for 20 marks(Module 1) & reduced to 10 marks	10
	CIE2	Conducted for 20 marks(Module 2) & reduced to 10 marks	10
	CIE3	Conducted for 20 marks(Module 3) & reduced to 10 marks	10
Activity Details	Activity 1	Laboratory CIE	10
	Activity 2	Activity Based Learning	10
		Total Marks	**50**

Integrated Laboratory Component (28 Hours)

Perform the below experiments using Digital trainer kit.

1.	Verification of truth tables of the following Logic gates Two input (i) OR (ii) AND (iii) NOR (iv) NAND (v) Exclusive-OR (vi) Exclusive-NOR
2.	Design a simple combinational circuit with four variables and obtain minimal expression and verify the truth table.
3.	Design full adder circuit and verify its functional table.
4.	In a battery powered computer, the diskette driver motor 1 should be ON iff There is a diskette in the drive The diskette drive door is closed Diskette drive motor 2 is not ON The battery low signal is not present and The computer has started a read operation or the computer has started a write operation Design a circuit to solve the above scenario using basic gates.
5.	You will gain weight if you eat too much or you do not exercise enough, and your metabolism rate is too low. Design a system such that it alarms you when you gain weight using NAND gates.
6.	The circuit breaker will trip iff The hair drier is turned ON The microwave oven is used All the lights in the room are ON or There is a short circuit in any appliance Solve the above issue using relevant MUX.
7.	In an automated house, two lamps L1 and L2 are controlled by 3 switches: A, B,C. Any one of the lamps should be ON, following the below conditions

	L1 is ON if switch A and B are open but not C L1 is ON if switch B and C are open but not A L2 is ON if only switch C is open L2 is ON if only switch B is open L2 is ON if switch A or C is open, but not B Design a circuit to make the lamp ON using decoder
8.	Assume you are generating and transmitting binary data from one place to another. Check whether the sent data is transmitted properly.
9.	Assume you need to send a secret message consisting of numbers from 1 to 9 and letters from A to F. Secret message is encoded using excess 3 code. Design a circuit using ADDER IC to send a secret message to your friend.
10.	Consider a computer operator who needs to generate a sequence 1011 continuously which is transmitted across the network. Design a circuit to implement this job.
11.	Consider a scenario where in you want to take print out of few selected random pages in sequence numbered from 0 to 15. Design a circuit to achieve this task using J-K Flip-flops.
12.	Design and implement a 3-stage up/down counter that counts from a preset value using Decade presentable counter ICs. Display the result suitably.
Self Study Component (14 Hours)	
1.	Number systems: Decimal, Binary and Hexadecimal.
2.	Number systems: Conversions between Decimal, Binary and Hexadecimal numbers.
3.	Integrated circuit manufacturing process
4.	Digital logic - Generating Logic Levels, The Buffer, The Tri-State Buffer
5.	Multiplexers in real life application
6.	Registers in real life application
7.	Function of internal hardware components of a computer system.
8.	Sequence of steps during system boot-up
9.	Progression of Computer Technology Over Generations
10.	Multicore Architecture
11.	Various levels of cache used in processors
12.	Carry Look ahead adder
13.	Hard Disk – how data is stored & retrieved
14.	Compare integer and floating-point operations
Activity Based Learning (30 Hours)	
DeldSim Simulator	Hours
1.	Learn DeldSim simulator	5
2.	Simulate the below : 1. Basic Logic Gates - Create and test a simple circuits using AND, OR, NOT 2. 4-bit Binary Adder - Use full adders to build a 4-bit binary addition circuit. 3. Binary to Gray Code Converter - Design a circuit that converts 4-bit binary input to Gray code. 4. 2-to-4 Line Decoder - Implement a decoder with enable input and verify outputs. 5. 4-bit Synchronous Counter - Create a counter using flip-flops and clock input. 6. Digital Clock (Basic) - Combine counters and display logic to make a simple digital clock display	20
3.	Documentation	05

Evaluation of Learning Process (6 Hours)	
Type of Evaluation	Hours
Test (1, 2 and 3)	3
Semester End Exam	3
Total	6

Course Articulation matrix

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	3	-	-	-	-	-	-	-	-	-	-	2
CO4	-	-	3	-	-	-	-	-	-	-	-	-	2

Course Title	OPERATING SYSTEMS		
Course Code	24CS303	(L-T-P) C	(3-0-2) 4
Exam	3	Hours/Week	05
CIE	50 Marks	SEE	50 Marks
		Total Hours	42L + 28I+14SL+36ABL = 120

Course Objective: Understand the role of Operating system in managing computer resources.

Course Outcomes: Upon completion of the course, students shall be able to :

COs	Statement	Mapping to PO's	Mapping to PSO's
1	Explain fundamental concepts of operating system.	1	-
2	Apply resource management strategies in operating system.	3,11	2
3	Explore various process synchronization techniques.	2	-
4	Apply suitable algorithms to handle deadlock.	3	2

MODULE - 1	10 Hrs.

Introduction to Operating Systems, System structures: What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and security; Distributed system. Operating System Services; User - Operating System interface; System calls; Types of system calls; System programs; Operating System design and implementation;

MODULE - 2	11 Hrs.

Operating System structure; Virtual machines. **Process Management**: Process concept; Process scheduling; Operations on processes; Inter- process communication, Threads: Overview; Multithreading models; Threading issues. Process Scheduling: Basic concepts; Scheduling criteria; Scheduling algorithms; Multiple-Processor scheduling;

MODULE - 3	11 Hrs.

Process Synchronization: Synchronization: The Critical section problem; Peterson's solution; Synchronization hardware; Semaphores; Classical problems of synchronization.

Deadlocks: Deadlocks: System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock.

MODULE - 4	10 Hrs

Memory Management: Main Memory: Background; Swapping; Contiguous memory allocation; Paging; Segmentation. Virtual Memory Management: Background; Demand paging; Page replacement. **Mass-Storage Structures:** Disk structure; Disk attachment; Disk scheduling; Disk management; Swap space management

Prescribed Text Books

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Operating System Principles	Abraham Silberschatz, Peter Baer Galvin, Greg Gagne	8th	Wiley-India	2012

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Operating systems - A concept based Approach	D.M. Dhamdhere	3rd	Tata McGraw- Hill	2006
2.	Operating Systems	P.C.P. Bhatt	2nd	PH	2006

3.	Operating systems	Harvey M Deital	3rd	Pearson Education	1990

E Books and online course materials:

Sl. No.	Course offered by		Year	URL
1.	Introduction to Operating System	Coursera	2024	https://www.coursera.org/courses?query=operating%20system
2.	Introduction to Operating System	NPTEL	2017	https://onlinecourses.nptel.ac.in/noc20_cs75/preview
3.	Introduction to Operating System	Udacity	2022	https://www.udacity.com/course/introduction-to-operating systems--ud923

Teaching - Learning – Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	2	14	28
3	Student Study Hours – Self Learning	1	14	14
3	Activity Based Learning (ABL1 & ABL2)	-	-	28
4	Evaluation of Learning Process	-	-	08
			Total Learning Hours / Semester	**120**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity 1 2) Details of activity 2	20
	Total	**50**

Activity Based Learning (27 Hours)

ABL 1 (18 Hours) : Activity 1 details **18 Hours**

ABL 1: Implementation of Operating System Concepts Using C Programming

1. Write programs using the I/O system calls of UNIX/LINUX operating system.
2. Write a C program simulate the following CPU scheduling algorithms:
   a) FCFS b) SJF c) Round Robin d) Priority
3. Write a C program which demonstrates interprocess communication between a reader process and a writer process. Use mkfifo, open, read, write and close APIs in your program.
3. Write a C program to simulate producer-consumer problem using semaphores.
4. Write a C program to simulate Bankers Algorithm for DeadLock Avoidance and Prevention.
5. Write a C program to simulate the following contiguous memory allocation Techniques:
   a) Worst Fit b) Best Fit c) First Fit
6. Write a C program to simulate page replacement algorithms:
   a) FIFO b) LRU
7. Write a C program to simulate the following memory segment techniques
   a) Paging b) Segmentation
8. Write a C program to simulate SCAN disk scheduling algorithm.

Evaluation of ABL 1

1. Verify if the program accurately implements the required algorithm or OS concept.
2. Check for correct usage of relevant system calls or simulation techniques.
3. Ensure the code is modular, readable, and well-commented.
4. Confirm the output is clear and test cases cover various input scenarios.

ABL 2: Simulation of Core Operating System Concepts using C – A Mini OS Development Project

Evaluation Criteria :

1. Students will be evaluated based on accurate implementation and functionality of each core OS module including process scheduling, memory management, interprocess communication, and disk scheduling using C and UNIX/Linux system calls.
2. Final assessment will include integration of all individual simulations into a cohesive mini operating system framework with proper modular design, code documentation, and demonstration of each feature.

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	3	-	-	-	-	-	-	-	3	-	2
CO3	-	3	-	-	-	-	-	-	-	-	-	-	-

Course Title	DATA STRUCTURES AND ITS APPLICATIONS		
Course Code	24CS304	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
CIE	50 Marks	SEE	50 Marks
		Total Hours	42L+ 14SL+34ABL = 90

Course Objective: To be able to use appropriate data structures for designing programs.

Course Outcomes (COs) : Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Describe the operations of linear and non-linear data structures	1	-
2.	Implement operations of linear and non-linear data structures	1	-
3.	Apply suitable data structures to solve a problem	2,3	-
4.	Develop a program using linear and non-linear data structures for a given scenario	2,3	2

Course Contents:

MODULE – 1 **11 Hrs**

Introduction: Structures and pointers revisited. Introduction to data structures - Basic terminology, Classification, Operations.

The Stack - Definition, Operations, Array Representation of stacks in C Applications of stack: Infix, postfix and prefix, Basic definitions and examples, evaluating a postfix expression, Program to evaluate a postfix expression, converting an expression from infix to postfix, Program in C to convert an expression from infix to postfix.

Self-Study: Files and its operations

MODULE – 2 **11 Hrs**

Recursion - finding GCD, Fibonacci Series, Recursion Types, Tower of Hanoi, and Recursion versus iteration.

Queues - Definition, Array representation of Queues, Operations on Queues, Types of Queues- Circular Queue and its implementation in C, Applications of Queues.

Linked List: Introduction to linked list, linked list versus arrays, Singly linked list operations - Insert, Delete, Display, Search and Traverse.

Self-Study: Priority Queues

MODULE – 3 **10 Hrs**

Other Lists structures: Circular Lists - C Implementation by adding and deleting nodes, Doubly Linked List - C implementation by adding and deleting nodes, Circular doubly linked list, Linked list Applications: Linked Implementation of stacks and Queues, Polynomial Representation.

Self-Study: Implementation of Polynomial addition using linked lists

MODULE – 4 **10 Hrs**

Trees: Basic Terminology, Types, Representation using array and Linked List. Creating a binary tree from a general tree, Traversing a binary tree- In-order, Pre-order, Post order, Level order, Constructing a binary tree from traversal results**.**

Efficient Binary Trees: Binary Search trees - definition, Operations- Create, Insert, delete, display, Finding height, Finding number of nodes. AVL trees - Definition, Rotations, Constructing an AVL tree.

Self-Study: Threaded Binary trees

Text Book:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Data Structures Using C	Reema Thereja	2nd	Oxford Press	2017

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Data Structures Using C and C++	Yedidyah, Augenstein, Tannenbaum	2nd	PearsonEducation	2003
2.	Data Structures A	Richard F. Gilberg and	1st	Cengage Learning	2005

	Pseudocode Approach with C	Behrouz A. Forouzan			
3.	Classic Data Structures	Debasis Samanta	2nd	PHI	2009
4.	Programming in ANSI C	Balagurusamy E	7th	Tata McGraw Hill	2017

MOOC:
http://nptel.ac.in/keyword_search_result.php?word=data+structures

Self-Learning (14 Hours)	
1.	File operations : read, write, append, seek, etc
2.	Programs on reading data from a file and writing onto a file
3.	Sorting data in files
4.	Counting number of lines, characters in a text file.
5.	Reading numbers from a file and storing odd numbers and even numbers into separate files
6.	Introduction to priority queue
7.	Implementation of priority queue using arrays
8.	Implementation of priority queue using linked lists
9.	Applications of priority queue
10.	Creating Polynomial using linked list
11.	Addition of two polynomials using linked list
12.	Subtraction of two polynomials using linked list
13.	Concept of threaded binary trees
14.	Traversal of a threaded binary trees

Activity Based Learning:	**Hours / Semester**
Applied Problem Solving **:** Students solve various problems on any online programming platform	**28**

Proposed Assessment Plan (for 50 marks of CIE):

Tool		**Remarks**	**Marks**
CIE	**CIE1**	Conducted for 20 marks(Module 1) & reduced to 10 marks	10
	CIE2	Conducted for 20 marks(Module 2) & reduced to 10 marks	10
	CIE3	Conducted for 20 marks(Module 3) & reduced to 10 marks	10
Activity Details		• Test Assignment of GATE question bank • Programming test on Self Learning component	20
		Total	**50**

Teaching - Learning – Evaluation Scheme

Sl. No	**Teaching - Learning Method**	**No. of Hours/ Week**	**No. of Weeks**	**Hours/ Semester**
1.	Class Room Teaching	3	14	42
2.	Self-Learning	1	14	14
3.	Activity Based Learning	-	-	28
4.	Evaluation of Learning Process	-	-	6
		Total Learning Hours / Semester		**90**

Course Articulation matrix

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	3	2	-	-	-	-	-	-	-	-	-	-
CO4	-	3	2	-	-	-	-	-	-	-	-	-	3

Course Title	DATA STRUCTURES LABORATORY		
Course Code	24CS305	L-T-P-C	(0-0-2)1
Exam Hrs.	3	Hours / Week	2
CIE	50 Marks	SEE	50 Marks
		Total Hours	28L+2EV = 30

Course Objective: Design and implement various data structures.

Course Outcomes (COs): Upon the completion of the course the students will be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Develop programs to demonstrate applications of data structures	3, 11	2
2.	Document the programs executed	9	-

Course Contents:

	Self-Guided Programs
1.	Write a C program to find the maximum and minimum element in an array of n integers. Use only pointers for referencing the array.
2.	Write a C program for Dynamic Memory allocation of 10 elements and find the largest element.
3.	Write a C program to represent a complex number using structure variable. Write user definedfunctions that accept two complex numbers and finds their sum and difference.
4.	Define a structure Author name with fields: First name, Middle name and Last name. Using the above structure, design another structure Book: ISBN, Author name, Book Title, Price, Publisher, and Edition.Write a function to search a book given the Author name. Using the above function write a C Program tostore N books information and display the details of a book given the author name.
	Guided Programs
1.	Files are placed one over another in my study room. The file which is at the top is the first one to be removed, i.e. the file which has been placed at the bottom most position remains in the pile of files for the longest period of time. Help me out to add a file and remove the bottom most file from the pile of files.
2.	Consider an algebraic expression which needs to be evaluated by a computer system. Operating System (OS) consumes less time to evaluate if it is in postfix form of the expression. Thus, help your OS to evaluate by converting the expression into its postfix form.
3.	Assume you have converted an algebraic expression into its postfix form to process the expression fast. This expression need to be evaluated for a given set of values.
4.	Assume you come across a toll gate while you are on your way to home town. Illustrate the working of the toll gate using suitable data structure.
5.	Suppose you want to search a text book in a huge library where books are arranged in alphabetical order. Optimize your search by using recursion. Implement Tower of Hanoi problem using recursion.
6.	Consider a traffic signal controlled by a computer system. Traffic signal has three colors: Red, yellow and Green. All these glow in a circular fashion based on the traffic. Implement the above using suitable data structure.
7.	Consider a treasure hunt task where a series of clues are given. Clue1 gives hint to clue2, clue2 Provides hint for clue3 and so on until you can get a hint to the final treasure. Develop an illustration to demonstrate the above scenario.
8.	The parking lot has a fixed number of parking spaces. Cars can enter the parking lot and occupy an available space, and they can also exit the parking lot, freeing up the space for other cars. Designing a parking lot management system using a circular queue.
9.	Consider a list of numbers. Find i. Maximum number ii. Minimum number

	iii. Sum of all the numbers
10.	The phonebook will contain a list of contacts sorted in ascending order based on their names. Each contact will have a name and a phone number. Developing a phonebook management system using an ordered linked list.
11.	Assume you have an iPod, where in you have stored plenty of songs so that you get engaged during a long journey. If you want to hear a particular song, you need to use forward button to reach that song and can also traverse back using backward button. Implement the following using relevant data structure.
12.	Your text book contains chapters, sections, subsections, subdivisions, etc. Illustrate this scenario of text book using tree structure.

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Laboratory CIE	30
Record	Laboratory Record Submission	10
Continuous Evaluation	Conduction of experiments	10
	Total	**50**

Teaching - Learning – Evaluation Scheme

Sl. No	Teaching - Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching	2	14	28
2.	Evaluation of Learning Process			2
			Total Learning Hours / Semester	**30**

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	3	-	-	-	-	-	-	-	3	-	3
CO2	-	-	-	-	-	-	-	-	3	-	-	-	-

Course Title	OBJECT ORIENTED PROGRAMMING WITH JAVA		
Course Code	24CS306A	L-T-P-C	(2-0-2)3
Exam Hrs.	3	Hours / Week	4
CIE	50 Marks	SEE	50 Marks
		Total Hours	28L+28P+ 34ABL=90

Course Objective: Develop java application using object-oriented concepts.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Explain the fundamentals of Object-Oriented Programming.	1	-
2.	Develop java programs for a given problem using suitable Object-Oriented concepts	3,5	1,2
3.	Analyze the syntax and semantics of a given java code/snippet.	2	1

Course Contents:

MODULE – 1 **14 Hrs.**

Object Oriented Concepts and Java: Concepts of Object-Oriented programming language: Object, Class, Message passing, inheritance, encapsulation, and polymorphism Difference between OOP and other conventional programming – advantages and disadvantages of OOP.

Java Programming Fundamentals: Java and Java Applications, Java Development Kit (JDK), The Byte Code, The Java Buzzwords, A first Simple program, handling syntax errors, The Java Keywords, Identifiers in Java.

Data Types and Operators: Java's Primitive Types, A Closer Look at Variables, The Scope and Lifetime of Variables, Operators: Arithmetic, Bitwise, Relational, Boolean Logical, Assignment Operators, the '?' Operator, Type conversion and Casting, Arrays, Strings.

MODULE – 2 **14 Hrs.**

Program Control Statements:Input characters from the Keyboard, if statement, Nested ifs, if-else-if Ladder, Switch Statement, Nested switch statements, for Loop, Enhanced for Loop, While Loop, do-while Loop, Nested Loops, Use of break and continue.

Introducing Classes, Objects and Methods: Class Fundamentals, Declaring Objects, Object Reference Variables, Methods, Constructors, the "This" keyword, Garbage collection, Overloading Methods and constructors, Argument Passing, Returning Objects, Access Control, Understanding Static, Nested and Inner Classes.

MODULE – 3 **14 Hrs.**

Inheritance: Inheritance Basics, Member Access and Inheritance, Constructors andinheritance, Using super to C all Superclass constructors, Using super to Access Superclass Members, Creating a Multilevel Hierarchy, When are Constructors Executed, Superclass References and Subclass Objects, Method Overriding, Overridden Methods support polymorphism, Why overridden Methods, Using Abstract Classes, Using final, The object class.

MODULE – 4 **14 Hrs.**

Interfaces: Interface Fundamentals, Creating an Interface, Implementing an Interface, Implementing Multiple Interfaces, Interfaces can be extended, NestedInterfaces. Packages: Package Fundamentals, Packages and Member Access, Importing Packages, Static import.

Exception Handling: Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and Catch, Multiple catch Clauses, throw, finally, Java's Built-in Exceptions, Customized exceptions.

Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Java Fundamentals: A comprehensive Introduction	Herbert Schildt, Dale Skrien.	1st	Tata McGraw Hill	2013

	(Chapters 1, 2, 3, 4, 5, 6, 7, 8, 9,10,12)				
2.	Java –The complete Reference (Chapter 19).	Herbert Schildt	8th	Tata Mcgraw Hill Education	-

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Programming in JAVA2	Dr K Somasundaram	1st	Jaico publications	-
2.	Java Programming	Hari Mohan Pandey	1st	Pearson Education	2012
3.	Java How to Program	Deitel and Deitel	6th	Pearson	-

MOOCs:

1. http://nptel.ac.in/courses/106106147/
2. http://www.nptelvideos.com/java/java_video_lectures_tutorials.php
3. https://www.youtube.com/watch?v=0KL_zftem4g
4. https://www.coursera.org/specializations/object-oriented-programming

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	2	14	28
2	Integrated Lab Component	2	14	28
3	Activity Based Learning (ABL)	-	-	24
4	Evaluation of Learning Process	-	-	10
			Total Learning Hours/Semester	**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool		Remarks	Marks
CIE	CIE1	Conducted for 20 marks & reduced to 10 marks	10
	CIE2	Conducted for 20 marks & reduced to 10 marks	10
	CIE3	Conducted for 20 marks & reduced to 10 marks	10
Activity Details	Activity-1	Laboratory CIE-1, Record & Continuous evaluation	15
	Activity-2	ABL	5

Laboratory Component:

Sl No	Programs	Hours
1.	Write java programs a. To print Fibonacci series without using recursion and using recursion. b. To check prime numbers. c. To sort an array element using bubble sort algorithm.	4
2.	Create a class called account with the data members (accNum: integer, name: string, phoneNum:integer, balAmt:float) and following methods: a. getInput() to get input from the user. b. deposit() method which takes the amount to be deposited in to his/her account and do the calculation. c. withdraw() method which gets the amount to be withdrawn from hi/her account. d. Print the appropriate results.	4
3.	Define a stack class to implement the stack data structure. Include constructors to	4

	perform initialization, method push to push an element into the stack, method pop to remove an element from the stack and display method to display the elements of the stack.	
4.	Define a class Complex with data members as two complex numbers, constructors for initialization these numbers, members, methods to add and subtract two complex numbers.	4
5.	Write a java program to work with strings: a. Program to check whether a string is a Palindrome b. Read a text and count all the occurrences of a particular word. c. Replace a substring in the given string, d. Rearrange the string and rewrite in alphabetical order. Compare two string ignoring case. Concatenate two strings.	4
6.	Write a Java program to create a class called Shape with a method called getArea(). Create a subclass called Rectangle that overrides the getArea() method to calculate the area of a rectangle.	4
7.	Write a Java program to create an abstract class BankAccount with abstract methods deposit () and withdraw (). Create subclasses: SavingsAccount and CurrentAccount that extend the BankAccount class and implement the respective methods to handle deposits and withdrawals for each account type.	2
8.	Write a Java program that reads a list of integers from the user and throws an exception if any numbers are duplicates.	2

Activity Based Learning (24 Hours)

ABL		**Hours**
1.	Develop a java application for the given real world problems using OOP concepts.	24

Course Articulation matrix

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	3	-	2	-	-	-	-	-	-	3	3
CO3	-	3	-	-	-	-	-	-	-	-	-	3	-

Course Title	OBJECT ORIENTED PROGRAMMING WITH C++		
Course Code	24CS306B	L-T-P-C	(2-0-2)3
Exam Hrs.	3	Hours / Week	4
CIE	50 Marks	SEE	50 Marks
		Total Hours	28L+28P+ 34ABL=90

Course Objective: To solve real world problems using object oriented concepts.
Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Explain the object-oriented programming concepts.	1	-
2.	Develop reusable and extensible programs using Inheritance.	3	-
3.	Implement the concept of Encapsulation, Polymorphism and exception handling.	3	-
4.	Design the solution to a real world problem using Object – Oriented programming concepts.	3	2

Course Contents:

MODULE – 1 **14 Hrs.**

Introduction to Object Oriented Programming: A Look at Procedure-Oriented Programming, Object-Oriented Programming Paradigm, Basic Concepts of Objet-Oriented Programming, Benefits of OOP, Object-Oriented Languages, and Applications of OOP. A Simple C++ Program, More C++ Statements, Structure of C++ Program, An Example with Class, Tokens, Keywords, Identifiers and constants, Reference Variables, Operators in C++, Scope resolution operator, Expressions and their types– Special assignment expressions.

MODULE – 2 **14 Hrs.**

Functions in C++: Function prototyping, Call by reference, Return by reference, Inline functions, Default arguments, Function overloading.
Classes and Objects: Specifying a Class, Defining Member Functions, A C++ Program with Class, Static Data Members, Static Member Functions, Arrays of Objects, Objects as Function Arguments, Friend Functions, Returning Objects, Constructors, Parameterized Constructors, Multiple Constructors in a class, Copy Constructor, Destructors.

MODULE – 3 **14 Hrs.**

Operator Overloading: Defining Operator Overloading – Overloading Unary Operators – Overloading Binary Operators - Overloading Binary Operators using Friend function – Manipulation of strings using Operators – Rules for Overloading Operators. **Inheritance:** Derived class Constructors, destructors, Types of Inheritance, Defining Derived classes, Single Inheritance, Multiple, Hierarchical Inheritance, Hybrid Inheritance.

MODULE – 4 **14 Hrs.**

Templates: Class Templates – Class Templates with Multiple Parameters, Function templates, Function Templates with Multiple Parameters, Overloading of Template functions, Member Function Templates.

Exception Handling: Introduction to Exception, Benefits of Exception handling, Try and catch block Throw statement, Pre-defined exceptions in C++.

Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Object Oriented Programming with C++	E. Balaguru samy	8th	Tata McGraw Hill Education Pvt.Ltd	2020

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Programming with ANSI C++",	Bhushan Trivedi	2nd	Oxford Press	2012

MOOCs:

1. https://www.mooc-list.com/course/introduction-c-coursera
2. https://onlinecourses.nptel.ac.in/noc21_cs02/preview
3. https://www.mooc-list.com/course/c-lab-content-coursera
4. https://www.mooc-list.com/course/c-class-development-coursera

Web links and Video Lectures (e-Resources):

1. Basics of C++ - https://www.youtube.com/watch?v=BClS40yzssA
2. Functions of C++ - https://www.youtube.com/watch?v=p8ehAjZWjPw

Tutorial Link:

1. https://www.w3schools.com/cpp/cpp_intro.asp
2. https://www.edx.org/course/introduction-to-c-3

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	2	14	28
2	Integrated Lab Component	2	14	28
3	Activity Based Learning (ABL)	-	-	24
4	Evaluation of Learning Process	-	-	10
		Total Learning Hours/Semester		**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool		Remarks	Marks
CIE	CIE1	Conducted for 20 marks & reduced to 10 marks	10
	CIE2	Conducted for 20 marks & reduced to 10 marks	10
	CIE3	Conducted for 20 marks & reduced to 10 marks	10
Activity Details	Activity-1	Laboratory CIE-1, Record & Continuous evaluation	15
	Activity-2	ABL	5

Laboratory Component: Develop C++ program to demonstrate

Sl No	Programs	Hours
1.	The use of scope resolution operator.	2
2.	Call by reference.	2
3.	Inline functions.	2
4.	Default arguments.	2
5.	Function overloading.	2
6.	Constructors and Destructors.	2
7.	Operator Overloading.	2
8.	Friend function.	2
9.	Single Inheritance.	2
10.	Multiple Inheritance.	2
11.	Hierarchical Inheritance.	2
12.	Class Templates.	3
13.	Function templates.	3

Activity Based Learning (26 Hours)

1.	Develop a C++ application for the given real world problems using OOP concepts.	24

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	**3**	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-	-
CO4	-	-	3	-	-	-	-	-	-	-	-	-	3

Course Title	R PROGRAMMING		
Course Code	24CS307A	L-T-P-C	(0-0-2) 1
Exam Hrs.	3	Hours / Week	02
CIE	50 Marks	SEE	50
		Total Hours	28P + 2EV = 30

Course Objective: To learn and Practice Programming techniques using R Programming.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Prepare the dataset in suitable format with required preprocessing.	1	-
2.	Apply suitable R programming language constructs to write a program.	2, 3, 5	-
3.	Use visualization packages and file handlers for data analysis.	1, 2	-

Course Contents:

Practice Programs: (Self-Learning)

1. Installation of R Studio
2. Write an R Program to take input from the user (name and age) and display the values. Also print the version of R installation.
3. Write an R Program to get the details of the objects in memory.
4. Write an R Program to create a sequence of numbers from 20 to 50 and find the mean and product of numbers from 20 to 60 and sum of numbers from 51 to 91.
5. Write an R Program to multiply two vectors of integer's type and length 3.

Guided Laboratory Experiments

1. Demonstrate the steps for installation of R and R Studio. Perform the following:
   a) Assign different type of values to variables and display the type of variable. Assign different types such as Double, Integer, Logical, Complex and Character and understand the difference between each data type.
   a. Demonstrate Arithmetic and Logical Operations with simple examples.
   b. Demonstrate generation of sequences and creation of vectors.
   c. Demonstrate Creation of Matrices
   d. Demonstrate the Creation of Matrices from Vectors using Binding Function.
   e. Demonstrate element extraction from vectors, matrices and arrays

2. Assess the Financial Statement of an Organization being supplied with 2 vectors of data: Monthly Revenue and Monthly Expenses for the Financial Year. You can create your own sample data vector for this experiment) Calculate the following financial metrics:
   a. Profit for each month.
   b. Profit after tax for each month (Tax Rate is 30%).
   c. Profit margin for each month equals to profit after tax divided by revenue.
   d. Good Months – where the profit after tax was greater than the mean for the year.
   e. Bad Months – where the profit after tax was less than the mean for the year.
   f. The best month – where the profit after tax was max for the year.
   g. The worst month – where the profit after tax was min for the year.

   Note: a. All Results need to be presented as vectors b. Results for Dollar values need to be calculated with $0.01 precision, but need to be presented in Units of $1000 (i.e 1k) with no decimal points c. Results for the profit margin ratio need to be presented in units of % with no decimal point. d. It is okay for tax to be negative for any given month (deferred tax asset) e. Generate CSV file for the data.

3. Develop a program to create two 3 X 3 matrices A and B and perform the following operations
   a) Transpose of the matrix b) addition c) subtraction d) multiplication
4. Develop a program to find the factorial of given number using recursive function calls.
5. Develop an R Program using functions to find all the prime numbers up to a specified number by the method of Sieve of Eratosthenes.
6. The built-in data set mammals contain data on body weight versus brain weight. Develop R commands to:
   a) Find the Pearson and Spearman correlation coefficients. Are they similar?
   b) Plot the data using the plot command.
   c) Plot the logarithm (log) of each variable and see if that makes a difference.
7. Develop R program to create a Data Frame with following details and do the following operations.

Item code	Item category	Item price
1001	Electronics	700
1002	Desktop Supplies	300
1003	Office Supplies	350
1004	USB	400
1005	CD Drive	800

   a) Subset the Data frame and display the details of only those items whose price is greater than or equal to 350.
   b) Subset the Data frame and display only the items where the category is either “Office Supplies” or “Desktop Supplies”
   c) Create another Data Frame called “item-details” with three different fields item_Code, ItemQtyonHand and ItemReorderLvl and merge the two frames
8. Let us use the built-in dataset air quality which has Daily air quality measurements in New York, May to September 1973. Develop R program to generate histogram by using appropriate arguments for the following statements.
   a) Assigning names, using the air quality data set.
   b) Change colors of the Histogram
   c) Remove Axis and Add labels to Histogram
   d) Change Axis limits of a Histogram
   e) Add Density curve to the histogram
9. Design a data frame in R for storing about 20 employee details. Create a CSV file named “input.csv” that defines all the required information about the employee such as id, name, salary, start_date, dept. Import into R and do the following analysis.
   a) Find the total number rows & columns
   b) Find the maximum salary
   c) Retrieve the details of the employee with maximum salary
   d) Retrieve all the employees working in the IT Department.
   e) Retrieve the employees in the IT Department whose salary is greater than 20000 and write these details into another file “output.csv”
10. Using the built in dataset mtcars which is a popular dataset consisting of the design and fuel consumption patterns of 32 different automobiles. The data was extracted from the 1974 Motor Trend US magazine, and comprises fuel consumption and 10 aspects of automobile design and performance for 32 automobiles (1973-74 models). Format A data frame with 32 observations on 11 variables : [1] mpg Miles/(US) gallon, [2] cyl Number of cylinders [3] disp Displacement (cu.in.), [4] hp Gross horsepower [5] drat Rear axle ratio,[6] wt Weight (lb/1000) [7] qsec 1/4 mile time, [8] vs V/S, [9] am Transmission (0 = automatic, 1 = manual), [10] gear Number of forward gears, [11] carb Number of carburetors
    Develop R program, to solve the following:
    a) What is the total number of observations and variables in the dataset?
    b) Find the car with the largest hp and the least hp using suitable functions

c) Plot histogram / density for each variable and determine whether continuous variables are normally distributed or not. If not, what is their skewness?
d) What is the average difference of gross horse power (hp) between automobiles with 3 and 4 number of cylinders (cyl)? Also determine the difference in their standard deviations.
e) Which pair of variables has the highest Pearson correlation?

Text Book :

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Learning R: A Step by Step Function Guide to Data Analysis	Cotton, R.	1st	O'Reilly Media Inc	2013

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Introduction to Scientific Programming and Simulation Using	Jones, O., Maillardet. R. and Robinson, A	1st	The R Series.	2014
2.	The Book of R: A First Course in Programming and Statistics	Davies, T.M	1st	No Starch Press	2016

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	3	-	3	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-	-

Teaching - Learning – Evaluation Scheme:

Sl No.	Teaching and Learning Method	No. of Hours/Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	-	-	-
2	Lab Component	2	14	28
3	Student Study Hours – Self Learning	-	-	-
4	Activity Based Learning (ABL1)	-	-	-
5	Evaluation of Learning Process	-	-	2
	Total Learning Hours/Semester			**30**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	CIE conducted for 30 marks	30
Lab Report	Lab Report Submission	10
Activity Details	Project based group activity	10

Activity Details

1.	Identifying areas in which students want to carry out the project
2.	Meeting and Discussion (Online or offline) with the faculty and fixing the Problem Statement
3.	Designing and implementing the project
4.	Presentation and submitting the final report

Course Title	DATA ANALYTICS WITH EXCEL		
Course Code	24CS307B	L-T-P-C	(0-0-2)1
Exam Hrs.	3	Hours / Week	2
CIE	50 Marks	SEE	50 Marks
		Total Hours	28L+2EV = 30

Course Objective: To perform Data analytics using Excel.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mappingto PSOs
1.	Apply the mathematical calculations in Excel	1, 2	2
2.	Apply sorting, filtering and condition formats for the given problem	2, 3, 5	1
3.	Visualize results of excel charts for the given problem.	1,5,11	1,2

Course Contents:

Guided Laboratory Experiments

1. In a company, 30 employee details (name, Date of Joining, Qualification, and Salary) are stored in Microsoft Access Database and text file. Using Excel tool import the data from different sources for analysis and perform the following:
   a. Show average salary.
   b. Show salary between 30000/- and 50000/-
   c. Sort the employee list on the date of joining.

2. Suppose a class of size 40 having SGPA of 8 semesters between 5 to 10. Calculate the CGPA of each student in below Grade form:

O	S	A	B	C
10>=9	8 - 8.9	7 – 7.9	6 – 6.9	5 – 5.9

3. Create 40 students name in the form of First name, Middle name and Last name. Concatenate all the names and store in one column and also find the length of each name.

4. Suppose your customer survey results from the east and west regions, month wise are

Month	East	West	Low (<50%)	Medium (50%-80%)	High (>80%)
Apr-15	86.4%	63.0%	50%	30%	20%
May-15	45.8%	58.9%	50%	30%	20%
Jun-15	44.1%	81.6%	50%	30%	20%
Jul-15	77.6%	86.1%	50%	30%	20%
Aug-15	80.7%	95.0%	50%	30%	20%

   For the above date, display customer satisfaction survey using Band Chart

5. A Person takes a loan of Rs. 5,00,000/- for a tenure of 30 years, find the monthly payments (EMI) for the varied interest rates (Assume interest rate start with 12% and incremented by 2% in each month). Calculate the amount of interest and Principal that is paid in the second year. (use what if Analysis tool)

6. Suppose there is a bookstore that has 100 books in storage. The original price of the book is 250 and certain number of books was sold at that price. Later, the bookstore announced a 10% discount on that book and cleared off the stock. You might want to know how many books are sold at the original price to obtain total revenue of 24,500.

7. Suppose you want to have a report displaying the following – (Explore Data using Pivot Table)
   a. Data for five disciplines - Archery, Diving, Fencing, Figure Skating and Speed Skating.
   b. Regions that scored more than 80 medals in these 5 disciplines.
   c. The count of medals in each of the five disciplines in each of these regions.
   d. Total count of medals for the five disciplines in each of these regions.

8.	Consider the data of 30 employees are stored in two different tables. First table consists of name, employee ID and Second table consists of employee ID, salary. Find the employee salary using lookup table from second table to first.
9.	In Olympic, 20 countries participated and won various medals by male and female in equal propositions. Display the medal count for each country with the charts (Pie, Column, Bar, Line, Scatter, and Bubble).
10.	Consider the sequence of data from 1 to 100, where Male are 48% and Female are 52% in the data. For the given data create Male vs Female Info-graphic Chart, Male vs Female Ratio Chart and Wafffle chart.

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Laboratory CIE	30
Record	Laboratory Record Submission	10
Continuous Evaluation	Conduction of experiments	10
	Total	50

Teaching - Learning – Evaluation Scheme

Sl. No	Teaching - Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching	2	14	28
2.	Evaluation of Learning Process	-	-	2
			Total Learning Hours / Semester	**30**

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	-	2
CO2		3	3		3	-	-	-	-	-	-	2	-
CO3	3	-	-	-	3	-	-	-	-	-	2	2	2

Course Title	DATA VISUALIZATION WITH PYTHON		
Course Code	24CS307C	L-T-P-C	(0-0-2) 1
Exam Hrs.	3	Hours / Week	02
CIE	50 Marks	SEE	50
		Total Hours	28P + 2EV = 30

Course Objective: To explore principles and techniques of data visualization using Python.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mappingto POs	Mapping to PSOs
1.	Demonstrate the use of IDLE or PyCharm IDE to create Python Applications	1, 5	-
2.	Apply various visualization techniques using suitable python libraries.	2, 5, 9	2
3.	Implement, document and present the data visualization projects for the chosen problems.	2, 5, 9, 11	2

Course Contents:

Practice Programs: (Self-Learning)

1 Installation of Pycharm
2 Importing numpy, CSV, matplotlib libraries.

Guided Laboratory Experiments

1. Write a Python program to read data from a CSV file and create a line plot to visualize the trend over time. Customize the plot with appropriate labels, title, and color.
2. Load a dataset containing information about students' scores in different subjects. Create a scatter plot to visualize the relationship between two variables (e.g., math score vs. science score). Use Seaborn to enhance the plot with appropriate styling and add labels.
3. Given a dataset with multiple variables, create a figure with two subplots: one displaying a line plot and the other showing a bar chart. Customize the subplots with appropriate titles, legends, and colors.
4. Load a dataset containing information about employees' salaries across different departments. Create a box plot and a violin plot to visualize the distribution of salaries by department. Customize the plots and add appropriate labels and titles.
5. Load a dataset containing stock prices over time. Create a line plot to visualize the stock prices and add appropriate labels and titles. Format the x-axis tick labels to display the dates properly.
6. Load a dataset containing temperature readings over time. Create an interactive line plot using Plotly, which displays the temperature when hovering over the data points. Add appropriate labels and customize the plot's appearance.
7. Load a dataset with information about population density by country. Create a choropleth map using GeoPandas to visualize the population density. Customize the map's appearance and add a color legend.
8. Design and implement an interactive dashboard using Dash to display various visualizations. Include at least two interactive controls (e.g., dropdowns, sliders) to update the visualizations dynamically.

Sample Activity Problem:

- Select a dataset related to a specific topic of interest (e.g., climate change, COVID-19). Design a series of visualizations that tell a compelling data story, highlighting key insights and trends. Present the visualizations with appropriate annotations and captions.
- Choose a dataset related to a real-world problem (e.g., retail sales, customer behavior). Explore the dataset, identify interesting patterns, and design a set of visualizations to present the findings effectively. Present the visualizations along with a brief explanation of the insights gained.

Text Book :

Sl.No	Book Title	Authors	Edition	Publisher	Year

1.	Python Data Visualization Using Plotly Framework	Stephen G Schmitt	1st		2024

MOOC:
https://www.coursera.org/learn/python-for-data-visualization
https://www.edx.org/learn/data-visualization/ibm-visualizing-data-with-python

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	2	-	-	-	-	-	-	-	-
CO2	-	2	-	-	3	-	-	-	3	-	-	-	3
CO3	-	3	-	-	3	-	-	-	3	-	3	-	3

Teaching - Learning – Evaluation Scheme:

Sl No.	Teaching and Learning Method	No. of Hours/Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	-	-	-
2	Lab Component	2	14	28
3	Student Study Hours – Self Learning	-	-	-
4	Activity Based Learning (ABL1)	-	-	-
5	Evaluation of Learning Process	-	-	2
	Total Learning Hours/Semester			**30**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	CIE conducted for 30 marks	30
Lab Report	Lab Report Submission	10
Activity Details	Project based group activity	10

Activity Based Learning (14 Hours)

ABL1: Implementing Real Time Project using Python

1.	Identifying areas in which students want to carry out the project
2.	Meeting and Discussion (Online or offline) with the faculty and fixing the Problem Statement
3.	Designing and implementing the project
4.	Presentation and submitting the final report

Course Title	VERSION CONTROLLER WITH GiT		
Course Code	24CS307D	L-T-P-C	(0-0-2) 1
Exam Hrs.	3	Hours / Week	02
CIE	50 Marks	SEE	50
		Total Hours	28P + 2EV = 30

Course Objective: To use GitLab/Git and utilize it for software development.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Construct the repository using various Git commands.	3, 5	1, 2
2.	Demonstrate and document the work carried out	5, 9, 11	1, 2

Course Contents:

Practice Programs: (Self-Learning)

- Installation of Desktop Git repository

Guided Laboratory Experiments

1. Initializing a Repository: Initialize a new Git repository for a simple project. Add a few files to the repository and commit them.
2. Committing Changes: Make changes to the files in the repository and commit them. Practice creating meaningful commit messages
3. Creating and Switching Branches: Create a new branch in the repository, make changes in the branch, and switch between branches.
4. Merging Branches: Create a branch, make changes in both the main branch and the new branch, and merge the changes back into the main branch.
5. Resolving Merge Conflicts: Create a merge conflict by making conflicting changes in two different branches. Practice resolving the conflict using Git's conflict resolution tools.
6. Working with Remote Repositories: Clone a remote repository to your local machine. Make changes locally and push the changes back to the remote repository.
7. Collaborating with Others: Practice collaborating with others using Git. Clone a shared repository, make changes, push the changes, and pull changes made by others.
8. Reverting and Rolling Back Commits: Experiment with reverting commits and rolling back changes to a previous state in the repository using Git commands.
9. Tagging Releases: Tag a specific commit in the repository as a release version. Practice creating annotated tags and lightweight tags.
10. Ignoring Files: Create a .gitignore file to exclude certain files or directories from being tracked by Git.
11. Viewing Repository History: Use Git commands to view the commit history, explore differences between commits, and track changes made over time.
12. Branch Management: Practice creating, deleting, and renaming branches in the repository using Git commands.

Text Book :

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Version Control with Git	Prem Kumar Ponuthorai, Jon Loeliger	3rd	O'Reilly Media Inc	2022

eBook:
https://www.oreilly.com/library/view/version-control-with/9781492091189/

MOOC:

1. https://www.coursera.org/learn/version-control-with-git
2. https://www.classcentral.com/course/microsoft-learn-introduction-to-version-control-with-git-2391

Course Articulation matrix													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	-	-	3	-	3	-	-	-	-	-	-	3	3
CO2	-	-	-	-	3	-	-	-	2	-	3	3	3

Teaching - Learning – Evaluation Scheme:

Sl No.	Teaching and Learning Method	No. of Hours/Week	No. of Weeks	Hours/ Semester
1	**Class Room Teaching & Learning**	**-**	**-**	**-**
2	**Lab Component**	2	14	28
3	**Student Study Hours – Self Learning**	**-**	**-**	**-**
4	**Activity Based Learning (ABL1)**	**-**	**-**	**-**
5	**Evaluation of Learning Process**	**-**	**-**	**2**
			Total Learning Hours/Semester	**30**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	CIE conducted for 30 marks	30
Lab Report	Lab Report Submission	10
Activity Details	Project based group activity	10

Activity Based Learning (14 Hours)

1.	Identifying areas in which students want to carry out the project
2.	Meeting and Discussion (Online or offline) with the faculty and fixing the Problem Statement
3.	Designing and implementing the project
4.	Presentation and submitting the final report

Course Title	SOCIAL CONNECT & RESPONSIBILITY		
Course Code	**24SCR**	**L-T-P**	**(0-0-2)1**
Exam	**3 Hrs.**	**Hours/Week**	**2**
CIE	**100 Marks**	**Total Hours**	**28L + 2E= 30**

Course Objective: Provide a formal platform for students to communicate and connect with their surroundings and create a responsible connection with society.

Course outcomes: At the end of course, student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Describe societal challenges and build solutions to alleviate these complex social problems through immersion, design & technology.	3,5,6	
2.	Communicate and connect with their surroundings.	7,11	

Course Content

MODULE – 1	5 Hrs

Plantation and adoption of a tree: Plantation of a tree that will be adopted by a group of students. They will also make an excerpt either as a documentary or a photo blog describing the plant's origin, its usage in daily life, and its appearance in folklore and literature.

MODULE – 2	5 Hrs

Heritage walk and crafts corner: Heritage tour, knowing the history and culture of the city, connecting to people around through their history, knowing the city and its craftsman, photo blog and documentary on evolution and practice of various craft forms.

MODULE -3	5 Hrs

Organic farming and waste management: Usefulness of organic farming, wet waste management in neighboring villages, and implementation in the campus.

MODULE -4	5 Hrs

Water Conservation: knowing the present practices in the surrounding villages and implementation in the campus, documentary or photo blog presenting the current practices. **Food Walk** City's culinary practices, food lore, and indigenous materials of the region used in cooking.

Course Conduction

A total of 15-20 hours engagement per semester is required for the course. Students will be divided into teams and each team will be handled by two **faculty mentors**. Faculty mentors will design the activities for evaluation.

Guideline for Assessment Process:

Continuous Internal Evaluation (CIE)

After completion of, the social connect, the student shall prepare, with daily **diary** as reference, a comprehensive report in consultation with the mentor/s to indicate what he has observed and learned in the social connect period. The report should be signed by the mentor. The report shall be evaluated on the basis of the following criteria and/or other relevant criteria pertaining to the activity completed.

- Dairy recording the details of activity conducted
- Planning and scheduling the social connect
- Information/Data collected during the social connect
- Analysis of the information/data and report writing

Considering all above points allotting the marks as mentioned below

Excellent	80 to 100
Good	60 to 79
Satisfactory	40 to 59
Unsatisfactory and fail	<=39

Teaching - Learning – Evaluation Scheme:				
Sl No.	**Teaching and Learning Method**	**No. of Hours/Week**	**No. of Weeks**	**Hours/ Semester**
1	Class Room Teaching & Learning	-	-	-
2	Lab Component	2	14	28
3	Student Study Hours – Self Learning			
4	Activity Based Learning (ABL1)			
5	Evaluation of Learning Process	-	-	2
			Total Learning Hours/Semester	**30**

Proposed Assessment Plan (for 50 marks of CIE):			
Tool		**Remarks**	**Marks**
CIE	**CIE1**		
	CIE2		
	CIE3		
Activity Details			

Course Articulation matrix

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	-	-	3	-	2	3	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	3	-	-	-	3	-	-

Course Title	NATIONAL SERVICE SCHEME (NSS)		
Course Code	24NYP1	L-T-P-C	(0-0-2)0
Exam Hrs.		Hours / Week	2
		Total Hours	28

Course Objective: To use GitLab/Git and utilize it for software development.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Understand the importance of his / her responsibilities towards society	6	-
2.	Analyze the environmental and societal problems/issues and will be able to design solutions for the same.	3,6	-
3.	Evaluate the existing system and to propose practical solutions for the same for sustainable development.	3,6	-
4.	Implement government or self-driven projects effectively in the field.	11	-
5.	Develop capacity to meet emergencies and natural disasters & practice national integration and social harmony in general.	11	-

Course Contents:

Module 1	8 Hrs
Organic farming, Indian Agriculture (Past, Present and Future) Connectivity for marketing	
Module 2	**8 Hrs**
Waste management– Public, Private and Govt. organization, 5 R's.	
Module 3	**8 Hrs**
Setting of the information imparting club for women leading to contribution in social and economic issues.	

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	NSS Course Manual	VTU Belagavi	1st	NSS Cell	
2.	Activities reports and its manual	Government of Karnataka	1st	NSS cell	
3.	Activities reports and its manual	Government of India	1st	NSS cell	

Proposed Assessment Plan (for 50 marks of CIE):

Tool		Remarks	Marks
CIE	CIE1		
	CIE2		
	CIE3		
Activity Details			

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2													

Course Title	PHYSICAL EDUCATION (PE)		
Course Code	24NYP1	L-T-P-C	(0-0-2)0
Exam Hrs.		Hours / Week	2
		Total Hours	28

Course Objective: To use GitLab/Git and utilize it for software development.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Understand the fundamental concepts and skills of Physical Education, Health, Nutrition and Fitness.	9, 10, 12	-
2.	Familiarization of health-related Exercises, Sports for overall growth and development.	9,12	-
3.	Create a foundation for the professionals in Physical Education and Sports	12	-
4.	Participate in the competition at regional/state / national / international levels.	9,10,12	-
5.	Create consciousness among the students on Health, Fitness and Wellness in developing and maintaining a healthy lifestyle.	9,10,12	-

Course Contents:

Module 1	4 Hrs
Orientation - Lifestyle, Health & Wellness, Pre-Fitness test.	
Module 2	**4 Hrs**
General Fitness & Components of Fitness - Warming up (Free Hand exercises), Strength – Push-up / Pull ups, Speed – 30 mtr Dash	
Module 3	**16 Hrs**
Specific games (Any one to be selected by the student) 1. Kabaddi – Hand touch, Toe Touch, Thigh Hold, Ankle hold and Bonus. 2. Kho-Kho – Giving Kho, Single Chain, Pole dive, Pole turning, 3-6 Up.	

Proposed Assessment Plan (for 50 marks of CIE):

Tool		Remarks	Marks
CIE	CIE1		
	CIE2		
	CIE3		
Activity Details			

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2													

Course Title	YOGA		
Course Code	24NYP1	L-T-P-C	(0-0-2)0
Exam Hrs.		Hours / Week	2
		Total Hours	28

Course Objective: To use GitLab/Git and utilize it for software development.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Understand the Philosophical and Scientific Basis of Yoga	12	-
2.	Demonstrate Proficiency in Basic Yoga Practices	9	-
3.	Analyze the Role of Yoga in Managing Stress and Enhancing Lifestyle	7, 12	-
4.	Apply Yoga Principles for Personal and Professional Growth	10, 12	-

Course Contents:

Module 1	8 Hrs
lntroduction of Yoga Aim and Objectives of yoga, Prayer, Brief introduction of yogic practices for common man, Rules and regulations, Misconceptions of yoga	
Module 2	**8 Hrs**
Suryanamaskara Suryanamaskar prayer and its meanitrg, Need, importance and benefits of Suryanamaskar 12 count, 2 rounds	
Module 3	**8 Hrs**
Different types of Asanas a. Sitting l. Padmasana 2. Vajrasana b. Standing 1. Vrikshana 2. Trikonasana c. Prone line l. Bhujangasana 2. Shalabhasana d. Supine line 1. utthitadvipadasana 2. Ardhahalasana	

Proposed Assessment Plan (for 50 marks of CIE):

Tool		Remarks	Marks
CIE	CIE1		
	CIE2		
	CIE3		
Activity Details			

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2													

Course Title	DESIGN AND ANALYSIS OF ALGORITHMS		
Course Code	24CS401	L-T-P-C	(4-0-0)4
Exam Hrs.	3	Hours / Week	4
SEE	50 Marks	CIE	50 Marks
		Total Hours	56L+ 14SL+43ABL + 7 EV = 120

Course Objective: To develop algorithms using suitable design technique and analyze it.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Describe the algorithm analysis framework and design strategies.	1	-
2.	Apply algorithms to solve a given computational problem.	1	2
3.	Analyze algorithms with respect to time complexity.	2	2
4.	Design algorithm for a given problem using suitable algorithm design strategy.	3	2

Course Contents:

MODULE – 1	14 Hrs

Introduction: Notion of Algorithm, Fundamentals of Algorithmic Problem Solving, Fundamentals ofthe Analysis of Algorithm Efficiency**:** Analysis Framework, Asymptotic Notations and Basic efficiency classes, Mathematical analysis of Recursive and Non-recursive algorithms, Examples.

Brute Force: Selection Sort and Bubble Sort, Sequential Search and String Matching, Exhaustive Search

MODULE – 2	14 Hrs

Brute Force (continued…): Depth First and Breadth First Search,

Divide-and-Conquer: Merge sort, Quick sort, Multiplication of large Numbers, Strassen's Matrix Multiplication

Decrease-and-Conquer: Insertion Sort, Topological Sorting, Algorithms for Generating, Combinatorial Objects, Binary Search.

MODULE – 3	14 Hrs

Transform-and—Conquer: Presorting, Heaps and Heapsort.

Space and Time Tradeoffs: Sorting by Counting**,** Input Enhancement in String Matching-Horspool algorithm, Hashing.

Dynamic Programming: The knapsack Problem, Warshall's Algorithm, Floyd's Algorithm

MODULE – 4	14 Hrs

Greedy Technique: Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Huffman Trees. **Limitations of Algorithm Power** Lower-bound Arguments, Decision Trees, P, NP and NP-Complete Problems. Coping with the Limitations of Algorithm Power**:** Backtracking – N Queens, Branch-and-Bound – Assignment Problem, KnapSack Problem, Travelling Salesmen problem

Text Books :

1. Anany Levitin, Introduction to The Design and Analysis of Algorithms, 3rd Edition, PearsonEducation, 2022
2. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Fundamentals of Computer Algorithms, 2nd Edition, Press 2014.

Reference Books:

1. Coremen T.H., Leiserson C. E., and Rivest R. L., Introduction to Algorithms, 3rd edition, PHI,2015.
2. R.C.T. Lee, S.S. Tseng, R.C. Chang and Y.T.Tsai, Introduction to the Design and Analysis of Algorithms A Strategic Approach, 1st Edition, Tata McGraw Hill, 2005.

Teaching -Learning– Evaluation Scheme:				
Sl. No	**Teaching and Learning Method**	**No. of Hours/ Week**	**No. of Weeks**	**Hours/ Semester**
1	Class Room Teaching & Learning	4	14	56
2	Self Learning Component	-	-	23
3	Activity Based Learning (ABL)	-	-	35
4	Evaluation of Learning Process	-	-	6
			Total Learning Hours/Semester	**120**

Self-Learning	
MOOC course with certificate submission – 23 Hrs	
Activity Based Learning	
ABL1 : Simulation based Assignment (Any online simulation tool) – 35 Hrs	
1.	Implement and compare the execution time of Bubble Sort, Merge Sort, and Quick Sort for varying input sizes (e.g., 100, 1000, 5000, 10000). Plot the time vs. input size graph and analyze the results.
2.	Simulate and compare the performance of Linear Search and Binary Search on a sorted array of increasing size. Record the number of comparisons made for each search.
3.	Use a simulation to analyze how Binary Search behaves when run on unsorted data. What insights can you gain?
4.	Simulate Dijkstra's Algorithm on randomly generated weighted graphs with different sizes and densities. Measure time taken and path correctness.
5.	Generate a directed graph using a simulation tool and apply Depth First Search (DFS) and Breadth First Search (BFS). Compare node visitation orders and execution time.
6.	Use a simulation to solve the 0/1 Knapsack problem using both Greedy and Dynamic Programming approaches. Compare the total value obtained and execution time.
7.	Simulate the Job Scheduling Problem using a greedy strategy. How does the performance vary with an increasing number of jobs?
8.	Implement a simulation of Merge Sort and Quick Sort using the Divide and Conquer strategy. Record recursion depth and number of comparisons.
9.	Use a simulation tool to analyze the time complexity of Strassen's Matrix Multiplication vs. naive matrix multiplication for matrices of size $2^n \times 2^n$.
10.	Simulate the N-Queens problem using a backtracking algorithm. Track the number of recursive calls made as N increases.

Proposed Assessment Plan (for 50 marks of CIE):			
Tool		**Remarks**	**Marks**
CIE	**CIE1**	Conducted for 20 marks & reduced to 10 marks	10
	CIE2	Conducted for 20 marks & reduced to 10 marks	10
	CIE3	Conducted for 20 marks & reduced to 10 marks	10
Activity Details	**Activity-1**	Simulation based Assignment	10
	Activity - 2	Problem Solving	10
Total			**50**

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-	3
CO3	-	3	-	-	-	-	-	-	-	-	-	-	3
CO4	-	-	3	-	-	-	-	-	-	-	-	-	3

Course Title	MICROCONTROLLER AND EMBEDDED SYSTEMS		
Course Code	24CS402	L-T-P-C	(3-0-2)4
Exam Hrs.	3	Hours/Week	5
CIE	50 Marks	SEE	50 Marks
		Total Hours	42L+28P+ 50ABL=120

Course Objective: To develop programs for microcontroller based embedded systems.
Course Outcomes(COs):Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Describe the concepts of RISC philosophy, ARM Processor Fundamentals and ARM instruction set	1	-
2.	Write assembly code for a given problem or a given 'C' language code	1	-
3.	Analyze the given assembly language code for its correctness and output	1,2	-
4.	Develop ARM based programs using IDE for a given problem with/without external hardware devices	3,5	1,2

Course Contents:

MODULE – 1	11 Hrs

ARM Systems: The RISC Design Philosophy, The ARM Design Philosophy, ARM based Embedded System Hardware and Software.
ARM Processor Fundamentals : ARM core data flow model, Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts and the Vector Table, Core Extensions

MODULE – 2	11 Hrs

Introduction to the ARM Instruction Set: Data Processing Instructions-move, barrel shifter, arithmetic, logical, comparison, multiply. Branch Instructions, Load-store instructions-single register transfer, single register load- store addressing modes, multiple register transfer, stack operations, and swap instruction ,Program Status Register Instructions, Loading Constants, and conditional execution.

MODULE – 3	10 Hrs

Introduction to Thumb Instruction Set: Thumb Register Usage, ARM-Thumb Interworking, Other Branch Instructions, Data Processing Instructions, Single-Register Load-Store Instructions, Multiple-Register Load-Store Instructions.
Efficient C Programming: Overview of C Compilers and Optimization, Basic C Data Types, C Looping Structures, Register Allocation

MODULE – 4	10 Hrs

Introduction to ARM7 LPC2148 Microcontroller: Introduction, Features of the LPC 214X Family, Internal Block Diagram of LPC 2148, LPC 2148 GPIO.
Interfacing: LED interfacing, 7 segment LED display interfacing, stepper motor interfacing, LCD interfacing, Keyboard interfacing and DAC interfacing.

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	ARM system developers guide(1.1 to 1.4, 2.1 to 2.5.1, 3.1 to 3.3, 3.5 to 3.6 (Excluding 3.5.1, 3.5.2), 3.8, 4.1 to 4.6, 5.1 to 5.4)	Andrew N Sloss, Dominic Symes and Chris Wright		Elsevier, Morgan Kaufman	
2.	Hardware interfacing Manual	Shashidhara H V		Malnad College of Engineering, Hassan	

Reference Books:					
1.	The Insider's Guide to the ARM7 Based Microcontrollers Hitex Ltd	Hitex Ltd	**1st**		**2005**
2.	ARM System-on-Chip Architecture	Steve Furber	**2nd**	Pearson	**2015**

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching & Learning	3	14	42
2.	Integrated Lab Component	2	14	28
3.	Self-Study Hours-Self Learning	1	14	14
4.	Evaluation of Learning Process	-	-	06
5.	Activity Based Learning	-	-	30
	Total Learning Hours/Semester			**120**

Proposed Assessment Plan (for 50 marks of CIE):

Tool		Remarks	Marks
CIE	**CIE1**	Conducted for 20 marks(Module 1) & reduced to 10 marks	10
	CIE2	Conducted for 20 marks(Module 2) & reduced to 10 marks	10
	CIE3	Conducted for 20 marks(Module 3) & reduced to 10 marks	10
Activity Details	**Activity 1**	Laboratory CIE	10
	Activity 2	Activity Based Learning	10

Integrated Laboratory Component (28 Hours)

	PART- A (Software)
1.	In a class of strength 10 students, I need to find the tallest guy in the class to reach the projector of the classroom. Help me to identify the tallest guy.
2.	To illustrate the working of lookup table in ARM processor, find the square of a number (1 to 10) stored in a look-up table.
3.	Write a procedure FACT to find the factorial of a given number. Use this procedure to compute Binomial coefficient for given two numbers.
4.	Write an ALP to add an array of 16 bit numbers and store the 32-bit result in memory.
5.	Write an ALP to count the number of ones and zeros in N words stored in consecutive memory locations.
6.	Write an ALP to search for a given number in a set of 32-bit numbers, using linear search algorithm.
	PART- B (Hardware Interface)
1.	In the retail shop, the owner wants to know how many customers have been using the service of the shop. A device is used to keep count of incoming customers in the shop. Program the device to carry out the counting. Also the device should reset back to ZERO by down counting. Implement the above using Logic Controller Interface.
2.	In a petrol bunk, if a fire occurs accidently you need to display messages FIRE and HELP alternately on a 7-segment display interface to alarm the people. Implement the above scenario.
3.	A toy car uses a Stepper Motor interface to rotate the motor in specified direction. Program the toy to rotate (Clockwise or Counter-Clockwise) by N steps. Introduce suitable delay between successive steps. (Any arbitrary value for the delay may be assumed by the student).
4.	Generate Sine Wave using DAC interface (The output of the DAC is to be displayed on the CRO).
5.	Write a program to display the text message "COMPUTER SCIENCE" on a LCD display.

6.	Scan a 4X4 keypad for a key pressed and display the key pressed on LCD screen
Self-Study Component (14 Hours)	
1.	Comparison between Microprocessor and Microcontroller.
2.	History of the ARM processor, ARM processor families.
3.	Real world applications of ARM based embedded systems.
4.	Number systems: Decimal, Binary and Hexadecimal.
5.	Number systems: Conversions between Decimal, Binary and Hexadecimal numbers.
6.	Pipeline hazards.
7.	Conversion of C code into assembly code: Arithmetic and Logical operations.
8.	Conversion of C code into assembly code: Branching concepts.
9.	Conversion of C code into assembly code: Load-Store concepts.
10.	Assembly programs on array: Vector addition and subtraction.
11.	Assembly program to transfer N blocks of data from source address location to destination address location, considering the case of with and without overlapping.
12.	Application of program status register instructions: Masking/unmasking interrupts, set/reset conditional flags.
13.	Implementation of conditional execution.
14.	Find the hexadecimal codes, to display a given message on seven segment LED display.

Activity Based Learning (30 Hours)

Learn the Proteus simulation environment and implement various LPC2148-based hardware interfacing projects.		**Hours**
1.	Learn the Proteus simulation environment	5
2.	Simulation of Projects given below: 1. LED array: Flash multiple LEDs in patterns (e.g. running light). 2. Switch + LED: Interface a digital switch to turn an LED ON/OFF. 3. IR Sensor + 7-Segment Display: Detect motion via IR sensor, increment a counter, and display on 7-segment. 4. Traffic Light Controller: Simulate a 4-way traffic intersection with timed red, yellow and green LEDs per lane. 5. Relay & Buzzer Security System: Activate relay and buzzer, possibly with simple sensor-triggered alarm.	15
3.	Documentation and Presentation	10
	Total	**30**

Evaluation of Learning Process (6 Hours)

Type of Evaluation	**Hours**
Test (1, 2 and 3)	3
Semester End Exam	3
Total	**6**

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	3	-	3	-	-	-	-	-	-	3	3

Course Title	DATABASE MANAGEMENT SYSTEMS		
Course Code	24CS403	L-T-P-C	(3-0-2) 4
Exam Hrs.	3	Hours / Week	5
CIE	50 Marks	SEE	50 Marks
		Total Hours	42L+14SL+28LC+30ABL = 120

Course Objective: Design a database and write SQL queries.

Course Outcomes (COs) : Upon completion of the course, students shall be able to

#	Course Outcomes	Mapping to POs	Mappingto PSOs
1.	Explain the concepts of DBMS.	1	-
2.	Formulate and execute SQL queries for a given problem	3, 5,11	1, 2
3.	Apply normalization techniques to enhance the quality of database schema	2,4	-
4.	Design and create database for a given scenario.	3, 5	1, 2

Course Contents:

MODULE – 1 **11 Hrs**

Introduction: Introduction; An example; Characteristics of Database approach; Actors on the screen; Advantages of using DBMS approach. Data models, schemas and instances; Three-schemaarchitectureanddataindependence;Databaselanguagesandinterfaces;Thedatabasesystemenvironment;Centralizedandclient-serverarchitectures; Classification of Database Management systems. **Entity-Relationship Model:** Using High-Level Conceptual Data Models for Database Design; An sample Database Application; Entity Types, Entity Sets, Attributes and Keys. Relationship types, Relationship Sets, Roles and Structural Constraints; Weak Entity Types; ER Diagrams, Naming Conventions and Design Issues.

MODULE – 2 **11 Hrs**

Relational Model and Relational Algebra: Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations, Transactions and dealing with constraint violations; Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory; Binary Relational Operations: JOIN-variations of JOIN, OUTER JOIN operations

MODULE – 3 **10 Hrs**

SQL: SQL Data Definition and Data Types; Specifying basic constraints in SQL; Basic Retrieval queries in SQL; Insert, Delete and Update statements in SQL; Additional features of SQL, More complex SQL Retrieval Queries; Views; Schema Change Statements in SQL.

MODULE – 4 **10 Hrs**

Database Design:

Informal Design Guidelines for Relation Schemas; Functional Dependencies; Normal Forms Based on Primary Keys-1NF, 2NF, 3NF, Boyce-Codd Normal Form. Multi-valued Dependencies and Fourth Normal Form; Concurrency control techniques: Two- Phase Locking Techniques for Concurrency control; Concurrency Control Based on Timestamp Ordering

Text Book:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Fundamentals of Database Systems	Elmasri and Navathe	7th	Pearson	2015
2.	Database Management Systems	Raghu Ramakrishnan and Johannes Gehrke	3rd	McGraw-Hill	2007

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year

1.	Database System Concepts	Silberschatz, Korthand Sudharshan	5th	Mc-GrawHill	2006
2.	An Introduction to Database Systems	C.J.Date, A.Kannan, S.Swamynatham	8th	Pearson education	2006

MOOC:

1. http://nptel.ac.in/courses/106106093
2. https://www.edx.org/course/database-systems-concepts-design-gtx-cs6400x

Self-Learning

1.	Use **DBDiagram.io** or **Lucidchart** to practice drawing ER diagrams for real-world scenarios
2.	Use db-fiddle to write and visualize SELECT, PROJECT, JOIN queries.
3.	Design a Mini Database – Model and implement a real-world system with proper keys and constraints.
4.	Practice identifying and correcting schema anomalies through normalization up to 4NF using functional and multivalued dependencies

Laboratory Component

1. Design an Employee database and answer following queries:
   a) List all the employees who are above 40 years of age
   b) List the employees who work in a particular department
   c) List the female employees who are 30 years of age and drawing salary >8000
   d) List the employee number, employee name and his department name of all employees

2. Design a video parlour database and solve the following queries as outlined below using SQL.
   a) List only videos in the Children category with a daily rental rate of less than 100 and sorted according to video title.
   b) List the catalogNo, title and category of the Video table, ordered by video title
   c) List all videos with a certification of "U" or "B" in the Video table.

3. Consider the Insurance database. Create the tables by properly specifying the primary keys and the foreign keys, Enter at least five tuples for each relation.
   a) Demonstrate how you
   i. Update the damage amount for the car with a specific regno in accident with report number 12 to 25000
   ii. Add a new accident to the database \
   b) Find the total number of people who owned cars that were involved in accidents in 2006.
   c) Find the number of accidents in which cars belonging to a specific model were involved.

4. Consider the database of student enrollment in courses and books adopted for each course.
   a) Demonstrate how you add a new text book to the database and make this book be adopted by some department.
   b) Produce a list of text books(include course # ,book_isbn, book-title) in the alphabetical order for courses offered by the cs department that use more than 2 books.
   c) List the department that has adopted books published by specific publisher.

5. Consider an order processing database application in a company. Create the tables by properly specifying the primary keys and the foreign keys. Enter at least five tuples for each relation.
   a) Produce a listing: CUSTNAME, NO_OF_ORDERS, and AVG_ORDER_AMT, where the middle column is the total number of orders by the customer and the last column is the average order amount for that customer.
   b) List the Order# for the orders that were shipped from all the warehouses that the company has in a specific city.
   c) Demonstrate how you delete a customer from the CUSTOMER table and make that field *null* in the ORDER table.

6. Design a relational database for a real estate agency. It should store information about houses for sale, seller information, Buyer information, agents information (who can act on behalf of either the buyer or the seller), and the sale of houses. Answer the following queries in SQL.
   a) What are the ids, addresses, asking_price, and selling_price of all houses that sold for less than the asking price?
   b) What are names of all of (prospective) buyers who have not bought a house? Each name should appear only once.
   c) Find the addresses and asking prices of all houses that have at least 3 bedrooms and two bathrooms that have not sold. Each address, asking price pair should appear only once.

7. Consider the details maintained by a book dealer. Create the tables by properly specifying the primary keys and the foreign keys. Enter at least five tuples for each relation.
   a) Give the details of the authors who have 2 or more books in the catalog and the price of the books is greater than the average price of the books in the catalog and the year of publication is after 2000 .
   b) Find the author of the book which has maximum sales.
   c) Demonstrate how you increase the price of books published by a specific publisher by 10%.

8. Consider the following schema:
   Suppliers(sid: integer, sname: string, address: string)
   Parts(pid: integer, pname: string, color: string)
   Catalog(sid: integer, pid: integer, cost: real)
   Design a database to the satisfy the above requirements and answer the following queries
   a) Find the names of parts for which there is some supplier.
   b) Find the names of suppliers who supply every part.
   c) Find the id's of suppliers who supply red parts.

Activity Based Learning (30 Hours)

ABL 1 (15 Hours) : Activity 1 details

Selecting a real-world scenario (e.g., Hospital Management, Library System, Online Store, or University Course Registration), analyzing its requirements, and designing an Entity-Relationship (ER) diagram to visually represent the data model.

ABL 2 (15 Hours): Activity 2 details

Formulate and execute queries in SQL for a given database application to retrieve and manipulate data based on specified requirements.

Proposed Assessment Plan (for 50 marks of CIE):

Tool		Remarks	Marks
CIE	CIE1	Conducted for 20 marks(Module 1) & reduced to 10 marks	10
	CIE2	Conducted for 20 marks(Module 2 and 50% of Module 3) & reduced to 10 marks	10
	CIE3	Conducted for 20 marks(Remaining of Module 3 and part of Module 4) & reduced to 10 marks	10
Activity Details		• Lab Program Execution – 10 Marks • Activity Based Learning – 10 Marks	20
		Total	**50**

Teaching - Learning – Evaluation Scheme

Sl. No	Teaching - Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
3.	Class Room Teaching	3	14	42
4.	Integrated Lab Component	2	14	28
5.	Student Study Hours – Self Learning	1	14	14
5.	Tutorial component	-	-	-

6.	Activity Based Learning (ABL1 & ABL2)	-	-	30
7.	Evaluation of Learning Process			06
			Total Learning Hours / Semester	**120**

Course Articulation matrix

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	3	-	2	-	-	-	-	-	3	3	3
CO3	-	3	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	3	-	2	-	-	-	-	-	-	3	3

Course Title	ALGORITHMS LABORATORY		
Course Code	24CS404	L-T-P-C	(0-0-2)1
Exam Hrs.	3	Hours / Week	2
SEE	50 Marks	CIE	50 Marks
		Total Hours	28P + 2 EV= 30

Course Objective: To demonstrate various algorithmic design techniques.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Exercise various algorithm design strategies for various problems	3, 5	2
2.	Conduct time complexity analysis of the algorithms	2,11	2
3.	Demonstrate and document the executed algorithms	9	-

Course Contents:

Practice Programs

1. Find GCD of two numbers using Euclid's algorithm and consecutive integer checking method
2. Implement Selection sort.
3. Implement string matching using brute force method
4. Sort a given set of elements using Insertion sort method.
5. Obtain the topological ordering of vertices in a given digraph.
6. Write a program using Transform and Conquer technique for checking whether the digits of mobile number of a person are unique.
7. Implement computing a mode using pre-sorting method.
8. Find the Binomial Co-efficient using Dynamic Programming
9. Implement 0/1 Knapsack problem using dynamic programming.

Guided Experiments

1. A. Generating consecutive primes using Sieve Eratosthenes algorithm
   B. Element Uniqueness
2. Print all the nodes reachable from a given starting node in a digraph using BFS and DFS method.
3. Employees in an organization need to be grouped for a tournament based on their ages. Sort the agesusing Merge sort and find the time required to perform the sorting.
4. Students in a department need to be selected for a high jump competition based on their height (integervalues only). Sort the heights of students using Quick sort and find the time required for the Sorting.
5. Sort a given set of elements using the Heap sort method.
6. Implement Horspool algorithm for String Matching.
7. Consider N cities. The shortest path between every pair of cities needs to be determined. Implement Floyd's algorithm for the All-Pairs- Shortest-Paths problem. Also find transitive closure by implementing Warshall's algorithm
8. There are N different routes from hostel to college. Each route incurs some cost. Find the minimum cost route to reach the college from hostel using Prim's algorithm.
9. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.
10. Consider the distance between Hassan and N different cities. Every city can be reached from Hassan directly or by using intermediate cities whichever costs less. Find the shortest distance from Hassan to other cities using Dijkstra's algorithm.
11. Consider the problem having weights and profits are:
    Weights: {3, 4, 6, 5}
    Profits: {2, 3, 1, 4}
    The weight of the knapsack is 8 kg.
    Find the optimal set of items to include in the knapsack using dynamic programming.
12. Implement N-Queens problem applying backtracking

Proposed Assessment Plan (for 50 marks of CIE):		
Tool	**Remarks**	**Marks**
CIE	Laboratory CIE	30
Record	Laboratory Record Submission	10
Continuous Evaluation	Conduction of experiments	10
	Total	**50**

Teaching - Learning – Evaluation Scheme				
Sl. No	**Teaching - Learning Method**	**No. of Hours/ Week**	**No. of Weeks**	**Hours/ Semester**
1.	Class Room Teaching	2	14	28
2.	Evaluation of Learning Process			2
			Total Learning Hours / Semester	**30**

Course Articulation matrix													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO 1**	**PSO2**
CO1	-	-	3	-	3	-	-	-	-	-	-	-	3
CO2	-	3	-	-	-	-	-	-	-	-	3	-	3
CO3	-	-	-	-	-	-	-	-	3	-	-	-	-

Course Title	UNIX AND SHELL PROGRAMMING LABORATORY		
Course Code	24CS405	L-T-P-C	(0-0-2)1
Exam Hrs.	3	Hours / Week	2
CIE	50 Marks	SEE	50 Marks
		Total Hours	28L+2EV = 30

Course Objective: Design and Learn various unix utilities and shell scripting

Course Outcomes (COs): Upon the completion of the course the students will be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Execute and document the commands related to Shell basics, vi editor.	1,3,5,9,10	-
2.	Design the solutions for a given problem using the concepts of shell concepts and document.	1,3,5,9,10	-

Course Contents:

Self-Guided Programs	
1.	To practice on UNIX commands: man, echo, passwd, uname, who, date, cal, banner, tty, pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat,touch, clear, more, wc, cmp, diff, comm, head, tail, cut, paste, sort, tr and vi editor commands.
Guided Programs	
1.	a) Write a shell script to read a message "Good Morning" and display it 10 times at regular intervals of 60 seconds. b) Write a shell script that accepts a string as a command line argument and reverse it.
2.	a) Write a shell script to generate multiplication table. b) Write a shell script to print sum of individual digits of a number.
3.	Write a shell script that accepts two integers as its arguments and computes the value of first number raised to the power of the second number.
4.	Write a shell script to search a given pattern in file, if found display the message "Found" or else display "Not found". Accept the pattern and input file as command line arguments. Display appropriate message if the input is not properly entered.
5.	Write a shell script that takes a command –line argument and reports on whether it is directory, a file, or something else. Also check whether the given file has read, write and execute permission.
6.	Write a shell script that searches a given string in a given file and prints the number of times it repeats, else display proper error message. The script should accept the file as command line argument.
7.	Write a shell script to display all the process running in the system every 30 seconds for 5 times using a) while b) for.
8.	Write a shell script that accepts one or more file name as arguments and converts all of them to uppercase, provided they exist in the current directory.
9.	Write a shell script that deletes all lines containing a specified word in one or more files supplied as arguments to it
10.	Write a shell script that computes the gross salary of an employee according to the following rules: i) If basic salary is < 1500 then HRA =10% of the basic and DA =90% of the basic. ii) If basic salary is >=1500 then HRA =Rs500 and DA=98% of the basic the basic salary is entered interactively through the key board.

11.	Write an interactive file-handling shell program. Let it offer the user the choice of copying, removing, renaming, or linking files. Once the user has made a choice, have the program ask the User for the necessary information, such as the file name, new name and so on.
12.	Write a shell script which receives two file names as arguments. It should check whether the two file contents are same or not. If they are same then second file should be deleted.
13.	Write a shell script to perform the following string operations: i. To find the length of a given string. ii. To extract a sub-string from a given string.
14.	Write a menu driven shell script to perform the following: i. List of users who are logged in ii. List of files in the current directory iii. List of processes of users iv. Today's date v. Quit to Unix

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Laboratory CIE	30
Record	Laboratory Record Submission	10
Continuous Evaluation	Conduction of experiments	10
	Total	50

Teaching - Learning – Evaluation Scheme

Sl. No	Teaching - Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching	2	14	28
2.	Evaluation of Learning Process	-	-	2
	Total Learning Hours / Semester			**30**

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	3	-	3	-	-	-	2	2	-	-	-
CO2	3	-	3	-	3	-	-	-	2	2	-	-	-

Course Title	OPTIMIZATION TECHNIQUES		
Course Code	24CS406A	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
CIE	50 Marks	SEE	50 Marks
		Total Hours	42L+ 48ABL=90

Course Objective: To solve optimization problems using various methods.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Develop mathematical model for a given problem.	1	-
2.	Apply techniques of Operations Research to solve problems.	2	2
3.	Solve prediction and estimation problems.	1, 2	2
4.	Apply various methods for solving optimization problems.	3, 5	2

Course Contents:

MODULE – 1	11 Hrs.

Introduction : Introduction: The origin, nature and impact of OR; Overview of the Operations Research Modeling Approach: Defining the Problem and Gathering Data; Formulating a Mathematical Model; Deriving Solutions from the Model; Testing the Model; Preparing to Apply the Model; Implementation

Linear Programming – 1 : Prototype example; The Linear Programming (LP) Model, Assumptionsof LP, Additional Examples

MODULE – 2	11 Hrs.

Simplex Method - 1 : The Essence of the Simplex Method; Setting up the Simplex Method; The **Algebra** of the Simplex Method; The Simplex Method in Tabular Form; Tie Breaking in the SimplexMethod

Simplex Method – 2 : Adapting to other Model Forms; Post Optimality Analysis, Computer implementation

MODULE – 3	10 Hrs.

Revised Simplex Method: Foundations of the Simplex Method, The revised simplex method, A Fundamental Insight

Duality Theory: The Essence of Duality Theory; Economic Interpretation of Duality. Primal-Dual **Relationships**, Adapting to other primal forms, The role of duality in sensitive analysis; The essenceof sensitivity analysis; Applying sensitivity analysis, The dual simplex method ; Parametric linear programming; The upper bound technique.

MODULE – 4	10 Hrs.

Transportation Model: D e f i n i t i o n of the Transportation Model, Nontraditional Transportation Models, The TransportationAlgorithm.

Assignment Model and Network Models : The Assignment Model, CPM and PERT

Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Introduction to Operations Research	Frederick S. Hillier and Gerald J. Lieberman (Chapters: 1.1 to 1.3, 2, 3.1 to 3.3, 4.1 to 4.7, 5, 6.1 to 6.7, 7.1)	9th	Tata McGraw Hill	2012
2.	Operations Research: An Introduction	Hamdy A Taha	8th	Prentice Hall India	2005

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Operations Research Applications and Algorithms	Wayne L. Winston	4th	Thomson Course Technology	2013

MOOCs:

1. https://onlinecourses.nptel.ac.in/noc21_ma62/preview
2. https://onlinecourses.swayam2.ac.in/cec23_ma02/preview
3. https://onlinecourses.nptel.ac.in/noc24_cs03/preview

Web links and Video Lectures (e-Resources):

1. Optimization Toolbox (https://in.mathworks.com/products/optimization.html)
2. S.N. Sivanandam, S.N. Deepa ,Principles of Soft Computing, 2nd Edition ,2011
3. Principle of Soft computing (https://archive.nptel.ac.in/courses/106/105/106105173/)

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Activity Based Learning (ABL)	-	-	41
3	Evaluation of Learning Process	-	-	07
			Total Learning Hours/Semester	**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool		Remarks	Marks
CIE	**CIE1**	Conducted for 20 marks(Module 1) & reduced to 10 marks	10
	CIE2	Conducted for 20 marks(Module 2) & reduced to 10 marks	10
	CIE3	Conducted for 20 marks(Module 3) & reduced to 10 marks	10
Activity Details	**Activity-1**	ABL-1	10
	Activity-2	ABL-2	10
		Total Hours	**50**

Activity Based Learning (48 Hours)

ABL-1		**30 hrs**
Sl No	**Problems on**	**Hours**
1.	Formulating a Mathematical model and deriving solution.	3
2.	Linear Programming (LP) Model.	3
3.	Essence of the Simplex Method.	3
4.	Simplex Method in Tabular Form.	3
5.	Post Optimality Analysis.	3
6.	Revised Simplex Method.	3
7.	Duality Theory.	3
8.	Relationships.	3
9.	Transportation Model.	3
10.	Assignment Model and Network Models.	3
ABL-2		**11 hrs**
1.	Develop any of the above optimization technique using MATLAB/Python, for the real world problems.	11

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	2	-	-	-	-	-	-	-	-	-	-	3
CO3	2	2	-	-	-	-	-	-	-	-	-	-	3
CO4	-	-	3	-	3	-	-	-	-	-	-	-	3

Course Title	DISCRETE MATHEMATICAL STRUCTURES		
Course Code	24CS406B	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
CIE	50 Marks	SEE	50 Marks
		Total Hours	42L+ 48ABL=90

Course Objective: Deploying concepts of mathematical logic for analyzing propositions and proving theorems.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply logic, mathematical proof and counting principles to given problem.	2 , 3	-
2.	Use concepts of functions in analyzing problems on algorithms.	2	-
3.	Analyze programming problems related to Group theory and Coding theory.	2	-

Course Contents:

MODULE – 1	11 Hrs.

Principles of Counting: The rule of sum and product, permutation principle, combination principle, Combination with repetition

Fundamentals of Logic: Basic logic connectives and truth tables. Logical equivalence and Tautologies. Statement of laws of logic

Self-study: Set theory – set operations, Venn diagram, Inclusion Exclusion principle.

MODULE – 2	11 Hrs.

Fundamentals of Logic (contd...): Logic implication - Rules of inference theory. Application of switching network.

Relation: Cartesian Product of Sets, Relations, Zero-one Matrix, Directed graph, Properties of Relation, Equivalence Relation, Partially ordered sets, Hasse diagram, Lattice.

Self-study: Quantifiers

MODULE – 3	10 Hrs.

Functions: Ceiling function, Floor function**,** Functions, Types of Functions, Properties of Functions, Composition of Functions, and Inverse Functions, Application of Stirling numbers of second kind. The Pigeon hole principle.

Self-study: Application of functions in vending machine, Application to algorithm testing using computational complexity.

MODULE – 4	10 Hrs.

Group theory: Examples and elementary properties

Coding theory: Elements of coding theory, the humming matric**,** the parity – check and Generator matrices, **Group codes**: Decoding with coset leaders. Hamming matrices.

Self-study: sub-groups, cosets, Matrix row operations.

Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Discrete and Combinatorial Mathematics	R C Grimaldi	5th	Pearson's publications	2007

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Discrete Mathematical Structures	D. S. Malik & M. K. Sen	1st	Thomson's Publications	2006

MOOCs:

1. https://onlinecourses.nptel.ac.in/noc22_cs33/preview
2. https://www.coursera.org/specializations/discrete-mathematics

Web links and Video Lectures (e-Resources):

1. https://www.youtube.com/watch?app=desktop&v=UwYJUKVc-Hs
2. https://www.youtube.com/watch?app=desktop&v=FMh8qNV3PHk

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Activity Based Learning (ABL)	-	-	41
3	Evaluation of Learning Process	-	-	07
	Total Learning Hours/Semester			**42L+ 48ABL=90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool		Remarks	Marks
CIE	CIE1	Conducted for 20 marks(Module 1) & reduced to 10 marks	10
	CIE2	Conducted for 20 marks(Module 2) & reduced to 10 marks	10
	CIE3	Conducted for 20 marks(Module 3) & reduced to 10 marks	10
Activity Details	Activity-1	ABL-1	10
	Activity-2	ABL-2	10

Activity Based Learning (48 Hours)

ABL-1		**30 hrs**
Sl No	Problems on	Hours
1.	Problems on permutation and combination.	3
2.	Problems on logic connectives and Logical equivalence	3
3.	Problems on laws of logic	3
4.	Problems on Logic implication	3
5.	Problems on Relation	3
6.	Problems on Hasse diagram and Lattice	3
7.	Problems on Functions	3
8.	Problems on Group theory	3
9.	Problems on Coding theory	3
10.	Problems on Group codes	3
ABL-2		**11 hrs**
1.	Develop any of the above problem (ABL-1) using MATLAB/Python, for the real world problems.	11

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	3	3	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-	-
CO3	-	3	-	-	-	-	-	-	-	-	-	-	-

Course Title	GRAPH THEORY AND COMBINATORICS		
Course Code	24CS406C	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
CIE	50 Marks	SEE	50 Marks
		Total Hours	42L+48ABL = 90

Course Objective: Understand the fundamentals of graph theory and combinatory.
Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Describe the concepts of graphs and counting principles.	1	-
2.	Apply the concepts of graphs and counting principles in solving problems	2	-
3.	Analyze various concepts of graph and counting techniques	2	-
4.	Solve a given problem adopting the concepts of graph and counting principles	3 , 5	2

Course Contents:

MODULE – 1	11 Hrs

An Introduction to Graph theory: Definitions and examples, Sub graphs, Complements and Graph isomorphism, Vertex degree, Euler Trails and Circuits, Hamilton paths and cycles,

MODULE – 2	11 Hrs

Planar Graphs and Colouring: Planar and non-planar graphs, Euler's Formula, Detection of planarity, Dual of a planar graph, Graph coloring, chromatic number, and chromatic polynomials.
Optimization and Matching: Cut-sets, Edge connectivity, Vertex connectivity, Transport Networks: The Max-Flow Min-Cut Theorem, MatchingTheory.

MODULE – 3	10 Hrs

The Principles of Inclusion and Exclusion: The Principle of Inclusion and Exclusion, generalizations of the principle, derangements, Rook Polynomials, Arrangements with forbidden Positions. **Generating function:** Introductory examples, Definition and examples; Partitions of Integers.

MODULE – 4	10 Hrs

Generating function (conti..): The exponential generating function, the Summation Operator. **Recurrence relations:** First-order and second order linear recurrence relations, with constant coefficients, The non- homogeneous recurrence relation, The Method of Generating Functions.

Text Books :

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Discrete and Combinatorial Mathematics	Ralph P. Grimaldi	5th	Pearson Education	**2004**
2	Graph Theory and Combinatorics	Dr. D.S. Chandrashekar	4th	Prism	**2012**

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Graph Theory with applications to Engineering and Computer Science	Narsing Deo		PHI Publications	

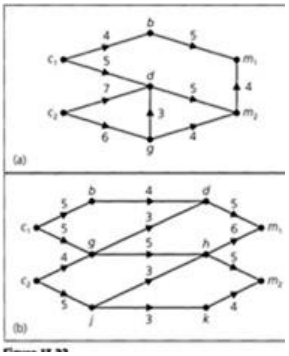
2	Combinatorics	V Balakrishnan	Schaum Series,	Tata-McGraw Hill Publications	

MOOCs:

1. http://nptel.ac.in/courses/111106050/
2. http://nptel.ac.in/courses/106108051/

Activity:

1. Two cases of soft drinks, 24 bottles of one type and 24 of another are distributed among five surveyors who are conducting taste tests. In how many ways can the 48 bottles be distributed so that each surveyors gets (a) at least two bottles of each type? (b) At least two bottles of one particular type and at least three of the other?
2. How can Mary split up 12 hamburgers and 16 hot dogs among her sons Richard, Peter Christopher, and James in such a way that James gets at least one hamburger and three hot dogs, and each of his brothers gets at least two hamburgers but at most five hot dogs?
3. Sergeant bueti must distribute 40bullets (20 for rifkes and 20 for handguns) among four officers so that each officer gets at least two, but no more than seven, bullets of each type. In how many ways can he do this
4. Nineteen students in a nursery school play a game each day where they hold to hands to form a circle. For how many days can they do this with no students holding hands with the same playmate twice?
5. In each of the following "transport networks" two companies c1 and c2, produce a certain product that is used by two manufactures, m1 and m2. For the network shown in part(a) of Fig. 13.23, company c1 can produce 8 units and company c2 can produce 7 units; manufacturer m1 requires 7 units and manufacturerm2 needs 6 units. In the network shown in Fig 13.22 (b), each company can produce 7 units and each manufacturer needs 6 units. In which situation(s) can the producers meet the manufactures demands?



6. Fritz is in charge of assigning students to part-time jobs at the college where he works. He has 25 student applications, and there are 25 different part-time jobs available on the campus. Each applicant is qualified for at least four of the jobs, but each job can be performed by at most four of the applicants. Can Fritz assign all the students to jobs for which they are qualified? Explain. Characterize the type of graph in which an Euler trail (circuit) is also a Hamilton path (cycle).

Proposed Assessment Plan (for 50 marks of CIE):

Tool		Remarks	Marks
CIE	CIE1	Conducted for 20 marks(Module 1) & reduced to 10 marks	10
	CIE2	Conducted for 20 marks(Module 2) & reduced to 10 marks	10
	CIE3	Conducted for 20 marks(Module 3) & reduced to 10 marks	10
Activity Details		Activity Based Learning	20
		Total	50

Teaching - Learning – Evaluation Scheme			
Sl. No	**Teaching - Learning Method**	**No. of Hours/ Week**	**No. of Weeks**	**Hours/ Semester**
1.	Class Room Teaching	3	14	42
2.	Self-Learning	3	13	39
3.	Evaluation of Learning Process			9
			Total Learning Hours	**90**

Course Articulation matrix

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-	-
CO3	-	3	-	-	-	-	-	-	-	-	-	-	-
CO4	-		3	-	2	-	-	-	-	-	-	-	3

Course Title	COMPUTER ASSEMBLY AND NETWORKING		
Course Code	24CS407A	L-T-P-C	(0-0-2)1
Exam Hrs.	3	Hours / Week	2
SEE	50 Marks	CIE	50Marks
		Total Hours	28P + 2ABL = 30

Course Objective: Acquire hands on experience on computer assembly and disassembly, trouble shooting and computer networking

Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1	Demonstrate computer assembly and disassembly and troubleshooting of computer systems hardware, software and other peripheral equipment.	1	-
2	Familiar with wired and wireless communication and computer networks instruments.	2,3	-
3	Gain practical experiences in networking hardware, device configuration, testing and troubleshooting.	1	-
4	Demonstrate network simulation using virtual network simulator software and analyze their performances.	5	1

Course Contents:

Lab 1: Computer assembly and disassembly **02 Hrs.**

Computer Assembly: Open the case, Install the power supply, Attach the components to the motherboard and install the motherboard, install internal drives, connect all internal cables, install motherboard power connections, connect external cables to the computer, Boot the computer for the first time. Computer Disassembly: Unplugging, Open the case, disconnect all the connectors, Remove the fan, Remove the power supply, Removing HDD and optical drive, Remove RAM (random access memory), modules, remove expansion cards, remove motherboard, Reassemble the components.

Lab 2: Troubleshooting **02 Hrs.**

Diagnose and troubleshooting microcomputer/computer systems hardware and software and other peripheral equipment: Approaches to solve a PC problem, troubleshooting a failed boot before the OS is loaded, different approaches to installing and supporting I/O device, managing faulty components. Troubleshooting printer and scanner problems, troubleshooting hard drive problems.

Lab 3: Network cables assembling and testing **01 Hrs.**

This lab introduces three types of cabling, i.e. twisted pairs, coaxial cable, and fiber optic. Students assemble connectors to a twisted pair cable using crimping tool, and then they test the cable to ensure properly wired connections. This is important because many of the network installation problems are related to cable errors.

Lab 4: Network cards installation and test **01 Hrs.**

This lab shows how to install and configure the network card into a PC expansion slot of a client computer. Connect the client computer to the network. Install the cable and document all network connections on a classroom LAN network.

Lab 5: LAN configuration **02 Hrs.**

Once the network operating system and the physical hardware are installed and configured, shares must be set up on the workstations. The lab introduces how to locate the network configuration screen used with Windows XP and configure a workstation with a unique computer name and configure a hub with an IP address. Each workstation becomes a client for Microsoft Networks, and File and Print Sharing is enabled. The basic elements will be in place to share files between workstations on the LAN. In this procedure students examine the user-level access control, that is, access is granted based upon access privileges granted to a single user or a group of users. Another lab activity is the configuration of a client computer for print sharing.

Lab 6: Wireless Networks	**02 Hrs.**
In this lab students will install and configure the TP-Link Wireless Access point, which allows laptops and other mobile computer systems wireless access to a network and perform a link test to assess the performance of the RF link. Also, students learn how to implement a strong network security by changing the Service Set Identifier (SSID), and establish a strong Wi-Fi Protected Access (WPA) passphrase on the router or access point. Then configure all the wireless computers and devices on the network to associate with the SSID of WPA-enabled router or access point using the same WPA passphrase.	
Lab 7: Router configuration	**02 Hrs.**
This lab introduces the concepts of IP forwarding and routing between IP networks. The lab exercise shows how to set up a Windows PC and a TP-Link router as an IP router and reveals the similarities of IP forwarding and routing tables on a Widows PC and a TP-Link router. Students learn how to interpret and edit routing-table entries in a network with multiple IP networks and IP routers.	
Lab 8: Client-Server Network Configuration	**02 Hrs.**
Students are introduced to the installation of Window Server tools on a Windows Professional workstation and set up a user account on the Windows server. Also create and manage networked groups and manage the security policies of users and the network.	
Lab 9: Routing Information Protocol	**01 Hrs.**
The lab explores a routing protocol based on the distance-vector algorithm using network simulator. The goal of the lab is to configure and analyze the performance of the Routing Information Protocol (RIP) model. Here students study how RIP provides a distributed, dynamic way to solve the problem of finding the lowest-cost path in the presence of link and node failures and changing edge costs. A lab exercise with the routing protocol RIP explores the analysis of the routing tables generated in the routers based on distance-vector algorithm, and how RIP is affected by link failures.	

Textbook:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Data and Communications and Networking	Behrouz A Forouzan	5th Indian	McGraw Hill,	2013
2.	Computer-Networks	Andrew S. Tanenbaum and David J. Wetherall	5th Indian	Pearson Education	2012
3.	Computer Networking a Top-Down Approach	James F. Kurose and Keith W. Ross	7th Indian	Pearson Education	2010

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Network Simulation Experiments Manual	E. Aboelela,	3rd **Indian**	Morgan Kaufmann	2003
2.	Mastering Networks, An Internet Lab Manual	J. Liebeherr, M. El Zarki	4th Indian	Pearson Education	2004
3.	Networking	J. S. Beasley	4th Indian	Pearson Education	2004.

Proposed Assessment Plan (for 50 marks of CIE):			
Tool		**Remarks**	**Marks**
CIE	**CIE1**	CIE will be conducted for 20 marks	20
	Record Writing	For record writing 10 marks will be awarded	10
Activity Details		Group activity will be carried out for 20 marks; individual students will be asked to prepare a report on the activity that they carry out.	20

Activity Based Learning (ABL) Details:

Sl No.	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Classroom Teaching & Learning	2	14	28
2.	Activity Based Learning (ABL)	-	-	2

ABL 1: Simulation based Assignment (2 Hrs.)

Simulation based Assignment	Tool selection and demonstration of usage of the selected tool	1
	Evaluating the student based on report and presentation	1

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	2	2	-	-	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	3	-	-	-	-	-	-	3	-

Course Title	INTRODUCTION TO POWER BI		
Course Code	24CS407B	L-T-P-C	(0-0-2) 1
Exam Hrs.	3	Hours / Week	02
CIE	50 Marks	SEE	50
		Total Hours	28P + 2EV = 30

Course Objective: To learn and Practice Programming techniques using Microsoft Power BI.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Prepare the dataset in suitable format with required preprocessing using Power Query Editor.	1, 2	1
2.	Apply suitable visualization techniques to generate report for the various problem.	3, 5, 9	2
3.	Implement, document and present the data visualization projects for the chosen problems.	3, 5, 9, 11	2

Course Contents:

Practice Programs: (Self-Learning)

1. Installation of Power BI
2. Building Blocks and Components of Power BI
3. Overview of GU
4. Introduction to Power Query Editor

Guided Laboratory Experiments

1. You have a dataset in an Excel file named SalesData.xlsx with the following columns: Date, Product, Quantity, and Price. You want to:
   a) Import the data.
   b) Filter out rows where the Quantity is less than 10.
   c) Remove duplicate rows.
   d) Add a new column TotalSales which is the product of Quantity and Price.
2. ABC Retailers deals with various data sources and formats, leading to inconsistencies and errors in the data. To derive meaningful insights, the data must be transformed and prepared using Power BI. This includes establishing appropriate data types, replacing erroneous values, handling nulls and errors, performing pivoting and un-pivoting operations, merging and appending queries, and importing data from folders.
3. ABC Retailers needs to perform advanced data transformations to derive more meaningful insights from their data. This involves creating custom columns, conditional columns, summarizing data with group by, managing queries, and optimizing report performance by enabling/disabling load and report refresh options.
4. ABC Corporation has a diverse dataset comprising sales transactions, product details, customer information, and category classifications. The company seeks to utilize Power BI to establish and manage relationships between these datasets to facilitate comprehensive data analysis and reporting.
5. XYZ Corporation is leveraging Power BI to analyze their sales and customer data. They need to understand how to configure cross-filter directions and effectively manage relationships between their datasets to enhance data analysis capabilities.
6. ABC Corporation is looking to enhance its data analysis capabilities using Power BI. Employee's need comprehensive training on understanding various visualization types, utilizing the Format tab effectively, and mastering the creation of tables and bar charts for insightful reporting.

7. XYZ Corporation aims to enhance its data analysis capabilities by leveraging Power BI for insightful data visualization. Employees need training on creating and customizing Clustered Column Charts, Matrix Visuals, Pie Charts, and Donut Charts to effectively present data and derive actionable insights.
8. XYZ Corporation is leveraging Power BI to analyze sales and operational data. Employees need training on creating Clustered Column charts, applying Conditional Formatting, and understanding various types of Filters in Power BI to enhance data visualization and analysis capabilities.
9. ABC Corporation is enhancing its data analytics capabilities using Power BI. Employees require training on utilizing Slicers, managing Edit Interactions, creating Bookmarks, and implementing Drill Down and Drill Through features to optimize data exploration and reporting.
10. XYZ Corporation is adopting Power BI for enhanced data visualization and analytics. Employees need training on using Tooltips, creating interactive Buttons, incorporating KPI Cards, generating Waterfall Charts, and integrating Custom Visuals to develop compelling and actionable reports.

Text Book :

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Introducing Microsoft Power BI	Alberto Ferrari and Marco Russo	1st	Microsoft Press	2016
2.	Mastering Microsoft Power BI	Brett Powell	1st	Packt	2018

Teaching - Learning – Evaluation Scheme:

Sl No.	Teaching and Learning Method	No. of Hours/Week	No. of Weeks	Hours/Semester
1	Class Room Teaching & Learning	-	-	-
2	Lab Component	2	14	28
3	Student Study Hours – Self Learning			
4	Activity Based Learning (ABL1)			
5	Evaluation of Learning Process	-	-	2
			Total Learning Hours/Semester	**30**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	CIE conducted for 30 marks	30
Lab Report	Lab Report Submission	10
Activity Details	Project based group activity	10

Activity Based Learning

ABL1: Implementing Real Time Project using R Programming

1.	Identifying areas in which students want to carry out the project	
2.	Meeting and Discussion (Online or offline) with the faculty and fixing the Problem Statement	
3.	Designing and implementing the project	
4.	Presentation and submitting the final report	

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	-	-	3	-
CO2	-	-	3	-	3	-	-	-	3	-	-	3	3
CO3	-	-	3	-	3	-	-	-	3	-	3	3	3

Course Title	TECHNICAL WRITING USING LATEX		
Course Code	24CS407C	L-T-P-C	(0-0-2)1
Exam Hrs.	3	Hours / Week	2
CIE	50 Marks	SEE	50 Marks
		Total Hours	28L+2EV = 30

Course Objective: To prepare a LaTeX document.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Design a document layout using a given problem.	2,3	1
2.	Prepare the document using mathematical equations, tables and figures.	1, 5	1
3.	Demonstrate and document the work carried out.	5, 9, 11	1

Course Contents:

Guided Laboratory Programs

1. Design an Introduction chapter with two sections, each containing a subsection with the relevant information, and include a header [title of document] and a footer [institute name, page number].
2. Create a document that displays the sample Abstract and Summary consists of relevant information.
3. Develop a LaTeX script to create a simple title page of the MCE project Report [Use suitable Logos and text formatting].
4. Develop a LaTeX script to create the Certificate Page of the Report [Use suitable commands to leave the blank spaces for user entry]
5. Develop a LaTeX script to create a document that contains the following table with proper labels.

Sl No.	USN	Student Name	Marks		
			Subject 1	Subject 2	Subject 3
1	4MC23XX001	Name 1	70	80	85
2	4MC23XX002	Name 2	80	84	90
3	4MC23XX003	Name 3	88	98	50

6. Develop a LaTeX script to include the side-by-side graphics/pictures/figures in the document by using the subgraph concept
7. Develop a LaTeX script to create a document that consists of the following two mathematical equations

$$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$$

$$= \frac{-2 \pm \sqrt{2^2-4\cdot(1)\cdot(-8)}}{2\cdot 1}$$

$$= \frac{-2 \pm \sqrt{4+32}}{2}$$

$$\varphi_\sigma^\lambda A_t = \sum_{\pi \in C_t} \operatorname{sgn}(\pi)\varphi_\sigma^\lambda \varphi_\pi^\lambda$$

$$= \sum_{\tau \in C_{\sigma t}} \operatorname{sgn}(\sigma^{-1}\tau\sigma)\varphi_\sigma^\lambda \varphi_{\sigma^{-1}\tau\sigma}^\lambda$$

$$= A_{\sigma t}\varphi_\sigma^\lambda$$

8. Develop a LaTeX script to demonstrate the presentation of Numbered theorems, definitions, corollaries, and lemmas in the document
9. Develop a LaTeX script to create a document that consists of two paragraphs with a minimum of 10 citations in it and display the reference in the section
10. Develop a LaTeX script to design a simple tree diagram or hierarchical structure in the document with appropriate labels using the Tikz library
11. Develop a LaTeX script to present an algorithm in the document using algorithm/algorithmic/algorithm2e library
12. Develop a LaTeX script to create a simple report and article by using suitable commands and formats of user choice.

Text Book :

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	LATEX Beginner's Guide	Stefan Kottwitz	-	-	-

MOOC:
https://www.my-mooc.com/en/mooc/latex-for-students-engineers-and-scientists

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Laboratory CIE	20
Record	Laboratory Record Submission	10
Activity Details	Project based activity	10
	Total	**50**

Teaching - Learning – Evaluation Scheme

Sl. No	Teaching - Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Classroom Teaching	2	14	28
2.	Evaluation of Learning Process			2
		Total Learning Hours / Semester		**30**

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	3	3	-	-	-	-	-	-	-	-	3	-
CO2	3	-	-	-	3	-	-	-	-	-	-	3	-
CO3	-	-	-	-	3	-	-	-	3	-	3	3	-

Course Title	UI/UX LABORATORY		
Course Code	24CS407D	L-T-P-C	(0-0-2)1
Exam Hrs.	3	Hours / Week	3
CIE	50 Marks	SEE	50 Marks
		Total Hours	28L+2EV = 30

Course Objective: To gain a solid understanding of fundamental UI/UX principles, including visual design, user-centred design, usability, and user experience.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply design principles and guidelines to create visually appealing and user-friendly interfaces for websites and mobile applications.	2	-
2.	Develop wireframes and interactive prototypes using design tools to visualize and communicate interface concepts and user flows.	5	-

Guided Programs:

1. Chat App Redesign: Create a Wireframe and redesign any popular chat app.
2. Food App: Create a wireframe, Design and Prototype the Ul Pages for the food application.
3. Social Media App: Create a wireframe Design and Prototype social media photo sharing app.
4. Product Website: Design and prototype a product website page. Create web pages and rollovers for the web pages
5. Travel Agency Website: Create a wireframe, Design and prototype the UI for the website including design for Home Page with search bar, Activities page, Client Testimonial Page, Image Gallery
6. UI/UX Designer Portfolio Design: Create a wireframe, Design and prototype a Ul for a portfolio including design for About page, Work showcase page, Blog page, contact page
7. Dashboard Design: Create a wireframe, Design and Prototype Dashboard UI page, add some Dashboard details, statistics and graphs, Add dropdown options for some dashboard details
8. E-Commerce Website: Create a wireframe, Design and prototype Web pages including product category pages (example: mobiles, gaming consoles, Speakers), product pages in each category, buy now page, add to cart page
9. Educational Website: Create a wireframe, Design and Prototype the Ul for an educational website include a Homepage with footer, About Us Page, Programs page, Instructors page, Pricing page, Payments page with radial buttons. Design dropdowns for programs button
10. Music Player App: Create a wireframe, Design and prototype the pages with a background and a Rollover button, and Song selection Page with a Home Rollover button. The third page may include animated play and pause button, play music animation, timer animation.

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Laboratory CIE	30
Record	Laboratory Record Submission	10
Continuous Evaluation	Conduction of experiments	10
	Total	50

Teaching - Learning – Evaluation Scheme

Sl. No	Teaching - Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Lab Conduction	2	14	28
2.	Evaluation of Learning Process			2
			Total Learning Hours / Semester	30

Course Articulation matrix													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	-	3	-	-	-	-	-	-	-	-	-	3	2
CO2	-	-	-	-	3	-	-	-	-	-	-	3	2