|| Jai Sri Gurudev ||

Sri Adichunchanagiri Shikshana Trust (R)

SJB Institute of Technology

An AUTONOMOUS INSTITUTION UNDER VISVESVARAYA TECHNOLOGICAL UNIVERSITY

Approved by AICTE, 2(f) and 12(B) recognized by UGC, New Delhi
Accredited by NAAC, Accredited by NBA, Certified by ISO 9001 - 2015

B.E.

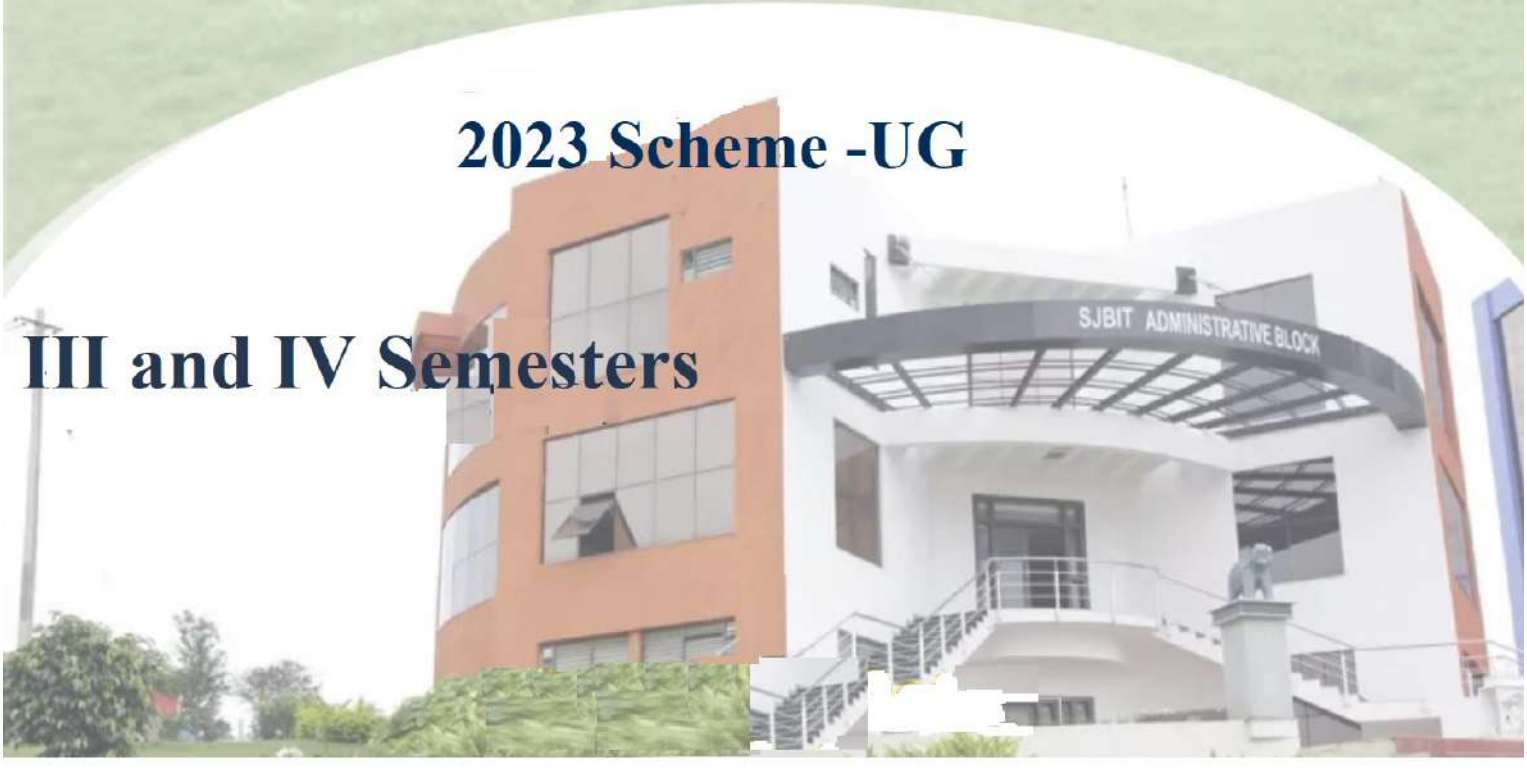
Autonomous Scheme & Syllabus

Second Year

Department of Computer Science and Engineering

2023 Scheme -UG

III and IV Semesters



SERVICE TO MANKIND IS SERVICE TO GOD

His Divine Soul Padmabhushana
Sri Sri Sri Dr. Balagangadharanath MahaSwamiji
Founder President, Sri Adichunchanagiri Shikshana Trust®

Belief in God is not ignorance or illusion. It is a belief that there is an unseen, ineffable Power that transcends all our powers of muscles, mind and lives.

His Holiness Parama Pujya
Sri Sri Sri Dr. Nirmalanandanatha MahaSwamiji
President, Sri Adichunchanagiri Shikshana Trust ®

True richness is the generosity of heart. Cultivate it and work to help the less fortunate ones in life.

Revered Sri Sri Dr. Prakashanatha Swamiji
Managing Director, BGS & SJB Group of Institutions & Hospitals

People and prosperity follow the path which the leaders take. So the elders and leaders should make sure that they give the right lead and take the right path.

2023 Scheme – UG

Syllabus for 3rd & 4th Semester

The syllabus, scheme and guidelines are provided in detail.
The syllabus, scheme and guidelines are subjected to changes if any needed.
The updates will be done timely.
Regularly access the institution website for the updated information.

The Syllabus book is available on	www.sjbit.edu.in
For any queries, please write to	academicdean@sjbit.edu.in

UPDATES

Release / Revision	Date	Remarks
Release	03/09/2024	First release
Version 2	10/02/2025	Changed CIE and SEE Guidelines

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Autonomous Scheme of Teaching & Examinations (ST&E) (Tentative) UG - BE 2nd Year Computer Science and Engineering

SCHEME: 2023 **SEM: III** **Revision date: 8/30/2024**

S. #	Course Type	Course type Series	Course Code	Course Title	Teaching Dept.	QP setting dept	Credits	Teaching Hrs/Week				Examinations				
								L	T	P	O	CIE Marks	SEE (Dur. & Marks)			
								Lecture	Tutorial	Practical	PBL/ABL / SL/etc.		Dur.	Th.	Lab	Tot.
1	IBSC	3	23CSI301	Discrete Mathematics and Graph Theory	Maths	Maths	4	2	2	2	@	50	03	50	-	100
2	PCC	1	23CST302	Data Structures and Applications	Dept.	Dept.	3	3	0	0		50	03	50	-	100
3	IPCC	1	23CSI303	Logic Design and Computer Organization	Dept.	Dept.	4	3	0	2		50	03	50	-	100
4	IPCC	2	23CSI304	Operating Systems	Dept.	Dept.	4	3	0	2		50	03	50	-	100
5	PCCL	1	23CSL305	Data Structures Lab	Dept.	Dept.	1	0	0	2		50	03	-	50	100
6	ETC	1	23CSE31y	Emerging Technology Course - 1	Dept.	Dept.	3	2	0	2		50	03	50	-	100
7	AEC	3	23CSAE31	Version Controller using Git	I.E.	I.E.	1	1	0	0	3	50	02	50	-	100
8	NCMC	3	23PDSN03	Skilful Futures: Empowering Aptitude and Soft skills	I.E.	I.E.	**PP/NP**	0	0	0	2	50	-	-	-	50
9	NCMC	4	23PASN01	Physical Education - Sports and Athletics	PED	PED	**PP/NP**	-	-	-	2	50	-	-	-	50
			23YOGN02	Yoga	PED	PED										
			23NSSN03	NSS - National Service Scheme	NSS	NSS										
			23NCCN04	NCC - National Cadet Corps	NCC	NCC										
			23IKSN05	Indian Knowledge System	HSS	HSS										
						Total	**20**	**14**	**2**	**10**	**7**	**450**		**300**	**50**	**800**

BSC: Basic Science Course; PCC: Professional Course; IPCC: Integrated Professional Core Course; PCCL: Professional Core Course Laboratory; AEC: Ability Enhancement Course;
{I.E.-Industry Experts};
{@ - Compulsory one activity}.
PBL: project Based learning; ABL: Activity Based Learning; SL: Self-Learning

ETC (Emerging Technology Course):

For ETC (L:T:P:O) can be plaanned by the depts considering practicality & possibility of conduction, same shall be indicated along with course title in the list, if altered than above. If planned altering the prescription, the same shall be approved at the department BOS & authorities. Atleast one activity is mandatory during the delivery of the course. The guidelines is applicable to all the semesters III to VI semesters (ETC-1 to ETC-4).

NCMC (Non Credit Mandatory Course): The following guidelines are applicable for the course type series-4 as mentioned above.

1) All students must register for any one of the course with the department during the first week of the III semester.
2) Once registered for a course in the III semester, the student shall continue and complete the same course in the remaining semesters. No provision for changing the courses after registration.
3) Activities shall be carried out by the students between III semester to VI semester (for 4 semesters).
4) The activities shall be organized, executed and monitored by the concerned department as mentioned above in coordination with the department level course coordinators. The same shall be reflected in the calendar of events of the above concerned departments.
5) Successful completion of the registered course and requisite CIE score (PP) is mandatory for the award of degree.
6) These courses are not considered for vertical progression, calculation of SGPA & CGPA, however it is mandatory for the award of degree.
7) The guidelines is applicable to all the remaining IV to VI semesters.

Additional courses for Lateral Entry students:

1) The lateral entry students getting admitted from the 2nd year of programme, shall register, study and complete additional courses prescribed & offered time to time.
2) Successful completion of the registered course and requisite CIE score (PP) is mandatory for the award of degree.
3) These courses are not considered for vertical progression, calculation of SGPA & CGPA, however it is mandatory for the award of degree.

Self-Learning Courses (SLC) as per the VIII Semester ST&E:

1) Offering and Registration of Self-learning Courses will commence from 3rd Semester itself and continues till the end of the duration of study.
2) Both regular & lateral entry students shall start registering for the self learning courses and complete as per the guidelines published separately. (Refer to the Self Learning Courses guidelines published).
3) These courses are not considered for vertical progression.
4) Calculation of SGPA & CGPA is considered for VIII Semester, irrespective of period or time of completion of the course.

Emerging Technology Course - 1	
Course Code	**Course Title**
23CSE311	Computer Graphics
23CSE312	Python for Data Analytics
23CSE313	Linux for Cyber Security
23CSE314	Web Design

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AUTONOMOUS SCHEME (Tentative) UG - BE 2nd Year YYYY

SCHEME: 2023 **Date of release: 29/06/2024**

SEM: III **Additional courses for Lateral Entry students**

Note:

1) For the fulillment of successful completion of degree, lateral entry students, shall study & complete additional courses as per the guidelines released time to time.
2) Regular courses (SL No 1 to 8) are same as applicable to all defined in the scheme of teaching & examinations (ST&E).
3) The below prescribed courses has to be registered whenever they are offered and successfully completed before the end of Seventh Semester End Examinations.

SL No	Course Type	Course type Count	Course Code	Course Title	Teaching Dept.	QP setting dept	Credits	Teaching Hrs/Week				Examinations				
								L	T	P	O	CIE Marks	SEE			
								Lecture	Tutorial	Practical	PBL/ABL/ SL/othrs.		Dur.	Th. Mrks	Lab. Mrks.	Tot. Marks
For CS stream (CSE/ISE/AIML/CSE(DS))																
9	BSC	-	23MAT31A	Additional mathematics-1	Maths	Maths	PP/NP	2	0	0	@	50	-	-	-	50
For EE stream (ECE & EEE)																
9	BSC	-	23MAT31B	Additional mathematics-1	Maths	Maths	PP/NP	2	0	0	@	50	-	-	-	50
For CV stream (Civil)																
9	BSC	-	23MAT31C	Additional mathematics-1	Maths	Maths	PP/NP	2	0	0	@	50	-	-	-	50
For ME stream (Mechanical)																
9	BSC	-	23MAT31D	Additional mathematics-1	Maths	Maths	PP/NP	2	0	0	@	50	-	-	-	50

Academic Dean **Principal**

AUTONOMOUS SCHEME (Tentative) UG - BE 2024

Department of Computer Science and Engineering

SCHEME: 2023 **Release date: 25/06/2024**

Self-Learning course - 1 (NPTEL) (23CSS1yy)			Self-Learning course - 2 (NPTEL) (23CSS2yy)		
Course Code	Course Title	NPTEL Code	Course Code	Course Title	NPTEL Code
23CSS101	Advanced Distributed Systems	noc24-cs99	23CSS201	Understanding Incubation and Entrepreneurship	noc24-de15
23CSS102	Artificial Intelligence: Search Methods For Problem solving	noc24-cs88	23CSS202	System Design for Sustainability	noc24-de16
23CSS103	Reinforcement Learning	noc24-cs102	23CSS203	Fiber Optic Communication Technology	noc24-ee131
23CSS104	Social Network Analysis	noc24-cs90	23CSS204	Introduction to Semiconductor Devices	noc24-ee99
23CSS105	Social Networks	noc24-cs120	23CSS205	Pattern Recognition and Application	noc24-ee118
23CSS106	Statistical Learning for Reliability Analysis	noc24-cs107	23CSS206	Real-Time Digital Signal Processing	noc24-ee136
23CSS107	Introduction to Industry 4.0 and Industrial Internet of Things	noc24-cs95	23CSS207	5G Wireless Standard Design	noc24-ee152
23CSS108	Algorithmic Game Theory	noc24-cs109	23CSS208	Mathematics for Machine Learning	noc24-ma61
23CSS109	Design & Implementation of Human-Computer Interfaces	noc24-cs126	23CSS209	Patent Law for Engineers and Scientists	noc24-hs155
23CSS110	Responsible & Safe AI Systems	noc24-cs132	23CSS210	Business to Business Marketing (B2B)	noc24-mg91

Head of the Department
Dept. of Computer Science and Engineering
SJB INSTITUTE OF TECHNOLOGY
BGS Health & Education City

Academic Dean
Dr. BABU. N.V
Prof. & Academic Dean
SJB Institute of Technology
BGS Health & Education City
Kengeri, Bengaluru-560060

Principal
Principal
SJB Institute of Technology

Guidelines for Self-learning courses – Under Graduation (UG)

1) As per the Scheme of Teaching & Examinations (ST&E) the UG students to earn totally 06 credits by studying and completing 02 NPTEL/SWAYAM courses of 12 weeks each earning 03 credits.
2) The credits so earned by successful completion of the courses will be credited in the 8th SEM grade card.
3) The successful completion of the courses means earning of the course completion certificates from NPTEL/SWAYAM.
4) The courses shall be studied and completed starting from 3rd Semester and shall be completed before the announcement of 8th Semester End Examinations. However, it is advised to complete both the courses before the 7th SEM of their graduation.
5) The respective department BOS shall identify the professional courses related to the respective discipline either core or multidisciplinary from the list of courses released by NPTEL/SWAYAM every season. At least ten such courses shall be identified and finalized after the discussions in the respective BOS meetings, and the list shall be approved by the Academic Dean.
6) The approved list shall be published by the departments to the students at the beginning of the 3rd SEM itself and the student shall be given an option to choose up to 02 courses for the study and earn certificates of completion.
7) The practicing of studying and completion of NPTEL/SWAYAM courses starting from 3rd SEM itself has multi-fold effect:
   i) Enhances the self-learning ability of the students.
   ii) Study of self-learning courses will have impact on the learning of other courses in the scheme of teaching & examinations.
   iii) Will address the real time challenges/difficulties/differences in the calendars of NPTEL/SWAYAM & Institution.
8) The respective departments shall make holistic efforts to bring awareness to the students about the objectives and importance of self-learning courses. The departments shall thrive towards fulfilment of the objectives.
9) The departments shall continuously monitor & track the progress of the accomplishment of the courses by the students.
10) The departments shall assign course mentors as per the guidelines of the NPTEL/SWAYAM.

11) The departments shall take care that the registered courses and the examinations shall be under the local chapter of the Institution.
12) Every care must be taken by the departments to guide, motivate, to help the students in completing the courses as the academic calendar of the institution and the calendar of the NPTEL/SWAYAM does not match. The faculty advisory system or Mentor System must play a significant role.
13) Every season new courses may be added to the identified list and a fresh list of courses shall be prepared based on the list announced by the NPTEL/SWAYAM every season. However, the courses published from the first list shall be maintained if the NPTEL/SWAYAM list has the courses.
14) If the students are unable to successfully complete the course, they shall be given an option to re-register for the same course multiple times if the courses are available during the respective seasons in NPTEL/SWAYAM list.
15) An option for making fresh choice shall be given to the students until the successful completion of the courses and earning of required number of credits within the defined time.
16) The list of students registered for the courses and completion of the courses shall be submitted to the dean office on completion of every season.
17) All the regulations such as "Dropping of courses", "Withdrawal of Courses", etc. as described in the academic regulations shall be applicable to the Self Learning Courses (SLC).
18) The performance of the students in the assignments and the certification exam of the NPTEL/SWAYAM shall be considered for awarding the grade points to the students in the self-learning courses.
19) If the students are successfully completing more than the prescribed number of courses in their period of study, best performed courses (group wise) may be considered for the award of credits.
20) The CIE & SEE marks as prescribed in the Scheme of Teaching & Examinations (ST&E) shall be considered as per the performance of the student in the successfully completed NPTEL/SWAYAM course. The obtained assignment marks in the successfully completed NPTEL/SWAYAM course shall be mapped to the CIE and obtained exam certification percentage in the successfully completed NPTEL/SWAYAM course shall be mapped for SEE marks.
21) The students unable to complete the self-learning courses and earn the required credits will not be awarded the degree. Degree shall be awarded only after successful completion and earning of credits.

Academic Dean
Dr. Babu N V

Principal
Dr. K V Mahendra Prashanth

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Autonomous Scheme of Teaching & Examinations (ST&E) (Tentative) UG - BE 2nd Year Compter Science and Engineering

SCHEME: 2023 **SEM: IV** **Revision date: 26/8/2024**

S. #	Course Type	Course type Series	Course Code	Course Title	Teaching Dept.	QP setting dept	Credits	Teaching Hrs/Week				Examinations				
								L	T	P	O	CIE Marks	SEE (Dur. & Marks)			
								Lecture	Tutorial	Practical	PBL/AB L/ SL/etc.		Dur.	Th.	Lab	Tot.
1	BSC	4	23CST401	Probability Distributions and Statistical Methods	Maths	Maths	**3**	2	2	0	@	50	03	50	-	100
2	PCC	2	23CST402	Design and Analysis of Algorithms	Dept.	Dept.	**3**	3	0	0		50	03	50	-	100
3	IPCC	3	23CSI403	Object-Oriented Programming with JAVA	Dept.	Dept.	**4**	3	0	2		50	03	50	-	100
4	IPCC	4	23CSI404	Microcontroller and Internet of Things	Dept.	Dept.	**4**	3	0	2		50	03	50	-	100
5	PCCL	2	23CSL405	Design and Analysis of Algorithms Lab	Dept.	Dept.	**1**	0	0	2		50	03	-	50	100
6	ETC	2	23CSE42y	Emerging Technology Course - 2	Dept.	Dept.	**3**	2	0	2		50	03	50	-	100
7	HSMC	5	23SFHH06/ 23UHVH07	Bioscience (or) UHV - Universal Human Values	any dept	any dept	**1**	0	2	0	@	50	02	50	-	100
8	AEC	4	23CSAE41	Flutter	I.E.	I.E.	**1**	1	0	0	3	50	02	50	-	100
9	NCMC	5	23PDSN04	Mindful Mastery: Aptitude and soft skill integration	I.E.	I.E.	**PP/NP**	0	0	0	2	50	-	-	-	50
10	NCMC	4	23PASN01	Physical Education - Sports and Athletics	PED	PED	**PP/NP**	-	-	-	2	50	-	-	-	50
			23YOGN02	Yoga	PED	PED										
			23NSSN03	NSS - National Service Scheme	NSS	NSS										
			23NCCN04	NCC - National Cadet Corps	NCC	NCC										
			23IKSN05	Indian Knowledge System	HSS	HSS										
Total							**20**	**14**	**4**	**8**	**7**	**500**		**350**	**50**	**900**

BSC: Basic Science Course; PCC: Professional Course; IPCC: Integrated Professional Core Course; PCCL: Professional Core Course Laboratory; AEC: Ability Enhancement Course; HSMC: Humanities, Social Sciences & Management Course; NCMC: Non Credit Mandatory Course;
{@ - Compulsory one activity during the semester}
{I.E.-Industry Experts}.
PBL: project Based learning; ABL: Activity Based Learning; SL: Self-Learning

ETC (Emerging Technology Course):

For ETC (L:T:P:O) can be plaanned by the depts considering practicality & possibility of conduction, same shall be indicated along with course title in the list, if altered than above. If planned altering the prescription, the same shall be approved at the department BOS & authorities. Atleast one activity is mandatory during the delivery of the course. The guidelines is applicable to all the semesters III to VI semesters (ETC-1 to ETC-4).

Bioscience & UHV-Universal Human Values:

1) Any one of the course will be offered by the departments in each semester of IV & VI based on the institutional planning.
2) Both the courses shall be studied and completed by the students registering each in the two semesters. For example, if Bioscience is offered in the IV semester, UHV-Universal Human Values is offered in the V semester.

NCMC (Non Credit Mandatory Course) for course type series-4: Refer to guidelines in III SEM.

Emerging Technology Course - 2	
Course Code	**Course Title**
23CSE421	Multimedia Technology
23CSE422	Exploratory Data Analytics
23CSE423	Cyber Security Principles and Practices
23CSE424	Server Side Scripting

3rd Semester Syllabus

Semester:	III	**Course Type:**	IBSC		
Course Title: Discrete Mathematics and Graph Theory					
Course Code:	**23CSI301**			**Credits:**	4
Teaching Hours/Week (L:T:P:O)			2:2:2:@	**Total Hours:**	40+(10 –12 lab slots)
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	**Theory**			**Exam Hours:**	3

I. Course Objectives:

This course will enable students to :

- Provide theoretical foundations of computer science to perceive other courses in the programme.
- Illustrate applications of discrete structures: logic, relations, functions and graphs.
- Describe different mathematical counting techniques.

II. Teaching-Learning Process (General Instructions):

1. In addition to the traditional lecture method, innovative teaching methods shall be adopted.
2. State the need for Mathematics with Engineering Studies and Provide real-life examples.
3. Grading assignments and quizzes and documenting student's progress.
4. Encourage the students for group learning to improve their creative and analytical skills.

III. COURSE CONTENT
III(a) Theory Part

Module-1: Fundamentals of Logic	8Hrs

Fundamentals of Logic: Propositions- Logical connectives, Tautologies, contradictions. Logical equivalence- The Laws of Logic, inverse, converse and contra positive. Logical Implication – Rules of Inference, Quantifiers- Types and uses of quantifiers.
Applications to verify the algorithm using Mathematical logic.
*** Application problems to be excluded for SEE.**
Textbook 2: Chapter 1(1.1, 1.2, 1.3, 1.5).
Self Learning: Applications to switching Networks.

RBT Levels: L1, L2 and L3

Module-2: Principles of counting	8Hrs

Well ordering principle and Mathematical Induction.
Fundamental Principles of Counting: The Rules of Sum and Product, Permutations, Combinations – The Binomial Theorem, Combinations with Repetition.
Applications to design algorithms.
*** Application problems to be excluded for SEE.**

Textbook 1: Chapter 4(4.1), Chapter 1(1.1 to 1.4). **Self Learning:** The Catalan Numbers.	
RBT Levels:L1, L2 and L3	
Module-3: Relations and Functions	8Hrs
Relations and Functions: Cartesian products and Relations, Functions – plain and one-to-one, onto functions. Function Composition and Inverse functions(without proof). **Relations:** Properties of Relations, Computer Recognition – Zero-one matrices and Directed graphs, Partial orders – Hasse diagrams, Equivalence relations and Partitions. Applications to map inputs to outputs in algorithms and represent the relation between the nodes. *** Application problems to be excluded for SEE.** **Textbook 1:** Chapter 5.1, 5.2, 5.6 **Self Learning:** Sterling numbers of second kind, Pigeonhole principle, Topological Sorting.	
RBT Levels: L1, L2 and L3	
Module-4: Fundamentals of Graph Theory	8Hrs
Introduction to Graph Theory: Definitions and Examples, Sub graphs, Complements and Graph Isomorphism. Vertex degree: Euler trails and circuits, planar graphs. Graph coloring and chromatic polynomials. Illustrative examples on Traveling salesman problem. *** Illustrative examples to be excluded for SEE.**	
Textbook 1: Chapter 11.1, 11.2, 11.3, 11.4, 11.6.	
Self Learning: Hamiltonian paths and cycles.	
RBT Levels: L1, L2 and L3	
Module-5: Trees and Connectivity	8Hrs
Trees – properties, pendant vertex, Distance and centers in a tree - Rooted and binary trees, counting trees, traversals, spanning trees. Connectivity Graphs: Vertex Connectivity, Edge Connectivity, Cut set and Cut Vertices, separability, Menger's Theorem, Fundamental circuits. Application to organizing and searching data. *** Application problems to be excluded for SEE.** **Textbook 3:** Chapter 3.1 to 3.8, 4.1 to 4.5. **Self Learning:** Matchings ,Coverings.	
RBT Levels: L1, L2 and L3	

III(b) Practical Part Using python/MATLAB software, demonstrate the operation of the following.	
Sl. No.	**Experiments**
1	Program on logical connectives (AND, OR, NOT, XOR).
2	Check whether the given proposition is a tautology or not.
3	Compute the sum of first n odd numbers using mathematical induction.
4	Calculation of Permutation and combination.
5	Implement functions to check whether a given function is one-to-one and onto (Example: $f(x)=x^2$).
6	Check whether the relation is equivalence or not.
7	Implement the Fibonacci sequence using both an iterative approach and a recursive approach.
8	Program to verify a given relation forms a partial order or not. [Example: elements = [1, 2, 3, 4], Relation = [(1, 1), (1, 2), (2, 2), (2, 3), (3, 3), (3, 4), (4, 4)]].
9	Program on assign colors to the vertices of a graph, no two adjacent vertices share the same color.
10	Implement the Traveling Salesman Problem (TSP) using a Hamilton Path approach to find the shortest Hamilton Path in a weighted graph.
11	Write a program to find the maximum number of edge-disjoint paths between two vertices. Use the Edmonds-Karp algorithm, an implementation of the Ford Fulkerson method for computing the maximum flow in a flow network.
12	Using Menger's theorem, find the minimum vertex cut between source and target.

IV. COURSE OUTCOMES The student will be able to:	
CO1	Illustrate the basic concepts of mathematical logic and Graph theory.
CO2	Apply the knowledge of mathematical logic, counting principles, Relations and functions, Graph theory to compute problems in various fields of Engineering.
CO3	Analyse the solutions of problems using mathematical logic and graphical techniques.
CO4	Develop the programs and algorithms on discrete mathematical structure and graphs.

V. CO-PO-PSO MAPPING (Mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3
CO1	3	2	1		2							1	1	1	1
CO2	3	2	1		2							1	1	1	1
CO3	3	2	1		2							1	1	1	1
CO4	3	2	1		2							1	1	2	1

VI. Assessment Details (CIE & SEE)

General Rules:
Refer CIE and SEE guidelines based on course type for autonomous scheme 2023

Continuous Internal Evaluation (CIE): Refer annexure section 2

Semester End Examination (SEE): Refer annexure section 2

VII. Learning Resources				
VII(a): Textbooks:				
Sl. No.	**Title of the Book**	**Name of the author**	**Name of the publisher**	**Edition and Year**
1	Discrete and Combinatorial Mathematics	Ralph P. Grimaldi	Pearson Education	5th Edition 2020
2	Discrete Mathematics and its Applications	Kenneth H. Rosen	McGraw Hill	8th Edition 2021
3	Graph Theory With Application to Engineering and Computer Science	Narsingh Deo	Prentice Hall of India	Latest edition 2016
VII(b): Reference Books:				
1	Discrete Mathematical Structures: Theory and Applications	D.S. Malik and M.K. Sen	Cengage Learning	4th Edition 2010
2	Discrete Mathematics with Applications	Thomas Koshy	Elsevier	5th Edition Reprint 2018
3	Introduction to graph theory	Douglas B. West	Prentice Hall	3rd Edition 2014
VII(c): Web links and Video Lectures (e-Resources):				
• http://nptel.ac.in/courses.php?disciplineID=111 • http://www.class-central-central.com/subject/math(MOOCs) • http://academiccarth.org/ VTU EDUSAT programme-20				
VIII: Activity Based Learning				
Assignments, Quiz, Presentation.				

Semester:	3rd	**Course Type:**	PCC		
Course Title: Data Structures and Applications					
Course Code:	**23CST302**			**Credits:**	03
Teaching Hours/Week (L:T:P:O)			3:0:0:0	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3 Hours

I. Course Objectives:

- Explain the fundamentals of data structures and their applications essential for implementing solutions to problems.
- Illustrate representation of data structures: Stack, Queues, Linked Lists, Trees and Graphs.
- Design and Develop Solutions to problems using Arrays, Structures, Stack, Queues, Linked Lists.
- To discuss applications of Nonlinear Data Structures in problem solving.
- To introduce advanced Data structure concepts such as Hashing and Optimal Binary Search Trees

II. Teaching-Learning Process (General Instructions):

Teachers can use following strategies to accelerate the attainment of the various course outcomes.

1. Chalk and Talk with Black Board
2. ICT based Teaching
3. Demonstration based Teaching

III. COURSE CONTENT

III(a). Theory PART

Module-1: INTRODUCTION TO DATA STRUCTURES — 8 Hrs

Data Structures, Classifications (Primitive & Non-Primitive), Data structure operations, Review of Pointers and Dynamic Memory Allocation.
ARRAYS and STRUCTURES: Arrays, Dynamic Allocated Arrays, Structures and Unions, Polynomials, Sparse Matrices, Representation of Multidimensional Arrays, Strings.
Text Book 1: Chapter-1:1.2 Chapter-2: 2.1 to 2.7
Reference Book 1: Chapter-1: 1.1 to 1.4

Pre-requisites
Basic knowledge of one programming language (C, C++ and Python)
Basic knowledge of common programming concepts, including loops, arrays and recursion

RBT Levels: L1 – Remembering, L2 – Understanding, L3 – Applying	
Module-2: STACKS AND QUEUES	8 Hrs
Stacks: Definition, Stack Operations, Array Representation of Stacks, Stacks using Dynamic Arrays. Different representation of expression. Stack Applications: Infix to postfix conversion, Infix to prefix conversion, evaluation of postfix expression, recursion. **Queues**: Definition, Array Representation of Queues, Queue Operations, Circular Queues, Queues and Circular queues using Dynamic arrays, Multiple Stacks and Queues **Textbook 1: Chapter-3**: 3.1,3.2, 3.3, 3.4, 3.6, 3.7	
Pre-requisites Basic knowledge of mathematics	
RBT Levels: L1 – Remembering, L2 – Understanding, L3 – Applying	
Module-3: LINKED LISTS	8 Hrs
LINKED LISTS: Singly Linked Lists, Representing Chains in C, Linked Stacks and Queues, Polynomials, Additional List Operations, Operations for Circularly Linked Lists, Sparse Matrices, Doubly Linked List, Doubly Linked List operations. **Textbook 1: Chapter-4**: 4.1 to 4.5,4.7,4.8	
Pre-requisites Basic knowledge of Dynamic Memory Allocation, Structures and Pointers	
RBT Levels: L1 – Remembering, L2 – Understanding, L3 – Applying,	
Module-4: TREES & GRAPHS	8 Hrs
TREES: Introduction, Binary Trees, Binary Tree Traversals, Threaded Binary Trees, Binary Search trees, Selection Trees, Forests, Representation of Disjoint sets, Counting Binary Trees. **GRAPHS**: The Graph Abstract Data Types, Elementary Graph Operations **Textbook1: Chapter-5:** 5.1 to 5.3, 5.5, 5.7 to 5.11 Chapter-**6**: 6.1, 6.2	
Pre-requisites **S**olid knowledge of Recursion, Stack, and Queue data structures	
RBT Levels: L2 – Understanding, L3 – Applying	
Module-5: HASHING & SEARCH STRUCTURES	8 Hrs
HASHING: Introduction, Static Hashing, Dynamic Hashing **HEAP STRUCTURES:** Min-Max Heaps, Leftist Trees **SEARCH STRUCTURES**: Optimal Binary Search Trees, AVL Trees, Splay Trees **Textbook1: Chapter 8:** 8.1 to 8.3 **Chapter 9:** 9.1, 9.3 **Chapter 10**: 10.1,10.2,10.7	
Pre-requisites: A good understanding of basic data structures like arrays, linked lists, stacks, Pointers, and Dynamic Memory allocation	
RBT Levels: L2 – Understanding, L3 – Applying	

IV. COURSE OUTCOMES

Students will be able to

CO1	Select appropriate data structures to solve the real-world problems.
CO2	Solve specific problems using stack and queues

CO3	Implement various applications using linked list.
CO4	Apply Non-Linear data structures to model and solve real-world problems
CO5	Utilize hashing techniques to store and retrieve data efficiently and resolve collisions during mapping of key value pairs.

V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3	S4
CO1	2	1	1										1			
CO2	2	2	2										1			
CO3	2	2	2										1			
CO4	2	2	2										1			
CO5	2	2	2										1			

VI. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023.

Continuous Internal Evaluation (CIE): Refer Annexure section 1

Semester End Examination (SEE): Refer Annexure section 1

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
01	Fundamentals of Data Structures in C.	Ellis Horowitz and Sartaj Sahni	2nd edition, 2014.	Universities Press

VII(b): Reference Books:

01	Data Structures Schaum's Outlines	Seymour Lipschutz	1ST edition, 2014	McGraw Hill
02	Gilberg & Forouzan,	Data Structures: A Pseudo-code approach with C,	2nd edition, 2014.	Cengage Learning
03	Jean-Paul Tremblay & Paul G. Sorenson	An Introduction to Data Structures with Applications	2nd Ed, 2013	McGraw Hill
04	Robert Kruse	Data Structures and Program Design in C	2 nd Ed, 1996.	PHI

VII(c): Web links and Video Lectures (e-Resources):

http://elearning.vtu.ac.in/econtent/courses/video/CSE/06CS35.html
- https://nptel.ac.in/courses/106/105/106105171/
- http://www.nptelvideos.in/2012/11/data-structures-and-algorithms.html
- https://www.youtube.com/watch?v=3Xo6P_V-qns&t=201s
- https://ds2-iiith.vlabs.ac.in/exp/selection-sort/index.html
- https://nptel.ac.in/courses/106/102/106102064/
- https://ds1-iiith.vlabs.ac.in/exp/stacks-queues/index.html
- https://ds1-iiith.vlabs.ac.in/exp/linked-list/basics/overview.html
- https://ds1-iiith.vlabs.ac.in/List%20of%20experiments.html

● https://ds1-iiith.vlabs.ac.in/exp/tree-traversal/index.html ● https://ds1-iiith.vlabs.ac.in/exp/tree-traversal/depth-first-traversal/dft-practice.html ● https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013501595428077568125 59/overview
VIII: Activity Based Learning / Practical Based Learning/Experiential learning:
• Case Study-1 • Programming Assignment • Gate Based Aptitude Test • MOOC Assignment for selected Module

Semester:	III	**Course Type:**	IPCC		
Course Title: Logic Design and Computer Organization					
Course Code:	**23CSI303**			**Credits:**	4
Teaching Hours/Week (L:T:P:O)			3:0:2:0	**Total Hours:**	40 +(10-12 lab slots)
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3

I. Course Objectives:

This course will enable students to:

- Understand the facts and ideas of simplifying the logical expressions.
- Analyse and construct various combinational and sequential logic circuits.
- Understand the basic internal data path architecture of computer system.
- Illustrate the working of I/O and arithmetic operations and processing unit.

II. Teaching-Learning Process (General Instructions):

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) need not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) learning in the class.
4. Ask at least three HOT (Higher Order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters student's analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce topics in manifold representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world and when that's possible, it helps to improve the student's understanding.

III. COURSE CONTENT	
III(a). Theory PART	
Module-1: Combinational Logic Circuits	8 Hrs
Sum of Products Method, Truth table to Karnaugh Maps, Pairs, Quads, and Octets, Karnaugh Simplifications, Don't Care Conditions, Product of Sums Method, Product of Sums Simplification, HDL Implementation Models. Multiplexer, Programmable Array Logic, Programmable Logic Array, HDL of Data Processing Circuits **Textbook1: Chapter 3: 3.2-3.8, 3.11, 3.13.** **Chapter 4: 4.1, 4.3, 4.11, 4.12, 4.14.**	
Pre-requisites Basic knowledge of Boolean algebra.	
RBT Levels: 1,2	
Module-2: Data Processing and Sequential Circuits	8 Hrs
Sequential Circuits-RS Flip Flops, Gated Flip Flops, Edge Triggered S R, J K, D Flip Flops, Flip-Flop Timing, Switch Contact Bounce Circuits, Various Representations of Flip-Flops, Types of Registers, Serial In-Serial out, Counter design as Synthesis Problem. **Textbook 1: Chapter 8: 8.1-8.6, 8.9, 8.10.** **Chapter 9: 9.1, 9.2.** **Chapter 10: 10.9.**	
Pre-requisites Knowledge of basic logic gates.	
RBT Levels: 1,2	
Module-3: Structure of Computers and Machine Instructions	8 Hrs
Basic Structure of Computers: Functional Units, Basic Operational Concepts, Bus structure, Performance –Processor Clock, Basic Performance Equation, Clock Rate, Performance Measurement. **Machine Instructions and Programs**: Numbers, Arithmetic operations and Characters, Memory Location and Addresses, Memory Operations, Instruction and Instruction sequencing, Addressing Modes. **Text book 2: Chapter 1: 1.2, 1.3, 1.4, 1.6.** **Chapter 2: 2.1, 2.2, 2.3, 2.4, 2.5.**	
RBT Levels: 1,2	
Module-4: Input/output Organization and Arithmetic	8 Hrs
Input/output Organization: Accessing I/O Devices, Interrupts – Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Direct Memory Access: Bus Arbitration, Speed, size and Cost of memory systems. Cache Memories – Mapping Functions, **Arithmetic**-Addition and Subtraction of Signed numbers, Multiplication of Positive Numbers, Signed Operand Multiplication. **Text book 2: Chapter 4: 4.1, 4.2.1, 4.2.2, 4.2.3, 4.4.** **Chapter 5: 5.4, 5.5.1.** **Chapter 6: 6.1, 6.3, 6.4.**	
RBT Levels: 1,2,3	
Module-5: Basic Processing Unit and Pipelining	8 Hrs

Basic Processing Unit: Some Fundamental Concepts: Register Transfers, Performing ALU operations, Fetching a word from Memory, Storing a word in memory. Execution of a Complete Instruction.

Pipelining: Basic concepts, Role of Cache memory, Pipeline Performance.

Text book 2: Chapter 7: 7.1, 7.2.
Chapter 8: 8.1.

RBT Levels: 1,2,3

III(b). PRACTICAL PART

Sl. No.	Experiments / Programs / Problems Simulation Packages Preferred: Multisim, Xilinx, Modelsim any other relevent
1	Given the four Variable logic Expression ,Simplify it using appropriate technique and simulate the same using basic Gates ,
2	Design and simulate Binary Full Adder and subtractor and implement the same in HDL.
3	Given a 4-variable logic expression, simplify it using MEV technique and realize the simplified logic expression using 8:1 multiplexer IC. Implement the same in HDL.
4	Design and Simulate code converter I)Binary to Gray (II) Gray to Binary Code using basic gates.
5	Write a Verilog program for implementing various types of Flip-Flops such as SR, JK and D.
6	Simulate a J-K Master / Slave Flip-Flop using NAND gates and verify its truth table.
7	Design and simulate a mod-n (n<8) synchronous up counter using J-K Flip-Flop ICs and demonstrate its working.
8	Design and Simulate an asynchronous counter using decade counter IC to count up from 0 to n (n<=9) and demonstrate on 7-segment display (using IC-7447)

IV. COURSE OUTCOMES

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

CO1	Solve the logical expression of digital circuits and construct the various data processing circuits using Karnaugh map. Demonstrate the combinational logic circuits with verilog program.
CO2	Construct and analyze various combinational and sequential circuits by choosing appropriate digital circuits. Demonstrate the sequential circuits with verilog program.
CO3	Apply the fundamentals of internal organization of a computer system in developing various applications.
CO4	Apply and analyse the communication between processor, Memory and IO devices and impact of cache/ pipelining on processor performance.

V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3	S4
CO1	2	1			2								1	1		
CO2	1	2	1		2								1	1		
CO3	1												1			
CO4	1	1											1			

VI. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023.

Continuous Internal Evaluation (CIE): Refer Annexure section 2

Semester End Examination (SEE): Refer Annexure section 2

VII. Learning Resources

VII(a): Textbooks: (Insert or delete rows as per requirement)

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Digital Principles and Applications	Donald P Leach, Albert,Goutam	8th Edition	Mc Graw hill
2	Computer Organization	Carl Hamacher, ZvonkoVranesic, SafwatZaky	5th Edition	Tata Mc Graw hill

VII(b): Reference Books: (Insert or delete rows as per requirement)

1	Digital Design with introduction to the verilog HDL	Morris Mano,Micheal Ciletti	5th edition	Pearson Education
2	Fundamentals of Logic Design	Charles H Roth.Larry Kinney	5th edition	Cengage Learning

VII(c): Web links and Video Lectures (e-Resources):

https://nptel.ac.in/courses/117106086
https://nptel.ac.in/courses/106106092

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quizzes
- Assignments
- Seminar

Semester:	III	**Course Type:**	IPCC		
Course Title: Operating Systems					
Course Code:	**23CSI304**			**Credits:**	04
Teaching Hours/Week (L:T:P:S)			3:0:2:0	**Total Hours:**	40 +(10-12 lab slots)
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	03

I. Course Objectives:

- To Demonstrate the need for OS and different types of OS.
- To discuss threading and multithreaded systems.
- To demonstrate concepts of Deadlock and memory management.
- To introduce Memory, storage, and file system management techniques.

II. Pre-requisites (Self Learning). Basics of Computers, Computer Organization.

III. Teaching-Learning Process (General Instructions):

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters student's Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world and when that's possible, it helps to improve the student's understanding.

IV. COURSE CONTENT	
Theory PART	
Module-1: Introduction to Operating Systems	8 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; Special-purpose systems; Computing environments. Operating System Services: User - Operating System interface; System calls; Types of system calls; System programs; Operating system design and implementation; Operating System structure; Virtual machines; Operating System debugging, Operating System generation; System boot. Textbook 1: Chapter – 1 (1.1-1.12), 2 (2.2-2.11)	
Self-learning: Types of Operating Systems.	
RBT Levels: L1, L2, L3	
Module-2: Process Management	8 Hrs
Process Management: Process concept; Process scheduling; Operations on processes; Inter process communication Multi-threaded Programming: Overview; Multithreading models; Thread Libraries; Threading issues. Process Scheduling: Basic concepts; Scheduling Criteria; Scheduling Algorithms; Thread scheduling; Multiple-processor scheduling, Textbook 1: Chapter – 3 (3.1-3.4), 4 (4.1-4.4), 5 (5.1 -5.5)	
Self-learning: Security in process management.	
RBT Levels: L1, L2, L3	
Module-3: Process Synchronization and Deadlocks	8 Hrs
Process Synchronization: Synchronization: The critical section problem; Peterson's solution; Synchronization hardware; Semaphores; Classical problems of synchronization; Deadlocks: System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock. Textbook 1: Chapter – 6 (6.1-6.6), 7 (7.1 -7.7)	
Self-learning: Resources allocation graph.	
RBT Levels: L1, L2, L3	
Module-4: Memory Management	8 Hrs
Memory Management: Memory management strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation. Virtual Memory Management: Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing. Textbook 1: Chapter -8 (8.1-8.6), 9 (9.1-9.6)	
RBT Levels: L1, L2, L3.	
Module-5: Secondary Memory and Protection	8 Hrs
File System, Implementation of File System: File system: File concept; Access methods; Directory and Disk structure; File system mounting; File sharing; Implementing File system: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management. Secondary Storage Structure, Protection: Mass storage structures; Disk structure; Disk attachment; Disk scheduling; Disk management; Protection: Goals of protection, Principles of protection, Domain of protection, Access matrix. Textbook 1: Chapter – 10 (10.1-10.5) ,11 (11.1-11.5),12 (12.1-12.5), 14 (14.1-14.4)	
RBT Levels: L1, L2, L3	

V. PRACTICAL PART

1. Develop a c program to implement the Process system calls (fork (), exec(), wait(), create process, terminate process)

2. Simulate the following CPU scheduling algorithms to find turnaround time and waiting time a) FCFS b) SJF c) Round Robin d) Priority.

3. Develop a C program to simulate producer-consumer problem using semaphores.

4. Develop 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.

5. Develop a C program to simulate Bankers Algorithm for DeadLock Avoidance.

6. Develop a C program to simulate the following contiguous memory allocation Techniques: a) Best fit b) First fit.

7. Develop a C program to simulate page replacement algorithms: a) FIFO b) LRU

8. Simulate following File Organization Techniques a) Single level directory b) Two level directory

9. Develop a C program to simulate the Linked file allocation strategies.

10. Develop a C program to simulate SCAN, LOOK disk scheduling algorithm.

VI. COURSE OUTCOMES

The student will be able to:

CO1	Define the process concept, structure, and design of the operating system.
CO2	Discuss the concepts of threads, process synchronization and CPU scheduling algorithms.
CO3	Identify causes of deadlocks and solutions for eliminating deadlock.
CO4	Analyze the virtual memory management and file system implementation.
CO5	Illustrate storage structure, disk scheduling and protection

VII. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3	S4
CO1	2	1														
CO2	2	2									1			1		
CO3	2	2									1			1		
CO4		2	1												1	
CO5	2	1	2					1							1	

VIII. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023.

Continuous Internal Evaluation (CIE): Refer Annexure section 2

Semester End Examination (SEE): Refer Annexure section 2

IX. Learning Resources

IX(a): Textbooks: (Insert or delete rows as per requirement)

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Operating System Principles	Abraham Silberschatz, Peter Baer Galvin, Greg Gagne	8th edition	Wiley-India

IX(b): Reference Books: (Insert or delete rows as per requirement)

Textbooks

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles 8th edition, Wiley-India, 2015 Reference Books 1. Ann McHoes Ida M Fylnn, Understanding Operating System, Cengage Learning, 6th Edition

2. D.M Dhamdhere, Operating Systems: A Concept Based Approach 3rd Ed, McGraw- Hill, 2013.

3. P.C.P. Bhatt, An Introduction to Operating Systems: Concepts and Practice 4th Edition, PHI(EEE), 2014. 4. William Stallings Operating Systems: Internals and Design Principles, 6th Edition, Pearson.

IX(c): Web links and Video Lectures (e-Resources):

- https://www.mbit.edu.in/wpcontent/uploads/2020/05/Operating_System_Concepts_8th_EditionA4.pdf
- https://www.coursera.org/courses?query=operating%20system
- https://onlinecourses.nptel.ac.in/noc20_cs04/preview
- https://www.udemy.com/course/operatingsystem-j/?utm_source=adwords&utm_medium=udemyads&utm_campaign=LongTail_la.EN_cc.INDIA&utm_content=deal4584&utm_term=_._ag_77882236223_._ad_533093955804_._kw ._de_c_._dm._pl._ti_dsa1007766171032_._li_1007771_._pd._&matchtype=&gclid=EAIaIQobChMIjOKkqKem-gIVFw4rCh3v_Q-aEAMYASAAEgJPu_D_BwE.

X: Activity Based Learning / Practical Based Learning/Experiential learning:

- Assignment
- Quiz
- Presentation
- Case Study on Unix based system

Semester:	3	**Course Type:**	PCCL		
Course Title: Data Structures LAB					
Course Code:	**23CSL305**			**Credits:**	1
Teaching Hours/Week (L:T:P:O) {O – Other pedagogies, mention @}			0:0:2:0	**Total Hours:**	24
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Practical			**Exam Hours:**	3

I. Course Objectives:

This laboratory course enables students to get practical experience in design, develop, implement, analyze and evaluation/testing of

- Dynamic memory management
- Linear data structures and their applications such as stacks, queues and lists
- Non-Linear data structures and their applications such as trees and graphs

II. Prerequisite: Basics oof C Programming

III. Self-Learning: Array operations programs, Program using Structures

IV. Teaching-Learning Process (General Instructions):

The student should be able to:

- Chalk and Talk with Black Board
- ICT based Teaching
- Demonstration based Teaching

V. COURSE CONTENT

Sl. No.	Experiments / Programs / Problems
1.	Develop a Program in C for the following: a. Declare a calendar as an array of 7 elements (A dynamically Created array) to represent7 days of a week. Each Element of the array is a structure having three fields. The first field is the name of the Day (A dynamically allocated String), The second field is the date of the Day (A integer), the third field is the description of the activity for a particular day (A dynamically allocated String). b. Write functions create(), read() and display(); to create the calendar, to read the data from the keyboard and to print weeks activity details report on screen.
2.	Develop a Program in C for the following operations on Strings. a. Read a main String (STR), a Pattern String (PAT) and a Replace String (REP) b. Perform Pattern Matching Operation: Find and Replace all occurrences of PAT in STR with REP if PAT exists in STR. Report suitable messages in case PAT does not exist in STR Support the program with functions for each of the above operations. Don't use Built-in functions.
3.	Develop a menu driven Program in C for the following operations on STACK of Integers (Array Implementation of Stack with maximum size MAX) a. Push an Element on to Stack

	b. Pop an Element from Stack c. Demonstrate how Stack can be used to check Palindrome d. Demonstrate Overflow and Underflow situations on Stack e. Display the status of Stack f. Exit Support the program with appropriate functions for each of the above operations
4.	Develop a Program in C for converting an Infix Expression to Postfix Expression. Program should support for both parenthesized and free parenthesized expressions with the operators: +, -, *, /, % (Remainder), ^ (Power) and alphanumeric operands.
5.	Develop a Program in C for the following Stack Applications a. Evaluation of Suffix expression with single digit operands and operators: +, -, *, /, %,^ b. Solving Tower of Hanoi problem with n disks
6.	Develop a menu driven Program in C for the following operations on Circular QUEUE of Characters (Array Implementation of Queue with maximum size MAX) a. Insert an Element on to Circular QUEUE b. Delete an Element from Circular QUEUE c. Demonstrate Overflow and Underflow situations on Circular QUEUE d. Display the status of Circular QUEUE e. Exit Support the program with appropriate functions for each of the above operations
7.	Develop a menu driven Program in C for the following operations on Singly Linked List (SLL) of Student Data with the fields: USN, Name, Programme, Sem, PhNo a. Create a SLL of N Students Data by using front insertion. b. Display the status of SLL and count the number of nodes in it c. Perform Insertion / Deletion at End of SLL d. Perform Insertion / Deletion at Front of SLL(Demonstration of stack) e. Exit
8.	Develop a menu driven Program in C for the following operations on Doubly Linked List (DLL) of Employee Data with the fields: SSN, Name, Dept, Designation, Sal, PhNo a. Create a DLL of N Employees Data by using end insertion. b. Display the status of DLL and count the number of nodes in it c. Perform Insertion and Deletion at End of DLL d. Perform Insertion and Deletion at Front of DLL e. Demonstrate how this DLL can be used as Double Ended Queue. f. Exit
9.	Develop a menu driven Program in C for the following operations on Binary Search Tree (BST) of Integers . a. Create a BST of N Integers: 6, 9, 5, 2, 8, 15, 24, 14, 7, 8, 5, 2 b. Traverse the BST in Inorder, Preorder and Post Order c. Search the BST for a given element (KEY) and report the appropriate message d. Exit
10.	Develop a Program in C for the following operations on Graph(G) of Cities a. Create a Graph of N cities using Adjacency Matrix. b. Print all the nodes reachable from a given starting node in a digraph using DFS/BFS method

Additional Practice Programs:

1. Write a program to Implement Single Link List with following operations: Sort the linked list, Reverse the linked list, Concatenation of two linked lists.
2. Write a C program to implement priority queue to insert, delete and display the elements.
3. Implement a program to multiply two polynomials using single linked list
4. Write a program to Implement Single Linked List to simulate Stack & Queue Operations.

5. Write a C program to simulate the working of Messaging System in which a message is placed in a circular Queue by a Message Sender, a message is removed from the circular queue by a Message Receiver, which can also display the contents of the Queue.
6. Write a C program to implement Hashing using Linear probing. Implement insertion, deletion, search and display

VI. COURSE OUTCOMES

CO1	Implement Linear data structures and their applications such as stacks, queues and lists
CO2	Implement Non-Linear data structures and their applications such as trees and graphs
CO3	Select appropriate data structures to solve real world problems

VII. CO-PO-PSO MAPPING(mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3	S4
CO1	2	1											1			
CO2	2	1											1			
CO3	2	2											1			

VIII. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023.

Continuous Internal Evaluation (CIE): Refer Annexure section 4

Semester End Examination (SEE): Refer Annexure section 4

- **Learning Resources**

VII(a): Textbooks: (Insert or delete rows as per requirement)

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
01	Fundamentals of Data Structures in C.	Ellis Horowitz and Sartaj Sahni	2nd edition, 2014.	Universities Press
02	Data Structures using C	Reema Thareja	3 rd Ed, 2012	Oxford press,

VII(b): Reference Books: (Insert or delete rows as per requirement)

01	Data Structures Schaum's Outlines	Seymour Lipschutz	1ST edition, 2014	McGraw Hill
02	Gilberg & Forouzan,	Data Structures: A Pseudo-code approach with C,	2nd edition, 2014.	Cengage Learning
03	Jean-Paul Tremblay & Paul G. Sorenson	An Introduction to Data Structures with Applications	2nd Ed, 2013	McGraw Hill
04	Robert Kruse	Data Structures and Program Design in C	2 nd Ed, 1996.	PHI

VII(c): Web links and Video Lectures (e-Resources):

- http://elearning.vtu.ac.in/econtent/courses/video/CSE/06CS35.html
- https://nptel.ac.in/courses/106/105/106105171/
- http://www.nptelvideos.in/2012/11/data-structures-and-algorithms.html
- https://www.youtube.com/watch?v=3Xo6P_V-qns&t=201s

- https://ds2-iiith.vlabs.ac.in/exp/selection-sort/index.html
- https://nptel.ac.in/courses/106/102/106102064/
- https://ds1-iiith.vlabs.ac.in/exp/stacks-queues/index.html
- https://ds1-iiith.vlabs.ac.in/exp/linked-list/basics/overview.html
- https://ds1-iiith.vlabs.ac.in/List%20of%20experiments.html
- https://ds1-iiith.vlabs.ac.in/exp/tree-traversal/index.html
- https://ds1-iiith.vlabs.ac.in/exp/tree-traversal/depth-first-traversal/dft-practice.html
- https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013501595428077568125 59/overview

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

- Case Study
- Programming Assignment
- MOOC Assignment for selected Module

Semester:	III	**Course Type:**	ETC		
Course Title: Computer Graphics					
Course Code:	**23CSE311**			**Credits:**	3
Teaching Hours/Week (L:T:P:O)			2:0:2:0	**Total Hours:**	25 +(10-12 lab slots)
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3

I. Course Objectives:

This course will enable students to:

- Explain hardware, software and OpenGL Graphics Primitives.
- Illustrate interactive computer graphic using the OpenGL.
- Design and implementation of algorithms for 2D graphics Primitives and attributes.
- Demonstrate Geometric transformations, viewing on both 2D and 3D objects.
- Infer the representation of Input interaction, Color and Illumination models

II. Teaching-Learning Process (General Instructions):

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.

2. Use of Video/Animation to explain functioning of various concepts.

3. Encourage collaborative (Group Learning) learning in the class.

4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.

5. Adopt Problem Based Learning (PBL), which fosters student's analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.

6. Introduce topics in manifold representations.

7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.

8. Discuss how every concept can be applied to the real world and when that's possible, it helps to improve the student's understanding.

III. COURSE CONTENT

III(a). Theory PART

Module-1: Computer Graphics and OpenGL:	Hrs 5

Computer Graphics: Basics of computer graphics, Application of Computer Graphics, Video Display Devices: Random scan and Raster scan displays, OpenGL: Introduction to OpenGL , Coordinate reference frames, Specifying two-dimensional world coordinate reference frames in OpenGL, OpenGL point functions, OpenGL line functions, Point attributes, Line attributes, Curve attributes, OpenGL point attribute functions, OpenGL line attribute functions, Line drawing algorithms(DDA, Bresenham's)

Text book-1: Chapter: 1(1,2), 2(5), 3(1 to 5), 5(1)

RBT Levels: 1,2,3

Module-2: 2D and 3D Geometric Transformations	Hrs 5

2D Geometric Transformations: Basic 2D Geometric Transformations, matrix representations and homogeneous coordinates. Inverse transformations, 2DComposite transformations, other 2D transformations, raster methods for geometric transformations, OpenGL raster transformations, OpenGL geometric transformation function.
3D Geometric Transformations: 3D translation, rotation, scaling, composite 3D transformations, other 3D transformations, affine transformations, OpenGL geometric transformations functions.

Text book-1: Chapter : 6 and 8

RBT Levels: 1,2,3

Module-3: Clipping, Color and Illumination Models:	Hrs 5

Clipping: Clipping window, normalization and viewport transformations, clipping algorithms,2D point clipping, 2D line clipping algorithms: Cohen-Sutherland line clipping only -polygon fill area clipping: Sutherland-Hodgeman polygon clipping algorithm only.
Color Models: Properties of light, color models, RGB and CMY color models.
Illumination Models: Light sources, basic illumination models-Ambient light, diffuse reflection, specular and Phong model, Corresponding OpenGL functions.

Text book-1: Chapter :7(2 to 8), 15(1,3,11)

RBT Levels:1,2,3

Module-4: 2D and 3D Viewing:	Hrs 5

2D Viewing: 2D viewing pipeline, OpenGL 2D viewing functions.
3D Viewing: 3D viewing concepts, 3D viewing pipeline, 3D viewing coordinate parameters, Transformation from world to viewing coordinates, Projection transformation, orthogonal projections, perspective projections, The viewport transformation and 3D screen coordinates. OpenGL 3D viewing functions.

Text book-1:Chapter: 7(1,4), 9(1 to 10)

RBT Levels:2,3,4

Module-5: Input & interaction:	Hrs 5

Input and Interaction: Input devices, clients and servers, Display Lists, Display Lists and Modeling, Programming Event Driven Input, Menus, Picking, Building Interactive Models, Animating Interactive programs, Design of Interactive programs, Logic operations.

Text book-2:Chapter 3: 3-1 to 3.11: Input& interaction

RBT Levels:2,3

III(b). PRACTICAL PART

Design, develop, and implement the following programs using OpenGL API

Sl. No.	Experiments / Programs / Problems
1	Draw basic geometric objects using OpenGL.
2	Implement Brenham's line drawing algorithm.
3	Create and rotate a triangle about the origin and a fixed point.
4	Draw a color cube and allow the user to move the camera suitably to experiment with perspective viewing.
5	Clip a lines using Cohen-Sutherland algorithm
6	To draw a simple shaded scene consisting of a tea pot on a table. Define suitably the position and properties of the light source along with the properties of the surfaces of the solid object used in the scene.
7	Design, develop and implement recursively subdivide a tetrahedron to form 3D Sierpinski gasket. The number of recursive steps is to be specified by the user.
8	Develop a menu driven program to fill the polygon using scan line algorithm
9	Develop a program to demonstrate animation effects on simple objects.

IV. COURSE OUTCOMES

The student will be able to:

CO1	Construct geometric objects using computer graphics primitives and OpenGL APIs
CO2	Illustrate 2D and 3D geometric transformation.
CO3	Demonstrate the concepts of clipping, color and illumination model.
CO4	Analyze various projection and viewing techniques on 2D and 3D objects..
CO5	Develop a GUI using various APIs for Input interaction.

V. CO-PO-PSO MAPPING(Mark H=3, M=2, L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3	S4
CO1	3	1			2								1			
CO2	3	2			2							1	1	1	1	
CO3	3	2			2							2	1	1	2	
CO4	3	2			2							2	1	1	2	
CO5	3	1			2							2	2	1	2	

VI. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023.

Continuous Internal Evaluation (CIE): Refer Annexure section 1

Semester End Examination (SEE): Refer Annexure section 1

VII. Learning Resources

VII(a): Textbooks: (Insert or delete rows as per requirement)

Reference / Text Book Details

Sl.No.	Title of Book	Author	Publication	Edition
1	Computer Graphics with OpenGL	Donald Hearn & Pauline Baker	Pearson Education	4th
2	Interactive Computer Graphics- A Top Down approach with OpenGL	Edward Angel:	Pearson Education,	5th
3	Computer graphics with OpenGL	James D Foley, Andries Van Dam, Steven K Feiner, John F Huges	Pearson education	---
4	Computer Graphics , sham's outline series	Xiang, Plastock	TMG.	2nd
5	Computer Graphics using OpenGL	M M Raiker,	Elsevier	---

VII(B): Web links and Video Lectures (e-Resources):

Web source: ***https://medium.com/analytics-vidhya/introduction-to-computer-vision-opencv-in-python-fb722e805e8b***

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

- Programming Assignment
- MOOC Assignment for selected Module

Semester:	III	**Course Type:**	ETC		
Course Title: Python for Data Analytics					
Course Code:	**23CSE312**			**Credits:**	3
Teaching Hours/Week (L:T:P:O)			2:0:2:0	**Total Hours:**	25 +(10-12 lab slots)
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3

I. Course Objectives:

This course will enable students to:

- Introduce fundamental Python programming concepts
- Develop proficiency with essential data structures
- Apply the NumPy library to perform mathematical operations
- Utilize Pandas DataFrames to explore and analyze data
- Employ Pandas functionalities to clean and prepare data for analysis

II. Pre-requisites: Basics of C and Python

III. Teaching-Learning Process (General Instructions):

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.

2. Use of Video/Animation to explain functioning of various concepts.

3. Encourage collaborative (Group Learning) Learning in the class.

4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.

5. Adopt Problem Based Learning (PBL), which fosters student's Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.

6. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.

7. Discuss how every concept can be applied to the real world and when that's possible, it helps to improve the student's understanding.

IV. COURSE CONTENT

IV(a). Theory PART

Module-1: An Introduction to Data Analysis	Hrs 5

Data Analysis, Knowledge Domains of the Data Analyst, Understanding the Nature of the Data, The Data Analysis Process, Quantitative and Qualitative Data Analysis, Open Data, Python and Data Analysis

Text book 1: Chapter 1

RBT Levels: 1,2,3

Module-2: Essentials of python programming	Hrs 5

Introduction to Python:

Features of Python, Installation of Python,Variables in Python, Output in Python, Input in Python, Operators

Control Flow Statements:

Decision making structures, Loops, Abnormal Loop Termination, User-defined Functions

Data Structures:

Lists, Tuples, Dictionary

Text Book 2: Chapter 1: 1.1, 1.2, 1.4, 1.5, 1.6, 1.7, Chapter 2: 2.1, 2.2, 2.4, 2.6, Chapter 3: 3.1, 3.2, 3.3

RBT Levels: 1,2,3

Module-3: Introduction to Numpy library	Hrs 5

The NumPy Library: ndarray: the heart of the library, Basic operations, indexing, slicing and iterating, conditions and boolean arrays, array manipulation, general concepts, reading and writing array data on files.

Textbook 1: Specified topics from Chapter 3

RBT Levels:1,2,3

Module-4: Introduction to Pandas library	Hrs 5

The pandas Library:

An Introduction to Data structure, Other functionalities on indexes, Operations between Data Structures, Function Application and Mapping.

Reading & Writing Data: I/O API tools, csv & Textual Files, Reading data in CSV or text files, Reading and Writing HTML files, Reading & Writing Data on Microsoft Excel Files.

Textbook 1: Specified topics from Chapter 4 and 5

RBT Levels:2,3,4

Module-5: Data Visualization with matplotlib	Hrs 5

The matplotlib Library, matplotlib Architecture, pyplot, using the kwargs, Adding further elements to the chart, Saving charts, Handling data values, Line chart, Histogram, Bar chart,

Textbook 1: Specified topics from Chapter 7

RBT Levels:2,3

IV(b). PRACTICAL PART	
Sl. No.	**Experiments / Programs / Problems**
1	a. Write a Python program to determine whether a given number is a prime number or not. Also enhance the program to find the first N prime numbers, where N is user input. b. Write a Python program to accept a positive integer and determine if it is a perfect square. Also display a message accordingly.
2	Create a list to represent a shopping cart, containing items (strings). a. Add items to the cart (using append()) b. Remove an item from the cart (using remove()) c. Create a function add_multiple_items that takes a list of items and uses extend to add them to the shopping cart in one go. d. Implement a function capitalize_first_letter that modifies an item's name (capitalizing the first letter) before adding it to the cart.
3	Write a Python program that functions as a customizable text analyzer. The program should accept a block of text and provide options to choose the type of analysis(word count, character count, Uppercase count and list, Lowercase count and list). Define separate functions for each option and also display the result in user-friendly format.
4	Create a tuple containing your name, age, and favorite color. Print the elements individually and access the entire tuple.
5	Write a Python program using NumPy that creates a random m x n integer array and prints the shape of the array (number of rows and columns) and also total number of elements in the array. a. Implement function fill_with_value (e.g., zeros) b. Implement a function randomly_generate_numbers (within a range) to populate the array.
6	Develop a python program to read and print CSV file in the console. After reading the CSV, calculate summary statistics for numerical columns (mean, median, standard deviation) using pandas functions.
7	Write a Python program to demonstrate how to draw a bar plot using Matplotlib.
8	Write a Python program to demonstrate how to draw a histogram plot using Matplotlib.
V. COURSE OUTCOMES	
CO1	Develop programs that demonstrate understanding of core concepts of Python language like data types, control flow, and functions.
CO2	Structure and organize data using lists, tuples and dictionaries in Python programs.
CO3	Apply essential numerical computations and data manipulation using the NumPy library.
CO4	Construct and manage DataFrames in pandas for data analysis tasks.
CO5	Implement basic plotting techniques using matplotlib library.
VI. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)	

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3	S4
CO1	2	1	3		2									1		
CO2	2	1			1									1		
CO3	2	1	2		2								1	1		
CO4	2	1			1								1	1		
CO5	2	1			1								1	1		

VII. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023.

Continuous Internal Evaluation (CIE): Refer Annexure section 1

Semester End Examination (SEE): Refer Annexure section 1

VIII. Learning Resources

VIII(a): Textbooks: (Insert or delete rows as per requirement)

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Python Data Analytics	Fabio Nelli	First Edition, 2015	Apress Publishing
2	Data Analytics using Python	Bharti Motwani	First Edition: 2020	Wiley Publication

VIII(b): Reference Books: (Insert or delete rows as per requirement)

1	Think Python	Allen B. Downey	Second Edition, Dec 2015	O'Reilly
2	Python for Data Analysis	Wes McKinney	Third Edition	O'Reilly

VIII(c): Web links and Video Lectures (e-Resources):

WebLinks:

1. https://docs.python.org/3/tutorial/ (Official Python Tutorial)
2. https://www.learnpython.org/ (Learn Python website with interactive tutorials)
3. https://discuss.python.org/c/core-dev/23 (No Starch Press' Intro to Python for Beginners)
4. https://numpy.org/doc/ (NumPy Official Documentation)
5. https://pandas.pydata.org/docs/ (Pandas PyData Documentation)
6. https://realpython.com/lessons/len-numpy-and-pandas/ (How to Use NumPy and Pandas Together by Real Python)

Video Lectures:

1. https://www.youtube.com/watch?v=eAoZjemZXrM (Crash Course in Python for Data Science by Google)
2. https://www.youtube.com/watch?v=FniLzpaSFGk (NumPy & Pandas Essential Training for Python by Linda Sandvik on YouTube)
3. https://m.youtube.com/watch?v=VK2QfDXPg6k (Data Wrangling with Pandas by Real Python)
4. https://www.youtube.com/channel/UC8butISFwT-Wl7EV0hUK0BQ/search?query=Python (Data Cleaning in Python Tutorial by freeCodeCamp on YouTube)

IX: Activity Based Learning / Practical Based Learning/Experiential learning:

- Quizzes
- Assignments

Semester:	III	**Course Type:**	ETC		
Course Title: Linux for Cyber Security					
Course Code:	**23CSE313**			**Credits:**	3
Teaching Hours/Week (L:T:P:O)			2:0:2:0	**Total Hours:**	25 +(10-12 lab slots)
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3

I. Course Objectives:

This course will enable students to:

- Understand fundamentals of ethical hacking, penetration testing, and the role of Linux in cybersecurity.
- Equip with essential Linux commands for text manipulation and basic network analysis techniques.
- Develop understanding of file and directory permissions, user management, and process control in Linux.
- Understand Bash scripting for automating tasks and provide them with tools for detecting network vulnerabilities.
- Familiarize with the Metasploit Framework, a popular tool for penetration testing and exploiting vulnerabilities.

II. Teaching-Learning Process (General Instructions):

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.

2. Use of Video/Animation to explain functioning of various concepts.

3. Encourage collaborative (Group Learning) Learning in the class.

4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.

5. Adopt Problem Based Learning (PBL), which fosters student's Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.

6. Introduce Topics in manifold representations.

7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.

8. Discuss how every concept can be applied to the real world and when that's possible, it helps to improve the student's understanding.

III. COURSE CONTENT

III(a). Theory PART

Module-1:	Hrs 5

Introduction
What is ethical hacking, Penetration testing, why hackers use linux, Getting started with Basics: Introductory Terms & Concepts, The Linux File system, Basic Commands in Linux, Modifying Files & Directories
Textbook 1: Specified topics from Chapter 1

RBT Levels: 1,2,3

Module-2:	Hrs 5

Text Manipulation:
Viewing files, Numbering the lines, filtering text with grep, using SED to find and replace, Viewing files with more and less, Analyzing and Managing Networks: Analyzing networks with ifconfig, checking wireless network devices with iwconfig, Changing your network information, Manipulating the domain name system.

Textbook 1: Chapter 2, Chapter 3

RBT Levels: 1,2,3.

Module-3:	Hrs 5

Controlling file and Directory Permissions:
Different types of users, granting permissions, checking permissions, changing permissions, Setting more secure default permissions with masks, special permissions.
Process Management:
Viewing Processes, filtering by process name, Greediest processes, Managing Processes, Killing Processes, Running Processes in the background, Moving a process to the foreground.

Textbook 1: Chapter 5, Chapter 6

RBT Levels:1,2,3.

Module-4:	Hrs 5

Bash Scripting:
A crash course in BASH, creating and running the bash scripts, scan for open ports, common built-in bash commands, Nmap and detecting and Exploiting vulnerabilities.
What is Nmap? Using Nmap to understand and exploit vulnerabilities, Scanning Techniques and Commands, Threat Modelling and Identifying vulnerabilities

Textbook 1: Chapter 8
Textbook 2: Chapter 5

RBT Levels:1,2,3.

Module-5:	**Hrs 5**

Metasploit Framework
What is Metasploit, Metasploit users, Metasploit Modules, Using Metasploit, Installing Metasploit, Managing Metasploit database, The Metasploit database, The Metasploit workspaces.
Textbook 2: Chapter 7

RBT Levels:1,2,3.

III(b). PRACTICAL PART

Sl. No.	Experiments / Programs / Problems
1	A. Demonstration of Installation and setting up of Virtual Machine and Kali Linux. B. Illustrate the below linux commands and directory operations: a) Ls b) whoami c)locate d)cat e)Directory operations
2	Find information on your active network interfaces.
3	Check whether you have any available wireless interfaces active
4	Find the name server and email server of your favorite website.
5	Select a directory and run a long listing on it. Note the permissions on the files and directories.
6	Illustration of changing permissions: a) chmod b) chown c) find d) SGID bitset
7	Illustration of different operations on Processes: a) ps b)top c) kill
8	Illustrate the common built-in bash commands.
9	Illustration of nmap with different operations.
10	Illustration of metaspoilt commands.

IV. COURSE OUTCOMES

The student will be able to

CO1	Define ethical hacking and penetration testing, and explain why Linux is a preferred platform for these activities.
CO2	Apply grep, sed commands and analyze network interfaces and configurations using tools like ifconfig and iwconfig.
CO3	Discuss and demonstrate file and directory permissions, understand different user types, and control running processes effectively.
CO4	Create basic Bash scripts, utilize Nmap for network scanning, and identify potential vulnerabilities in network configurations.
CO5	Illustrate Metasploit Framework's functionalities and its role in penetration testing.

V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3	S4
CO1	2	2			2			2				1	1			
CO2	2	2			1								1			
CO3	2	2												2		
CO4	2	2		2	2			2				2		2		
CO5											2		1			

VI. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023.

Continuous Internal Evaluation (CIE): Refer Annexure section 1

Semester End Examination (SEE): Refer Annexure section 1

VII. Learning Resources

VII(a): Textbooks: (Insert or delete rows as per requirement)

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Linux Basics for Hackers	OccupyTheWeb	2019	No Starch Press
2	Kali Linux Hacking, "A Complete Step by Step Guide to Learn the Fundamentals of Cyber Security, Hacking, and Penetration Testing.	Ethem Mining	2019	Amazon Digital Services LLC - Kdp, 2019

VII(b): Reference Books: (Insert or delete rows as per requirement)

1	Linux Command Line Crash Course	William Shotts	2nd Edition	No Starch Press
2	Linux Command Line and Bash Scripting Bible	Richard Blum Christine Bresnahan	Third Edition, 2015	Wiley

VII(c): Web links and Video Lectures (e-Resources):

WebLinks:

1. https://www.geeksforgeeks.org/introduction-to-kali-linux/
2. https://www.javatpoint.com/kali-linux-course

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

- Quizzes
- Assignments
- Seminar

Semester:	III	**Course Type:**	ETC		
Course Title: Web Design					
Course Code:	**23CSE314**			**Credits:**	3
Teaching Hours/Week (L:T:P:O)			2:0:2:0	**Total Hours:**	25 +(10-12 lab slots)
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3

I. Course Objectives:

This course will enable students to:

- Use the syntax and semantics of HTML5
- Develop different parts of a web page
- Understand how CSS can enhance the design of a webpage.
- Create and apply CSS styling to a webpage using Bootstrap.
- Get familiarity with the JavaScript language and understand Document Object Model handling of Java Script

II. Pre-requisite: Basics of HTML and CSS

III. Teaching-Learning Process (General Instructions):

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective

1. Use https://pythontutor.com/visualize.html#mode=edit in order to visualize the operations of Javascripts
2. Chalk and talk
3. Online demonstration
4. Hands on problem solving

IV. COURSE CONTENT

IV(a). Theory PART

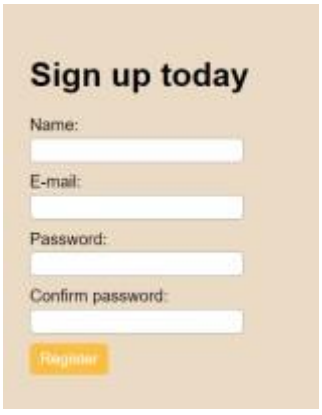
Module-1: HTML5:	Hrs 5

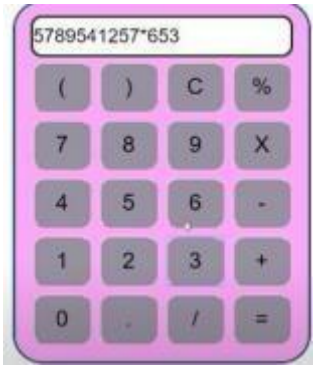
Hello HTML5, Loose Syntax Returns, XHTML5, HTML5: Embracing the Reality of Web Markup, Presentational Markup Removed and Redefined, HTML5 Document Structure Changes, Adding Semantics, HTML5's Open Media Effort, Client-Side Graphics with <canvas>, HTML5 Form Changes, Emerging Elements and Attributes to Support Web Applications.
Textbook 1: Chapter 2

RBT Levels: 1,2

Module-2: Cascading Style Sheets (CSS)	Hrs 5
CSS Syntax and Style, CSS Properties, Color Properties, RGB Values for Color, Opacity Values for Color, HSL and HSLA Values for Color, Font Properties, line-height Property, Text Properties, Border Properties, Element Box, padding Property, margin Property, Case Study: Description of a Small City's Core Area.families. **Textbook 2:** Chapter 3	
RBT Levels: 1,2	
Module-3: Tables and CSS, Links and Images	Hrs 5
Table Elements, Formatting a Data Table: Borders, Alignment, and Padding, CSS Structural Pseudo-Class Selectors, thead and tbody Elements, Cell Spanning, Web Accessibility, CSS display Property with Table Values, a Element, Relative URLs, Navigation Within a Web Page, CSS for Links, Bitmap Image Formats: GIF, JPEG, PNG, img Element, Responsive Images, Positioning Images, Shortcut Icon, iframe Element **Textbook 2:** 5.2 to 5.8, 6.2, 6.3, 6.6., 6.7, 6.9, 6.10, 6.12, 7.2 to 7.4	
RBT Levels:1,2,3	
Module-4: Getting Started with Bootstrap	Hrs 5
Bootstrap: Getting Started with Bootstrap- Mobile-irst design, Why Bootstrap, Including Bootstrap in your HTML file, The Bootstrap CDN, overriding with custom CSS, Using the Bootstrap customizer, Deep customization of Bootstrap Using the Base CSS: Implementing the Bootstrap Base CSS, Headings, Body copy, Typographic elements, Emphasis inline elements, Alignmenclasses, Emphasis classes, Addresses, Blockquotes, Abbreviations, Lists, Tables, Basic styling, Buttons, Forms, Inline forms, Horizontal forms, Code, Images, Font families **TextBook 3:** Chapter 1,2	
RBT Levels:1,2,3	
Module-5: JavaScript: Functions, DOM, Forms, and Event Handlers	**Hrs 5**
History of JavaScript, Hello World Web Page, Buttons, Functions, Variables, Identifiers, Assignment Statements and Objects, Document Object Model, Forms and How They're Processed: Client-Side Versus Server-Side, form Element, Controls, Text Control, Accessing a Form's Control Values, reset and focus Methods. **TextBook2:** 8.2 to 8,13, 8.15, 8.16	
RBT Levels:1,2,3	

IV(b). PRACTICAL PART	
Sl. No.	**Experiments / Programs / Problems**
1	Use HTML5 for performing following tasks: (i) Draw a square using HTML5 SVG , fill the square with green color and make 6px brown

	stroke width (ii) Write the following mathematical expression by using HTML5 MathML. $d=x^2-y^2$ (iii) Redirecting current page to another page after 5 seconds using HTML5 meta tag
2	Demonstrate the following HTML5 Semantic tags- <article>, <aside>, <details>, <figcaption>, <figure>, <footer>, <header>, <main>, <mark>, <section> for a webpage that gives information about travel experience.
3	Create a class called income, and make it a background color of #0ff. Create a class called expenses, and make it a background color of #f0f. Create a class called profit, and make it a background color of #f00. Throughout the document, any text that mentions income, expenses, or profit, attach the appropriate class to that piece of text. Further create following line of text in the same document: ~~The current price is 50₹~~and new price is 40
4	Change the tag li to have the following properties: • A display status of inline • A medium, double-lined, black border • No list style type Add the following properties to the style for li: • Margin of 5px • Padding of 10px to the top, 20px to the right, 10px to the bottom, and 20px to the left Also demonstrate list style type with user defined image logos
5	Design a web page to demonstrate, customization of Bootstrap classes using CSS
6	Develop an event countdown timer using HTML5, CSS/Bootstrap and JavaScript
7	Create following web page using HTML and CSS with tabular layout 

8	Create following calculator interface with HTML and CSS 
9	Write a Java Script program that on clicking a button, displays scrolling text which moves from left to right with a small delay
10	Create a webpage containing 3 overlapping images using HTML, CSS and JS. Further when the mouse is over any image, it should be on the top and fully displayed.

V. COURSE OUTCOMES

After going through this course, the student will be able to

CO1	Describe the fundamentals of web and concept of HTML5
CO2	Develop HTML5 documents by applying various semantic markup tags
CO3	Analyse various attributes, values and types of CSS
CO4	Implement core constructs and event handling mechanisms of JavaScript.

VI. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3	S4
CO1	3												2	2	1	
CO2	2	2	2										2	2	1	
CO3	2	2											2	2	1	
CO4	2	2	2										2	2	1	

VII. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023.

Continuous Internal Evaluation (CIE): Refer Annexure section 1

Semester End Examination (SEE): Refer Annexure section 1

VIII. Learning Resources

VIII(a): Textbooks: (Insert or delete rows as per requirement)

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	The Complete Reference	Thomas A. Powell,	Fifth Edition,2017	Tata McGraw Hill,
2	WEB PROGRAMMIN	John Dean, Jones & Bartlett Learning,	First Edition,2016	O'Reilly Media,

	G with HTML5, CSS and JavaScript,			
3	Learning Bootstrap	Aravind Shenoy, Ulrich Sossou	2020	Jones & Bartlett Learning,
VIII(b): Reference Books: (Insert or delete rows as per requirement)				
1	Internet & World Wide Web How to program	M.Deitel, P.J.Deitel, A.B.Goldberg	2004	3rd Edition, Pearson Education
VIII(c): Web links and Video Lectures (e-Resources):				
WebLinks: 1. Java Script and HTML Documents: https://www.youtube.com/watch?v=Gd0RBdFRvF0 2.Dynamic Documents with JavaScript: https://www.youtube.com/watch?v=HTFSIJALNKc				
IX: Activity Based Learning / Practical Based Learning/Experiential learning:				
Develop simple GUI interfaces for a computer program to interact with users				

Semester:	III	**Course Type:**	AEC		
Course Title: Version Controller using GIT					
Course Code:	**23CSAE31**			**Credits:**	1
Teaching Hours/Week (L:T:P:O) {O – Other pedagogies, mention @}			1:0:0:3	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	2

I. Course Objectives:

- Understand the importance of version control and distinguish between centralized and distributed systems.
- Learn to install GIT and execute basic commands for repository management.
- Explore advanced GIT operations like branching, merging, and workflows.
- Identify and resolve common GIT issues, ensuring smooth repository maintenance.
- Integrate GIT with Continuous Integration (CI) pipelines for automated testing and deployment.
- Utilize GitHub/GitLab for effective project management, collaboration, and open-source contribution.

II. Pre - Requisites:

Having prior experience in below will be very helpful in Learning(Not Compulsory).

- Basic Command Line Skills
- Text Editor or IDE proficiency
- Under Web Programming Basics

III. Teaching-Learning Process (General Instructions):

The Respective Trainer is advised to follow the Below methods.

1. A Power Point Presentation – For Course Overview and Lectures
2. Live Execution of Concepts and Make the students Replicate the same(Not copying).
3. Explain the Concepts step by step with continuous replication for larger concepts
4. Each Session should be combined with hands-on exercises

IV. COURSE CONTENT

Module-1: Introduction to Version Control and GIT Basics	8 Hrs

Understanding Version Control Systems: Overview of version control, its benefits, and popular systems, Getting Started with GIT: Installing GIT, basic commands, initializing repositories, Basic GIT Operations: Cloning, adding, committing, branching, GIT Help and Documentation: Using GIT help, understanding config files.

RBT Levels: L1, L2	
Module-2: GIT Advanced Operations and Collaboration	8 Hrs
Branching and Merging: Managing branches, resolving conflicts, Collaborating with GIT: Forking, pull requests, managing repositories, GIT Workflows: Different workflows, like centralized and feature branch, GIT Tools and Extensions: GIT GUI, IDE plugins.	
RBT Levels:L1, L2, L3	
Module-3: GIT Internals and Troubleshooting	8 Hrs
Understanding GIT Internals: Object model, references, packfiles, Troubleshooting GIT Issues: Common problems, solutions, GIT Hooks: Setting up and using hooks, GIT Best Practices: Commit messages, branching strategies.	
RBT Levels: L1, L2, L3	
Module-4: GIT and Continuous Integration/Deployment	8 Hrs
Continuous Integration Concepts: Introduction to CI/CD, benefits, tools, Setting Up a CI Pipeline with GIT: Integrating GIT, basic pipelines, Advanced CI/CD Pipelines: Handling variables, deployment strategies, Case Studies and Best Practices: Examples, maintenance tips.	
RBT Levels: L1, L2, L3	
Module-5: GIT and GitHub/GitLab Mastery	8 Hrs
Mastering GitHub/GitLab: Using features, managing teams, Advanced GitHub/GitLab Features: Actions, packages, documentation, Open Source Contribution: Finding projects, contributing, Security and Compliance with GIT: Best practices, sensitive information.	
RBT Levels: L1, L2, L3	

V. COURSE OUTCOMES

CO1	Define the importance of version control and be able to initiate a GIT repository.
CO2	Utilize branching and merging techniques and effectively collaborate using GIT in team environments.
CO3	Explain GIT's internal structure and troubleshoot common issues, ensuring a smooth version control process.
CO4	Utilize GIT with CI/CD pipelines, automating testing and deployment processes efficiently.
CO5	Demonstrate proficiency in using GitHub/GitLab for project management, contributing to open-source projects, and ensuring security compliance.

VI. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3	S4
CO1	1				3				1			1				
CO2	1				3				3	3		1				
CO3	2	2			3							1				
CO4	1				3						1	1				

CO5	1				3			1		2	1	1					

VII. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023.

Continuous Internal Evaluation (CIE): Refer Annexure section 5

Semester End Examination (SEE): Refer Annexure section 5

VIII. Learning Resources

VIII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Pro GIT Book	GIT Official	2nd Edition 2014	GIT

VIII(b): Web links and Video Lectures (e-Resources):

Title: Learn Git – Full Course for Beginners
Link: https://youtu.be/zTjRZNkhiEU?si=CHL90bu7Ixci1e6z
Title: Git For Beginners
Link: https://youtu.be/vwj89i2FmG0?si=FjSy-68PE_Sfb0nn

IX: Activity Based Learning / Practical Based Learning/Experiential learning:

- Quizzes
- Experiment the Learned Concepts

Semester:	III	**Course Type:**	NCMC		
Course Title: Skilful Futures: Empowering Aptitude and Soft skills					
Course Code:	**23PDSN03**			**Credits:**	PP/NP
Teaching Hours/Week (L: T: P: O)			0:0:0:2	**Total Hours:**	24
CIE Marks:	50	**SEE Marks:**	NA	**Total Marks:**	50
SEE Type:	NA			**Exam Hours:**	NA

I. Course Objectives:

- To strengthen logical and analytical thinking skills required to solve quantitative problems.
- To discuss the importance of ethical considerations in leadership and negotiation, emphasizing integrity, fairness, and accountability in decision-making and interactions.
- To apply problem-solving strategies to real-world situations.
- To crafting Effective Openings and Closings.
- To develop a systematic approach to creative problem solving

II. Teaching-Learning Process (General Instructions):

The following are some of the strategies that teachers can employ to facilitate the achievement of various course outcomes:

1. **Diverse Teaching Methods**: Instead of relying solely on traditional lecture methods, can explore alternative and effective teaching approaches. These might include interactive discussions, hands-on activities, or multimedia presentations.
2. **Visual Aids**: Utilize videos and animations to elucidate complex concepts. Visual representations enhance understanding and engagement among students.
3. **Collaborative Learning**: Encourage group learning within the classroom. Collaborative activities foster teamwork, communication, and a deeper grasp of subject matter.
4. **Higher Order Thinking (HOT) Questions**: Pose at least three thought-provoking questions during class. These questions stimulate critical thinking and encourage students to analyze and evaluate information.
5. **Problem-Based Learning (PBL):** Implement PBL, which nurtures analytical skills. PBL goes beyond rote memorization by challenging students to design solutions, evaluate evidence, and think critically.
6. **Multiple Representations**: Introduce topics using various representations. Visuals, diagrams, and real-world examples cater to diverse learning styles.
7. **Creative Problem Solving**: Present different approaches to solving the same problem. Encourage students to think outside the box and devise their own innovative solutions.
8. **Real-World Application**: Discuss how each concept relates to practical scenarios. Connecting theoretical knowledge to real-world contexts enhances students' comprehension and retention.

□ Chalk & Talk □ Stud. Assignment □Web Resources □LCD/Smart Boards □Stud. Seminars

III. COURSE CONTENT

Module-1: Quantitative Aptitude-1	6 Hrs
Problems on Permutation and Combination. Problems on Surds and Indices **Textbook : Textbook (b) -1: Section –I Page no: 308-373; page no 375-408**	
Prerequisites: Basic knowledge of Mathematics	

Module-2: Visualize Leadership and Negotiation skills	4 Hrs
Leadership skills, Persuasion Skills, Negotiation Skills and Conflict Resolving Skills **Textbook: Textbook 5: Chapter-1**	
Module-3: Quantitative Aptitude – 02	6 Hrs
Problems on Percentage, Problems on Profit and Loss , Problems on cubes and Dices. **Textbook : Textbook (b) -1 Section –I Page no: 308-373; page no 375-408**	
Prerequisites: Basic Calculation Knowledge.	
Module-4: Letter and Writing Skills	4 Hrs
Writing Skills, Formal, Informal Letters, Sample Letters, Business Professional writings and Adaptability in writing style **Textbook : Textbook 4: Chapter-1**	
Module-5: Logical Reasoning	4 Hrs
Syllogism Concepts and Logical Deduction **Text book : Textbook 3; Chapter1 to 3**	
Prerequisites: Basic concepts of Set theory/ Venn diagrams	

IV. COURSE OUTCOMES:

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

CO1	Solve complex problems related to Arithmetic, algebra, geometry, Statistics Permutation and Combination, demonstrating a strong understanding of the concepts.
CO2	Apply Surds and Indices concepts proficiently to solve mathematical problems with precision.
CO3	Develop leadership skills, including effective communication, persuasion, negotiation, and conflict resolution techniques.
CO4	Demonstrate proficiency in solving Percentage, Profit and Loss, and cubes and Dices problems, showcasing quantitative aptitude.
CO5	Enhance writing skills by effectively composing formal and informal letters, business professional writings, and adapting writing styles to different contexts.

V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3	S4
CO1	2	2						2				1	1		2	1
CO2								2	2			2		2		
CO3	2	2						2				2			1	
CO4										2		2				2
CO5	2	2										1	1	1		1

VI. Assessment Details (CIE & SEE)

General Rules: Refer Annexure-1 section 8

Continuous Internal Evaluation (CIE): Refer Annexure-1section 8

Semester End Examination (SEE): Refer Annexure-1 section 8

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Fastrack Objective Arithmetic	Rajesh verma	2022	Arihant Publications
2	Algebra Booster	Rejaul Markshud	2017	Mcgraw Hill Education
3	Sense and Syllogism	Aparna Tulpule	2019	Whitefalcon
4	A Handbook on letter writing	S.C Gupta	2018	Arihant publications

5	"Leadership Theory and practice"	Peter.G Northouse	2021	SAGE
VII(b): Reference Books:				
1	Quantitative Aptitude for Competitive examination	R S Agarwal	2017	S Chand
2	Are we leading?	Kaushik Mahaputhra	2020	Notion press
4	A modern approach to logical reasoning	R S Agarwal	2019	S Chand
VII(c): Web links and Video Lectures (e-Resources):				
• https://youtu.be/6B-dvOMTeV8?si=Mx0GqAVqjh6VtDRP • https://youtu.be/MFj7QIXn-mM?si=AQlxLi086k1GrJuk				
VIII: Activity Based Learning / Practical Based Learning/Experiential learning:				
Assignments, Quizzes and Seminar, group discussions etc.				

4th Semester Syllabus

Semester:	IV	**Course Type:**	BSC		
Course Title: Probability Distributions and Statistical Methods					
Course Code:	**23CST401**			**Credits:**	3
Teaching Hours/Week (L:T:P:O)			2:2:0:@	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3

I. Course Objectives:

This course will enable students to:

- To facilitate the students with a concrete foundation of probability distributions.
- Understand the concepts of sampling distributions.
- Learn the concepts of curve fitting and statistical techniques.

II. Teaching-Learning Process (General Instructions):

1. In addition to the traditional lecture method, innovative teaching methods shall be adopted.
2. State the need for Mathematics with Engineering Studies and Provide real-life examples.
3. Grading assignments and quizzes and documenting students' progress.
4. Encourage the students for group learning to improve their creative and analytical skills.

III. COURSE CONTENT

Module-1: Curve fitting and Statistical Techniques	8Hrs

Curve fitting by method of least squares: $y = ax+b$, $y = ax^2 +bx+c$ and $y= ab^x$, Correlation–Karl Pearson's coefficient of correlation, Regression analysis – lines of regression (without proof)-problems, Rank correlation.

Applications of multiple regression in performance tuning and optimization in software engineering.

*** Application problems to be excluded for SEE**

Textbook1: Chapter 24(24.4 to 24.6, 24.8) ,Chapter 25(25.12 to 25.14, 25.16).

Self Learning: Angle between two regression lines, problems, Fitting of the curve $y= ax^b$

RBT Levels:L1, L2 and L3

Module-2: Probability Distributions	8Hrs

Review of basic probability theory. Random Variables (Discrete and Continuous). Probability mass and density functions. Mathematical expectation, Mean and varience. Discrete probability distributions: Binomial, Poisson and Normal distributions (derivations for mean and standard deviation for Binomial and Poisson distributions only)-Illustrative examples.

Applications to analyze the performance of the algorithms.

*** Application problems to be excluded for SEE.**

Textbook1: Chapter 26.7 to 26.10, 26.14 to 26.17.	
Self Learning: Geometric distribution and Exponential distribution.	
RBT Levels:L1, L2 and L3	
Module-3: Two dimensional Random variables and Stochastic process	8Hrs
Joint Probability distribution for two discrete random variables, expectation, covariance, correlation coefficient. **Stochastic process:** Stochastic processes, probability vector, stochastic matrices, fixed points, regular stochastic matrices, Markov chains, higher transition probability-simple problems. Applications to rank web pages based on their importance. *** Application problems to be excluded for SEE).**	
Textbook2: Chapter 31(31.1 ,31.2).	
Self Learning: Conditional density function.	
RBT Levels: L1, L2 and L3	
Module-4: Sampling distributions	8Hrs
Introduction to Sampling distributions, Standard error, Type-I and Type-II errors. Test of hypothesis for means. Confidence limits for means, Student's t-distribution, Chi-square distribution as a test of goodness of fit. F-distribution. **Textbook1:** Chapter 27 (27.1 to 27.8, 27.10 to 27.12, 27.14, 27.15, 27.17, 27.18 and 27.19). **Self Learning:** Point estimation and interval estimation.	
RBT Levels: L1, L2 and L3	
Module-5: Design of Experiments & ANOVA	8Hrs
Principles of experimentation in design, Analysis of completely randomized design, randomized block design. The ANOVA Technique, Basic Principle of ANOVA, One-way ANOVA, Two-way ANOVA, Latin-square Design. **Textbook3: Chapter** 12(12.4, 12.5 ,12.6). **Self Learning:** Analysis of Co-Variance	
RBT Levels: L1, L2 and L3	

IV.COURSE OUTCOMES

The student will be able to:

CO1	Illustrate the basic concepts of statistics, probability and sampling theory.
CO2	Apply the knowledge of statistical techniques and probability distributions of Random variables .
CO3	Analyse the concepts of statistics, sampling techniques and probability distributions for models arising in the engineering field.
CO4	Interpret the strength and limitations of statistical data, probability distributions and sampling theory.

V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/ PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3
CO1	3	2	1									1	1		1
CO2	3	2	1									1	2		2
CO3	3	2	1									1	2		2
CO4	3	2	1									1	1		1

VI. Assessment Details (CIE & SEE)

General Rules:
Refer CIE and SEE guidelines based on course type for autonomous scheme 2023

Continuous Internal Evaluation (CIE): Refer annexure section 1

Semester End Examination (SEE): Refer annexure section 1

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Name of the publisher
1	Higher Engineering Mathematics	B.S. Grewal	Khanna Publishers
2	Higher Engineering Mathematics	B.V.Ramana	Tata Mc Graw-Hill
3	Probability & Statistics for Engineers & Scientists	Ronald E. Walpole, Raymond H Myers, Sharon L Myers & Keying Ye	Pearson Education

VII(b): Reference Books:

1	Advanced Engineering Mathematics	E. Kreyszig	John Wiley & Sons	10th Ed., 2016
2	Advanced Engineering Mathematics	C. Ray Wylie, Louis C. Barrett	McGraw – Hill Book Co.,	6th Ed., 2017
3	Probability & Statistics for Engineers & Scientists	Ronald E. Walpole, Raymond H Myers, Sharon L Myers & Keying Ye	Pearson Education	9th Ed., 2023.
4	Linear Algebra and its Applications	David C Lay	Pearson Publishers	4th Ed., 2018.

VII(c): Web links and Video Lectures (e-Resources):

- http://nptel.ac.in/courses.php?disciplineID=111
- http://www.class-central-central.com/subject/math(MOOCs)
- http://academiccarth.org/
- VTU EDUSAT programme-20

VIII: Activity Based Learning

Assignments / Quiz / Presentation.

Semester:	IV	**Course Type:**	**PCC**		
Course Title: Design and Analysis of Algorithms					
Course Code:	**23CST402**			**Credits:**	4
Teaching Hours/Week (L:T:P:O)			3:0:0:0	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3

I. Course Objectives:

- To learn the methods for analysing algorithms and evaluating their performance
- To demonstrate the efficiency of algorithms using asymptotic notations.
- To solve problems using various algorithm design methods, including brute force, greedy, divide and conquer, decrease and conquer, transform and conquer, dynamic programming, backtracking, and branch and bound.
- To learn the concepts of P and NP complexity classes.

II. Teaching-Learning Process (General Instructions):

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only traditional lecture method, but different type of teaching methods may be adopted to develop the outcomes.

2. Show Video/animation films to explain functioning of various concepts.

3. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.

4.Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it.

5. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.

6. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

III. COURSE CONTENT	
Module-1: Introduction to Algorithm and its Analysis	8 Hrs
Introduction: What is an Algorithm? It's Properties. Algorithm Specification-using natural language, using Pseudo code convention, Fundamentals of Algorithmic Problem solving, Analysis Framework, time efficiency and space efficiency, Worst-case, Best-case and Average case efficiency. **Performance Analysis**: Estimating Space complexity and Time complexity of algorithms. Asymptotic Notations: Big-Oh notation (O), Omega notation (Ω), Theta notation (θ) with examples, Basic efficiency classes, Mathematical analysis of Non-Recursive and Recursive Algorithms with Examples. **Brute Force Design Technique**: Selection sort, sequential search, string matching algorithm with complexity Analysis. Textbook 1: Chapter 1 (Sections 1.1,1.2), Chapter 2(Sections 2.1,2.2,2.3,2.4), Chapter 3(Section 3.1,3.2) Textbook 2: Chapter 1(section 1.1,1.2,1.3)	
Pre-requisites : **Different types of data structures and problem types.**	
RBT Levels:L1,L2,L3	
Module-2: Divide and Conquer	8 Hrs
Divide and Conquer: General method, Recurrence equation for divide and conquer, solving it using Master's theorem, Divide and Conquer algorithms and complexity Analysis of Finding the maximum & minimum, Merge sort, Quick sort. **Decrease and Conquer Approach**: Introduction, Insertion sort, Topological Sorting. It's efficiency analysis. Textbook 2: Chapter 3(Sections 3.1,3.3,3.4,3.5,3.6) Textbook 1: Chapter 4 (Sections 4.1,4.2,4.3), Chapter 5(Section 5.1,5.3)	
Pre-requisites: **Knowledge of Tree traversal like Breadth first Search and Depth First Search**	
RBT Levels: L1, L2, L3	
Module-3: Greedy Method	8 Hrs
Greedy Method: General method, Knapsack Problem, solving Job sequencing with deadlines Problems. Minimum cost spanning trees: Prim's Algorithm, Kruskal's Algorithm with performance analysis. Single source shortest paths: Dijkstra's Algorithm. Optimal Tree problem: Huffman Trees and Codes. **Transform and Conquer Approach**: Introduction, Heaps and Heap Sort. Textbook 2: Chapter 4(Sections 4.1,4.3,4.5) Textbook 1: Chapter 9(Section 9.1,9.2,9.3,9.4), Chapter 6(Section 6.4)	
Pre-requisites : **Knowledge of trees , representation of graphs, tree properties , spanning tree.**	
RBT Levels:L1,L2,L3	
Module-4: Dynamic Programming	8 Hrs

Dynamic Programming: General method with Examples, Multistage Graphs. Transitive Closure: Warshall's Algorithm,All Pairs Shortest Paths: Floyd's Algorithm, Knapsack problem, Travelling Sales Person problem.
Space-Time Tradeoffs: Introduction, Sorting by Counting, Input Enhancement in String Matching Horspool's algorithm.
Textbook 2: Chapter 5 (Sections 5.1,5.2,5.4,5.9)
Textbook 1: Chapter 8(Sections 8.2,8.4), Chapter 7 (Sections 7.1,7.2)

Pre-requisite: Transitive property

RBT Levels:L1,L2,L3

Module-5: Backtracking	8 Hrs

Backtracking: General method, solution using back tracking to N-Queens problem, Sum of subsets problem
Branch and Bound: Assignment Problem, Travelling Sales Person problem, 0/1 Knapsack problem
NP-Complete and NP-Hard problems: Basic concepts, non- deterministic algorithms, P, NP, NP Complete, and NP-Hard classes.
Textbook 1: Chapter 12 (Sections 12.1,12.2) Chapter 11(11.3)
Textbook 2: Chapter 7 (Sections 7.1,7.2,7.3,7.4,7.5)Chapter 11 (Section 11.1)

Pre-requisites:
Knowledge of subset
Self learning: Basic concepts **of** P, NP, NP Complete, and NP-Hard classes

RBT Levels:L1,L2,L3

IV. COURSE OUTCOMES

CO1	Use asymptotic notations to analyse the performance of the algorithms in terms of time complexity.
CO2	Illustrate divide & conquer approach and decrease & conquer approach to design and analyse computational problems.
CO3	Incorporate transform & conquer and greedy method to design an algorithm for given real world or complex computational problems.
CO4	Apply Dynamic programming and input enhancement methods to solve graph & string based computational problems.
CO5	Analyse various classes (P,NP and NP Complete) of problems ,Illustrate backtracking, branch & bound methods..

V. CO-PO-PSO MAPPING(mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3	S4
CO1	3	2											2		2	
CO2	3	3	3										2		2	
CO3	3	3	3										2		2	
CO4	3	2	3										2		2	
CO5	3	2	3										2		2	

VI. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023.

Continuous Internal Evaluation (CIE): Refer Annexure section 1

Semester End Examination (SEE): Refer Annexure section 1

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Introduction to the Design and Analysis of Algorithms	AnanyLevitin	2nd Edition, 2017	Pearson Education
2	Computer Algorithms/C++	Ellis Horowitz, SatrajSahni and Rajasekaran	2nd Edition, 2014	Universities Press

VII(b): Reference Books:

1	Introduction to Algorithms	Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein	3rd edition	PHI
2	Design and Analysis of Algorithms	S. Sridhar	-	Oxford(Higher Education)

VII(c): Web links and Video Lectures (e-Resources):

Mention the links of the online resources, video materials, etc. Weblinks and Video Lectures (e-Resources):

1. https://nptel.ac.in/courses/106/101/106101060/

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

1. Promote real-world problem-solving and competitive problem solving through group discussions to engage students actively in the learning process.
2. Encourage students to enhance their problem-solving skills by implementing algorithms and solutions through programming exercises, fostering practical application of theoretical concepts.

Assessment Methods -

1. Problem Solving Assignments (Hacker Rank/ Hacker Earth / Leadcode)
2. Gate Based Aptitude Test

Semester:	IV	**Course Type:**	IPCC		
Course Title: Object Oriented Programming with JAVA					
Course Code:	**23CSI403**			**Credits:**	4
Teaching Hours/Week (L:T:P:O)			3:0:2:0	**Total Hours:**	40 +(10-12 lab slots)
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3

I. Course Objectives:

- To learn fundamentals OOP and JAVA evolution.
- To learn primitive constructs JAVA programming language.
- To understand Object Oriented Programming Features of JAVA.
- To learn exception handling and thread programming in JAVA.

II. Teaching-Learning Process (General Instructions):

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective

1. Use Online Java Compiler IDE: https://www.jdoodle.com/online-java-compiler/ or any other.
2. Demonstration of programming examples.
3. Chalk and board, power point presentations
4. Online material (Tutorials) and video lectures.

III. COURSE CONTENT

III(a). Theory PART

Module-1	12 Hrs

An Overview of Java: Object-Oriented Programming, A First Simple Program, A Second Short Program, Two Control Statements, Using Blocks of Code, Lexical Issues, The Java Class Libraries.
Data Types, Variables, and Arrays: Java Is a Strongly Typed Language, The Primitive Types, Integers, Floating-Point Types, Characters, Booleans, A Closer Look at Literals, Variables, Type Conversion and Casting, Automatic Type Promotion in Expressions, Arrays, A Few Words About Strings.
Operators: Arithmetic Operators, The Bitwise Operators, Relational Operators, Boolean Logical Operators, The Assignment Operator, The ? Operator, Operator Precedence, Using Parentheses.
Control Statements: Java's Selection Statements, Iteration Statements, Jump Statements.
Textbook 1: Ch 2,Ch 3.Ch 4, Ch 5.

RBT Levels: 1,2

Self-learning: Operators

Module-2	12 Hrs

Introducing Classes: Class Fundamentals, Declaring Objects, Assigning Object Reference Variables, Introducing Methods, Constructors, The this Keyword, Garbage Collection, The finalize( ) Method, A Stack Class.

A Closer Look at Methods and Classes: Overloading Methods, Using Objects as Parameters, A Closer Look at Argument Passing, Returning Objects, Recursion, Introducing Access Control, Understanding static, Introducing final, Arrays Revisited.

Textbook 1: Ch 6, Ch 7.

RBT Levels:2,3,4

Module-3	12 Hrs

Inheritance: Inheritance Basics, Using super, Creating a Multilevel Hierarchy, When Constructors Are Executed, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, Using final with Inheritance, Local Variable Type Inference and Inheritance, The Object Class.

Textbook 1: Ch 8.

RBT Levels:2,3,4

Module-4	12 Hrs

Interfaces: Interfaces, Default Interface Methods, Use static Methods in an Interface, Private Interface Methods.

Packages: Packages, Packages and Member Access, Importing Packages.

Textbook 1: Ch 9.

RBT Levels:2,3,4

Module-5	12 Hrs

Exceptions: Exception-Handling Fundamentals**,** Exception Types**,** Uncaught Exceptions**,** Using try and catch, Multiple catch Clauses, Nested try Statements, throw, throws, finally, Java's Built-in Exceptions, Creating Your Own Exception Subclasses, Chained Exceptions.

Multithreaded Programming: The Java Thread Model, The Main Thread, Creating a Thread, Creating Multiple Threads, Using isAlive() and join(), Thread Priorities, Synchronization, Inter thread Communication, Suspending, Resuming, and Stopping Threads, Obtaining a Thread's State.

Textbook 1: Ch 10, Ch 11.

RBT Levels:2,3,4

III(b). PRACTICAL PART

Sl. No.	**Experiments / Programs / Problems**
1.	Aim: Discuss the various Decision-making statements, loop constructs in java Program: A. Write a program to check prime number B. Write a program for Arithmetic calculator using switch case menu
2.	Aim: Demonstrating creation of java classes, objects, constructors, declaration and initialization of variables. A class called Employee, which models an employee with an ID, name and salary. The method raiseSalary (percent) increases the salary by the given percentage. Develop the Employee class and suitable main method for demonstration.
3.	Aim: Demonstrating command line arguments.

	Develop a JAVA program to add TWO matrices of suitable order N (The value of N should be read from command line arguments).
4.	Aim: Demonstrating Stack operation. Develop a stack class to hold a maximum of 10 integers with suitable methods. Develop a JAVA main method to illustrate Stack operations.
5.	Aim: Introduce concepts of method overloading, constructor overloading, overriding. Program: Write a java program demonstrating Method overloading and Constructor overloading.
6.	Aim: Introduce the concept of Inheritance (is-a relationship). Develop a JAVA program to create a class named shape. Create three sub classes namely: circle, triangle and square, each class has two member functions named draw () and erase (). Demonstrate inheritance concepts by developing suitable methods, defining member data and main program.
7.	Aim: Introduce the concept of Inheritance (has-a relationship). Develop a JAVA program to create an outer class with a function display. Create another class inside the outer class named inner with a function called display and call the two functions in the main class.
8.	Aim: Introduce the concept of Polymorphism. Develop a JAVA program to create an abstract class Shape with abstract methods calculateArea() and calculatePerimeter(). Create subclasses Circle and Triangle that extend the Shape class and implement the respective methods to calculate the area and perimeter of each shape.
9.	Aim: Introduce the concept of Interface. Develop a JAVA program to create an interface Resizable with methods resizeWidth(int width) and resizeHeight(int height) that allow an object to be resized. Create a class Rectangle that implements the Resizable interface and implements the resize methods
10.	Aim: Introduce the concept of Packages. Develop a JAVA program to create a package named mypack and import & implement it in a suitable class.
11.	Aim: Exception handling in java, introduction to throwable class, throw, throws, finally. Program: Write a Java program to read two integers a and b. **Compute** a/b and print, when b is not zero. Raise an exception when b is equal to zero.
12.	Aim: Demonstrate creation of threads using Thread class and Runnable interface, multi-threaded programming. Program: Write a Java program that implements a **multi-thread** application that has three threads. First thread generates a random integer for every 1 second; second thread computes the square of the number and prints; third thread will print the value of cube of the number.

IV. COURSE OUTCOMES

CO1	Demonstrate proficiency in writing simple programs involving branching and looping structures.
CO2	Construct a class involving data members and methods for the given scenario.
CO3	Apply the concepts of inheritance and interfaces in solving real world problems.
CO4	Utilize the concept of packages and exception handling in solving complex problem.
CO5	Apply concepts of multithreading in program development.

V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3	S4
CO1	2															
CO2	2	1	1													
CO3	2	1	2	1									1			
CO4	2	1	2										1			
CO5	2	2	1										1			

VI. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023.

Continuous Internal Evaluation (CIE): Refer Annexure section 2

Semester End Examination (SEE): Refer Annexure section 2

VII. Learning Resources

VII(a): Textbooks: (Insert or delete rows as per requirement)

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Java: The Complete Reference	Herbert Schildt	Twelfth Edition, November 2021	McGraw-Hill, ISBN: **9781260463422**

VII(b): Reference Books: (Insert or delete rows as per requirement)

1	Programming with Java	E Balagurusamy	6th Edition Mar--**2019**	McGraw Hill Education, ISBN: 9789353162337.
2	Thinking in Java,	Bruce Eckel	Fourth Edition 2006	Prentice Hall (https://sd.blackball.lv/library/thinking_in_java_4th_edition.pdf)

VII(c): Web links and Video Lectures (e-Resources):

- Java Tutorial: https://www.geeksforgeeks.org/java/
- Introduction To Programming In Java (by Evan Jones, Adam Marcus and Eugene Wu): https://ocw.mit.edu/courses/6-092-introduction-to-programming-in-java-january-iap-2010/
- Java Tutorial: https://www.w3schools.com/java/
- Java Tutorial: https://www.javatpoint.com/java-tutorial

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

- Installation of Java (Refer: https://www.java.com/en/download/help/index_installing.html)
- Demonstration of online IDEs like geeksforgeeks, jdoodle or any other Tools
- Demonstration of class diagrams for the class abstraction, type visibility, composition and inheritance

Semester:	IV	**Course Type:**	IPCC		
Course Title: Microcontroller and Internet of Things					
Course Code:	**23CSI404**			**Credits:**	4
Teaching Hours/Week (L:T:P:O)			3:0:2:0	**Total Hours:**	40 +(10-12 lab slots)
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3

I. Course Objectives:

This course will enable students to:

- Understand the fundamentals of ARM based systems, basic hardware components, selection methods and attributes of an embedded system.
- Program ARM controller using the various instructions.
- Analyze the impact and challenges posed by IoT networks leading to new architectural models.
- Compare and contrast the deployment of smart objects and the technologies to connect them to network.
- Illustrate and develop different sensor technologies for sensing real world entities and understand the role of IoT in various domains of Industry, Design solutions for complex engineering problems related to real world scenarios

II. Prerequisite: Basic Networking Concepts

III.Teaching-Learning Process (General Instructions):

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters student's Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.

7.Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.

8. Discuss how every concept can be applied to the real world and when that's possible, it helps to improve the student's understanding.

9. Demonstration of sample code for various hardware components using keil software.

IV. COURSE CONTENT

IV(a). Theory PART

Module-1: Microprocessors versus Microcontrollers, ARM Embedded Systems	8 Hrs

Microprocessors versus Microcontrollers, ARM Embedded Systems: The RISC design philosophy, The ARM Design Philosophy, Embedded System Hardware, Embedded System Software.

ARM Processor Fundamentals: Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts, and the Vector Table , Core Extensions..

Textbook1: Chapter 1:1.1-1.4, Chapter 2:2.1-2.5.

RBT Levels: 1,2

Module-2: Introduction to ARM Instruction Set	8 Hrs

Introduction to the ARM Instruction Set : Data Processing Instructions , Programme Instructions, Software Interrupt Instructions, Program Status Register Instructions, Coprocessor Instructions, Loading Constants.

Textbook 1: Chapter 3: 3.1-3.6.

RBT Levels: 1,2

Module-3: What is IoT	8 Hrs

What is IoT, Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT and IoT, IoT Challenges, IoT Network Architecture and Design, Drivers Behind New Network Architectures, Comparing IoT Architectures, A Simplified IoT Architecture, The Core IoT Functional Stack.

Textbook 2: Chapter 1, Chapter 2.

RBT Levels: 1,2,3

Module-4: Smart Objects	8 Hrs

The "Things" in IoT, Sensors, Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects, Communication Criteria.

Textbook 2: Chapter 3, Chapter 4.

RBT Levels: 1,2,3

Module-5: IoT Physical Devices and Endpoints - Arduino UNO	8 Hrs

Introduction to Arduino, Arduino UNO, Installing the Software, Fundamentals of Arduino Programming. IoT Physical Devices and Endpoints - RaspberryPi: Introduction to RaspberryPi, About the RaspberryPi Board: Hardware Layout, Operating Systems on RaspberryPi, Configuring RaspberryPi.

Textbook 3: Chapter 7:7.1-7.4, Chapter 8:8.1-8.4, 8.6.

RBT Levels: 1,2,3

IV(b). PRACTICAL PART

Sl. No.	Experiments / Programs / Problems
1	Using Keil software, observe the various registers, dump, CPSR, with a simple ALP programme.
2	Write a program to find the sum of the first 10 integer numbers.
3	Write a program to find factorial of a number.
4	Write a program to find the square of a number (1 to 10) using a look-up table.
5	Write a program to add an array of 16 bit numbers and store the 32 bit result in internal RAM.
6	Write a program to find the largest or smallest number in an array of 32 numbers.
7	Write a program to arrange a series of 32 bit numbers in ascending/descending order.
8	Write a program to count the number of ones and zeros in two consecutive memory Locations.
9	To interface LED/ Buzzer with Arduino/ Intel Galileo / Intel Edison Board and write a program to turn ON LED for 1 sec after every 2 seconds.
10	To interface DHT11 sensor with Arduino/ Intel Galileo / Intel Edison Board and write a program to print temperature and humidity readings.
11	To interface motor using relay with Arduino/ Intel Galileo / Intel Edison Board and write a program to 'turn ON' motor when push button is pressed.

V. COURSE OUTCOMES

CO1	Describe the architectural features, fundamentals of ARM based systems.
CO2	Apply the knowledge of ARM instruction set for programming ARM to develop different applications.
CO3	Analyze the impact and challenges posed by IoT networks leading to new architectural models.
CO4	Compare and contrast the deployment of smart objects and the technologies to connect them to network
CO5	Illustrate & develop different sensor technologies for sensing real world entities and identify the applications of IoT in Industry. Design Solutions for complex engineering problems related to real world scenarios.

VI. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3	S4
CO1	3												3			
CO2	2	2												2		
CO3	2	2											2			
CO4	2		2										2			
CO5		2											2			

VII. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023.

Continuous Internal Evaluation (CIE): Refer Annexure section 2

Semester End Examination (SEE): Refer Annexure section 2

VIII. Learning Resources

VIII(a): Textbooks: (Insert or delete rows as per requirement)

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	ARM System Developers Guide	Andrew N Sloss, Dominic Symes and Chris Wright	2008	Elsevier, Morgan Kaufman publishers
2	IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things	David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry	1st Edition	Pearson Education (Cisco Press Indian Reprint). (ISBN: 978-9386873743)
3	Internet of Things	Srinivasa K G	2017	CENGAGE Leaning, India

VIII(b): Reference Books: (Insert or delete rows as per requirement)

1	Microcontroller (ARM) and Embedded System	Raghunandan.G.H	2019	Cengage learning Publication
2	The Insider's Guide to the ARM7 Based Microcontrollers	Hitex	1st Edition, 2005	Hitex ltd

VIII(c): Web links and Video Lectures (e-Resources):

1. https://microcontroller.com/Link_to_Microcontroller.com.htm
2. https://realtimelogic.com/articles/Embedded-Web-Server-Tutorials
3. https://dst.gov.in/internet-things-iot-research-initiative
4. https://internetofthingsagenda.techtarget.com/resources

IX: Activity Based Learning / Practical Based Learning/Experiential learning:

Mini project on Internet of Things using Arduino/ Intel Galileo / Intel Edison Board

Semester:	IV	**Course Type:**	PCCL		
Course Title: Design and Analysis of Algorithms lab					
Course Code:	**23CSL405**			**Credits:**	1
Teaching Hours/Week (L:T:P:O)			0:0:2:0	**Total Hours:**	24
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Practical			**Exam Hours:**	3

I. Course Objectives:

- To design and implement various algorithms in C/C++ programming using suitable development tools to address different computational challenges.
- To apply diverse design strategies for effective problem-solving.
- To Measure and compare the performance of different algorithms to determine their efficiency and suitability for specific tasks.

II. Prerequisite: Programming in C

III. COURSE CONTENT

Sl. No.	Experiments / Programs / Problems
1	Design and implement a program to sort a given set of n integer elements using Selection Sort method and compute its time complexity. Run the program for varied values of n> 5000 and record the time taken to sort. Plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.
2	Design and implement a program to sort a given set of n integer elements using quick Sort method and compute its time complexity. Run the program for varied values of n> 5000 and record the time taken to sort. Plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.
3	Design and implement a program to sort a given set of n integer elements using merge Sort method and compute its time complexity. Run the program for varied values of n> 5000 and record the time taken to sort. Plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.
4	To solve Knapsack problem using Greedy method.
5	To find shortest paths to other vertices from a given vertex in a weighted connected graph, using Dijkstra's algorithm.
6	To find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal's algorithm.

7	To find Minimum Cost Spanning Tree of a given connected undirected graph using Prim's algorithm.
8	a. Design and implement a program to solve All-Pairs Shortest Paths problem using Floyd's algorithm. b. Design and implement a program to find the transitive closure using Warshal's algorithm
9	Solve Travelling Sales Person problem using Dynamic programming.
10	Solve 0/1 Knapsack problem using Dynamic Programming method.
11	Implement N queen's problem using Backtracking method
12	Program to find a subset of a given set S = {Sl, S2,…, Sn} of n positive integers whose SUM is equal to a given positive integer d. For example, if S = {1, 2, 5, 6, 8} and d= 9, there are two solutions {1, 2, 6} and {1, 8}. Display a suitable message, if the given problem instance doesn't have a solution.

IV. COURSE OUTCOMES

CO1	Develop algorithms using appropriate design techniques.
CO2	Implement the algorithms to solve real world problems.
CO3	Analyse and compare the performance of algorithms.

V. CO-PO-PSO MAPPING(mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3	S4
CO1	2	2	2										2		1	
CO2	2	2	2		1								2		1	
CO3	2	2	2		1								2		1	

VI. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023.

Continuous Internal Evaluation (CIE): Refer Annexure section 4

Semester End Examination (SEE): Refer Annexure section 4

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Introduction to the Design and Analysis of Algorithms	AnanyLevitin	2nd Edition, 2017	Pearson Education
2	Computer Algorithms/C++	Ellis Horowitz, SatrajSahni and Rajasekaran	2nd Edition, 2014	Universities Press

VII(b): Reference Books:

1	Introduction to Algorithms	Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein	3rd edition	PHI
2	Design and Analysis of Algorithms	S. Sridhar	-	Oxford(Higher Education)

VII(c): Web links and Video Lectures (e-Resources):

Mention the links of the online resources, video materials, etc. Weblinks and Video Lectures (e-Resources):

1 . http://cse01-iiith.vlabs.ac.in/

VIII:Activity Based Learning / Practical Based Learning/Experiential learning:

- Case Study
- Programming Assignment

Semester:	IV	**Course Type:**	ETC		
Course Title: Multimedia Technology					
Course Code:	**23CSE421**			**Credits:**	3
Teaching Hours/Week (L:T:P:O)			2:0:2:0	**Total Hours:**	25 +(10-12 lab slots)
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3

I. Course Objectives:

This course will enable students to:

- To provide an understanding of the fundamental concepts of multimedia.
- Explore the various multimedia tools and applications.
- Understand the principles of multimedia systems and networks.
- Develop skills in designing and implementing multimedia projects.
- Comprehend the integration of multimedia technologies in real-world applications.

II. Teaching-Learning Process (General Instructions):

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking. 5. Adopt Problem Based Learning (PBL), which fosters student's Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it. 6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
9. Discuss how every concept can be applied to the real world and when that's possible, it helps to improve the student's understanding.

III. COURSE CONTENT

III(a). Theory PART

Module-1: Introduction to Multimedia	Hrs 5

Definition and Characteristics of Multimedia, Multimedia Elements: Text, Audio, Images, Video, and Animation, Applications of Multimedia in Education, Entertainment, Business, and research, Multimedia Hardware: Input and Output Devices, Multimedia Software: Authoring Tools and Applications, Multimedia System Architecture and Design

References:

Chapter 1, Section 1.1, 1.2, "Fundamentals of Multimedia" by Ze-Nian Li and Mark S. Drew
Chapter 2, Section 2.1, 2.2, 2.3, "Fundamentals of Multimedia" by Ze-Nian Li and Mark S. Drew
Chapter 1, Section 1.1, 1.2, 1.3, "Multimedia: Making It Work" by Tay Vaughan
Chapter 2, Section 2.1, "Multimedia: Making It Work" by Tay Vaughan

RBT Levels: 1,2,3

Module-2: Multimedia Tools and Technologies	Hrs 5

Multimedia Authoring Tools: Features and Types, Image Editing and Graphics Software: Photoshop, GIMP, and CorelDRAW, Audio Processing Tools: Audacity, Adobe Audition, Video Editing Software: Adobe Premiere, Final Cut Pro, Animation Software: Adobe Animate, Blender Integrating Multimedia Elements in Authoring Tools,

References:

Chapter 3, Section 3.1, 3.2, "Fundamentals of Multimedia" by Ze-Nian Li and Mark S. Drew
Chapter 10, Section 10.1, 10.2, "Fundamentals of Multimedia" by Ze-Nian Li and Mark S. Drew
Chapter 3, Section 3.1, 3.2, 3.3, "Multimedia: Making It Work" by Tay Vaughan
Chapter 4, Section 4.1, 4.2, "Multimedia: Making It Work" by Tay Vaughan
Chapter 5, Section 5.1, 5.2, "Multimedia: Making It Work" by Tay Vaughan
Chapter 6, Section 6.1, 6.2, "Multimedia: Making It Work" by Tay Vaughan

RBT Levels: 2,3,4

Module-3: Multimedia Data Representation and Compression	Hrs 5

Fundamentals of Data Representation: Text, Images, Audio, and Video, Text Compression Techniques: Huffman Coding, LZW Image Compression Techniques: JPEG, PNG, GIF Audio Compression Techniques: MP3, AAC, Video Compression Techniques: MPEG-1, MPEG-2, MPEG-4, Standards for Multimedia Compression and Transmission

References:

Chapter 4, Section 4.3, "Fundamentals of Multimedia" by Ze-Nian Li and Mark S. Drew
Chapter 5, Section 5.3, "Fundamentals of Multimedia" by Ze-Nian Li and Mark S. Drew
Chapter 6, Section 6.1, 6.2, 6.3, "Fundamentals of Multimedia" by Ze-Nian Li and Mark S. Drew
Chapter 7, Section 7.2, 7.3, 7.4, "Fundamentals of Multimedia" by Ze-Nian Li and Mark S. Drew

RBT Levels:1,2,3

Module-4: Multimedia Communication and Networks	Hrs 5

Fundamentals of Multimedia Networking, Quality of Service (QoS) in Multimedia Networks: Concepts and Techniques, Streaming Protocols: RTP, RTSP, HLS, Content Delivery Networks (CDNs): Architecture and Functionality, Multimedia Conferencing: Tools and Technologies, Security and Privacy in Multimedia Communication

References:

Chapter 13, Section 13.1, 13.2, 13.3, "Multimedia: Computing, Communications and Applications" by Ralf Steinmetz and Klara Nahrstedt
Chapter 14, Section 14.1, 14.2, 14.3, "Multimedia: Computing, Communications and Applications" by Ralf Steinmetz and Klara Nahrstedt

RBT Levels:1,2,3,4	
Module-5: Multimedia Applications and Future Trends	**Hrs 5**
Interactive Multimedia Systems: Design and Implementation, Virtual Reality (VR) and Augmented Reality (AR): Concepts and Applications, Multimedia in Mobile Applications: Challenges and Opportunities, Web-based Multimedia Applications: Technologies and Standards, Emerging Trends in Multimedia: AI, IoT, and Multimedia, Case Studies of Multimedia Applications in Various Domains **References:** Chapter 16, Section 16.1, 16.2, 16.3, "Fundamentals of Multimedia" by Ze-Nian Li and Mark S. Drew Chapter 15, Section 15.1, 15.2, "Multimedia: Making It Work" by Tay Vaughan Chapter 16, Section 16.1, 16.2, "Multimedia: Making It Work" by Tay Vaughan	
RBT Levels:2,3	

III(b). PRACTICAL PART

We can use Unity and GIMP (GNU Image Manipulation Program) as our primary tools. Both are powerful, free, and widely used in multimedia projects. Unity is excellent for creating interactive multimedia applications and games, while GIMP is suitable for image editing and manipulation tasks. For compression exercise we can use Python.

Sl. No.	Experiments / Programs / Problems
1	Explore the user interface, tools, and basic functionalities of Unity and GIMP software to get familiarize with the basic interface and features of Unity and GIMP.
2	Explore basic image editing techniques in GIMP to edit and enhance an image using cropping, Color correction, and layering.
3	Create textures in GIMP and import them into Unity to design a texture in GIMP, save it, and apply it to a 3D object in Unity.
4	Create and manipulate 3D objects in Unity. Create basic 3D shapes, apply transformations (translate, rotate, scale), and use imported textures.
5	Integrate audio into a Unity project. Import audio files, add background music, and create sound effects for events.
6	Design and implement a basic user interface (UI) in Unity. Create UI elements such as buttons, text fields, and menus
7	Develop an interactive scene with user input using Unity to implement interaction using scripts to handle user input and manipulate objects.
8	Understand and implement text compression using Python. Write a simple script to compress and decompress text using Huffman coding.
9	Develop complex animations and interactions in Unity. Use animation curves and events to create detailed animations triggered by user actions.
10	Create a simple game in Unity incorporating multimedia elements. Design game mechanics, integrate textures, audio, and UI to build a playable game.

IV. COURSE OUTCOMES

CO1	Understand the basic concepts and applications of multimedia.
CO2	Understand proficiency in using multimedia tools and technologies.
CO3	Develop skills in multimedia data representation and compression techniques.
CO4	Understand multimedia networking and communication protocols.
CO5	Analyze and evaluate multimedia applications and trends.

V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3	S4
CO1	1	1											1	1		
CO2	1	1	1		1								1	1		
CO3	2	2			1								1	1		
CO4	1	1											1	1		
CO5	1	1	1										1	1		

VI. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023.

Continuous Internal Evaluation (CIE): Refer Annexure section 1

Semester End Examination (SEE): Refer Annexure section 1

VII. Learning Resources

VII (a):Textbook:

Book Title	Author(s)	Year of Publication	Publisher	Edition
Multimedia: Computing, Communications and Applications	Ralf Steinmetz and Klara Nahrstedt	2002	Pearson Education India	1e
Fundamentals of Multimedia	Ze-Nian Li and Mark S. Drew	2014	Pearson Education India	2e
Multimedia: Making It Work	Tay Vaughan	2014	McGraw Hill Education	9e

VII(b): Web links and Video Lectures (e-Resources):

1. https://www.tutorialspoint.com/multimedia/multimedia_introduction.htm
2. https://www.geeksforgeeks.org/introduction-to-data-compression/

VIII:Activity Based Learning / Practical Based Learning/Experiential learning:

Assignment / Quiz / Presentation

Semester:	IV	**Course Type:**	ETC		
Course Title: Exploratory Data Analytics					
Course Code:	**23CSE422**			**Credits:**	3
Teaching Hours/Week (L:T:P:O)			2:0:2:0	**Total Hours:**	25 +(10-12 lab slots)
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3

I. Course Objectives:

This course will enable students to:

- Develop foundational knowledge of EDA principles and techniques.
- Gain proficiency in data manipulation, cleaning, and transformation using libraries.
- Master the art of data visualization to effectively communicate insights.
- Apply statistical measures and data grouping methods for analyzing data characteristics.
- Become familiar with time series data analysis concepts.

II. Prerequisite: Python Fundamentals, Functionalities of NumPy and Pandas Libraries.

III. Teaching-Learning Process (General Instructions):

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.

2. Use of Video/Animation to explain functioning of various concepts.

3. Encourage collaborative (Group Learning) Learning in the class.

4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.

5. Adopt Problem Based Learning (PBL), which fosters student's Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.

6. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.

7. Discuss how every concept can be applied to the real world and when that's possible, it helps to improve the student's understanding.

IV. COURSE CONTENT

IV(a). Theory PART

Module-1: Introduction to EDA	Hrs 5

Exploratory Data Analysis Fundamentals: Understanding data science, The significance of EDA - Steps in EDA, **Making sense of data:** Numerical data - Discrete and continuous data,Categorical data, Measurement scales - nominal, ordinal, interval ratio, **Comparing EDA with classical and Bayesian analysis, Getting started with EDA -** Numpy, Pandas, Interval, Ratio,**.**
Case Study: EDA with Personal Email: Loading the dataset, Data Transformation - Data cleaning, Loading the csv file, Converting the date, removing NaN values, Removing NaN values, Applying descriptive statistics, Data refactoring, Dropping columns, Refactoring timezones. Data Analysis - Number of emails, Time of day, Average emails per day and hour, Number of emails per day, Most frequently used words

Specified Topics from Chapter 1

RBT Levels: 1,2,3

Module-2: Data Transformation	Hrs 5

Merging database - style dataframes: Concatenating along with an axis, using df.merge with an inner join, using the pd.merge() method with a left join, using the pd.merge() method with a right join, using pd.merge() methods with outer join, Merging on index, Reshaping and pivoting**, Transformation techniques:** Performing data deduplication, Replacing values, Handling missing data - NaN values in pandas objects, Dropping missing values, Dropping by rows, Dropping by columns, Mathematical operations with NaN, Filling missing values, Backward and forward filling, Interpolating missing values, Renaming axis indexes, Discretization and binning, outlier detection and filtering, Permutation and random sampling - random sampling without and with replacement, Computing indicators/dummy variables, String manipulations.

Specified topics from chapter 4

RBT Levels: 2,3,4

Module-3: Grouping and Correlation	Hrs 5

Grouping Datasets - Understanding groupby(), Groupby mechanics - Selecting a subset of columns, max and min, mean**, Data aggregation -** Groupwise operations, Renaming grouped aggregation columns, Group-wise transformations, **Pivot tables and cross - tabulations:** Pivot tables, Cross-tabulations
Correlation: Introduction to Correlation, Types of analysis - Understanding univariate analysis, Understanding bivariate analysis, Understanding multivariate analysis
Case Study: Discussing multivariate analysis using the Titanic dataset

Specified Topics from chapter 6 & 7

RBT Levels:1,2,3

Module-4: Time Series Analysis	Hrs 5

Understanding Time Series Dataset: Fundamentals of TSA - Univariate time series, Characteristics of time series data.
Case study: TSA with open power system data: Data Cleaning, Time-based indexing, Visualising time series, Grouping time series data, Resampling time series data

Specified topics from Chapter 8

RBT Levels:1,2,3,4	
Module-5: Hypothesis testing and Regression	**Hrs 5**
Hypothesis testing principles, statsmodel library, average reading time, types of hypothesis testing, T-test. Understanding regression - types of regression - simple linear regression, multiple linear regression, non linear regression, model development and evaluation- constructing a linear regression model, model evaluation, computing accuracy, implementing a multiple linear regression model **Specified topics from Chapter 9**	
RBT Levels:2,3	
IV(b). PRACTICAL PART	
Sl. No.	**Experiments / Programs / Problems**
1	Analyze email data for insights like number of emails, time distribution, and frequent words.
2	Download the Titanic passenger list dataset from Kaggle. a. Use pandas functions (head, tail, info, describe) to explore the data structure, data types, missing values, and summary statistics. b. Identify and address missing values in relevant features (e.g., Age). Explore techniques like dropping rows with missing values or imputation with mean/median. c. Analyze the distribution of the "Fare" feature. Identify and handle potential outliers (e.g., using IQR method or visualization) if necessary. d. The "Cabin" feature might contain inconsistencies. Clean the data by extracting meaningful information (e.g., presence/absence of cabin) if possible. e. Create a new feature to categorize passengers into age groups
3	Use the VGChartz video game sales dataset available from https://www.kaggle.com/datasets/gregorut/videogamesales. a. Import pandas and matplotlib.pyplot. b. Load the VGChartz video game sales data into a DataFrame. c. Create a pie chart to visualize the distribution of video games across different genres (e.g., Action, Adventure, Role-Playing). d. Create a bar chart to compare the average sales of video games across different platforms (e.g., Playstation, Xbox, PC). e. Create a lollipop chart to visualize the top 10 best-selling video games, with the lollipop stick representing the sales value and the circle representing the game title.
4	Python Program with Heatmap using Iris Dataset: a. Import libraries and Load data “iris.csv” b. Calculate the correlation matrix using iris.corr() c. Create a figure and use plt.imshow to display the correlation as a heatmap with a coolwarm colormap.

5	Python Program with Histogram using Iris Dataset: a. For the above dataset(Iris dataset), Create a figure and use plt.hist to visualize the distribution of Sepal Length using 10 bins and black edge color. b. Add labels, title, and grid for better readability.
6	Analyze Online Retail Customer Purchases using GroupBy: Dataset: Online Retail Dataset available from Kaggle (https://www.kaggle.com/datasets/lakshmi25npathi/online-retail-dataset a. Import pandas and load the "online_retail.csv" data into a DataFrame. b. Use info and describe to understand data types, identify potential missing values, and explore summary statistics for numerical features. c. Create new features based on customer demographics (e.g., Country, Age Group based on birth year). i. Use groupby to group data by "Country". Calculate: ii. Average order value per country iii. Total number of purchases per country iv. Most frequently purchased product categories (using value counts within groups) d. Create bar charts to visualize average order value.
7	Explore the structure of a time series dataset (e.g., stock prices). a. Import pandas and load the stock price data (date, open, high, low, close, volume) into a DataFrame. b. Clean the data and visualize trends using line charts. c. Calculate basic time series statistics.
8	Download a Twitter dataset containing tweets about a specific brand or event. a. Utilize libraries like NLTK or TextBlob to perform sentiment analysis on the tweets. b. Explore the distribution of positive, negative, and neutral sentiment. Identify keywords or phrases associated with each sentiment category.
9	**Movie Ratings and Reviews: An EDA Case Study** **Dataset Description:** Imagine you have a dataset containing the following information about movies and user reviews: • **movie_id:** Unique identifier for each movie. • **title:** Movie title. • **genre:** Genre of the movie (e.g., Comedy, Drama, Action). • **director:** Director of the movie (categorical). • **release_year:** Year the movie was released (numerical). • **user_id:** Unique identifier for each user who submitted a review (categorical). • **rating:** User rating for the movie (numerical scale). **Sample Dataset Creation:** • **Movies:** Create a list of 10-15 movies with titles, genres, directors, and release years. • **Users:** Create a list of 20-30 user IDs (can be represented by letters/numbers).

	• **Ratings and Reviews:** For each movie, assign random ratings (within your chosen scale) from different users. Write short reviews (2-3 sentences) expressing positive or negative opinions for some movies. **Note:** • Vary the review sentiment (positive, negative, neutral) to reflect real-world scenarios. • Introduce some inconsistencies in review text (typos, informal language) to practice cleaning techniques. **Exploratory Analysis:** **A. Target Audience:** **Question 1:** What is the distribution of user ratings by age group (if available)? **Question 2:** Are there age groups that tend to favor certain genres? **B. Genre Preferences:** **Question 3:** Do users tend to give higher ratings to movies in specific genres (e.g., Comedy vs. Drama)? Visualize the distribution of ratings across genres. **C. Director Popularity:** **Question 4:** Are there any directors who consistently receive higher user ratings? Calculate average rating for each director. **D. Gender Bias:** **Question 5:** What percentage of users who submit reviews are male and female? **Question 6:** Is there a difference in average rating between genders? **E. Review Length and Rating:** **Question 7:** Is there a relationship between the length of a user review and the rating they give to a movie (consider word count)? **F. Release Year Impact:** **Question 8:** Has the average user rating for movies changed over time (considering release year)? Visualize the trend. • Document your findings, including visualizations and interpretations. • Consider limitations of the sample dataset when drawing conclusions.

V. COURSE OUTCOMES

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

CO1	Apply EDA techniques to various real world datasets.
CO2	Implement various data transformation methods to prepare data for further analysis.
CO3	Construct the most appropriate chart type based on the data characteristics and analysis goals.
CO4	Implement fundamental time series analysis techniques to explore patterns and make informed decisions.
CO5	Construct and evaluate simple linear regression models to understand the relationship between variables in real world datasets.

VI. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3	S4
CO1	2	3		3									2			
CO2	2				3								2			
CO3	1									1			2			
CO4	2	2		2									2			
CO5	2	2		2									2			

VII. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023.

Continuous Internal Evaluation (CIE): Refer Annexure section 1

Semester End Examination (SEE): Refer Annexure section 1

VIII. Learning Resources

VIII(a): Textbooks: (Insert or delete rows as per requirement)

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Hands-On Exploratory Data Analysis with Python	Suresh Kumar Mukhiya, Usman Ahmed	2020	Packt Publishing

VIII(b): Reference Books: (Insert or delete rows as per requirement)

1	Python Data Science Handbook: Essential Tools for Working with Data	Jake Vander Plas	1st Edition, 2016	Oreilly
2	Exploring Data: An Introduction to Data Analysis for Social Scientists	Catherine Marsh, Jane Elliott	2nd Edition, 2008	Wiley Publications

VIII(c): Web links and Video Lectures (e-Resources):

WebLinks:

1. **https://pandas.pydata.org/docs/**
2. **https://seaborn.pydata.org/**
3. **https://www.statsmodels.org/stable/index.html**

Video Lectures:

1. Exploratory Data Analysis (EDA) Using Python | Python Data Analysis | Python Training | Edureka http://www.youtube.com/watch?v=-o3AxdVcUtQ
2. http://www.youtube.com/watch?v=TPivN7tpdwc
3. http://www.youtube.com/watch?v=csXmVBw8cdo
4. http://www.youtube.com/watch?v=SplCk-t1BeA

5. http://www.youtube.com/playlist?list=PLJy0LHDLpgHF8OJanA9pJg1N5vxDlEce4
6. https://www.youtube.com/watch?v=i7HARZlJv7Y

IX: Activity Based Learning / Practical Based Learning/Experiential learning:

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning
· Quizzes
· Assignments
· Seminar

Semester:	4	**Course Type:**	ETC		
Course Title: Cyber Security Principles and Practices.					
Course Code:	**23CSE423**			**Credits:**	3
Teaching Hours/Week (L:T:P:O)			2:0:2:0	**Total Hours:**	25 +(10-12 lab slots)
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3

I. Course Objectives:

This course will enable students to:

- To learn about concepts and different types of cyber crime and Mitigation
- To have an overview of the cyber security for Mobile Devices, Digital Payments, Email, Web and Wireless networks
- Introduction to basics of Cryptography
- To study the defensive techniques against Cyber attacks

II. Teaching-Learning Process (General Instructions):

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) needs not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.

2. Use of Video/Animation to explain functioning of various concepts.

3. Encourage collaborative (Group Learning) Learning in the class.

4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.

5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.

6. Introduce Topics in manifold representations.

7. Show the different ways to solve the same problem with different circuits/logic and encourage the students to come up with their own creative ways to solve them.

8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

9. Use any of these methods: Chalk and board, Active Learning, Case Studies.

III. COURSE CONTENT	
III(a). Theory PART	
Module-1:	Hrs 5
Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Cyber Threats-Cyber Warfare, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy. Text Book 1:Chapter 1,2,4,6	
RBT Levels: 1,2.	
Module-2:	Hrs 5
Mobile and Digital Payments Security: Security Challenges and types of attacks on Mobile devices, Security for Mobile Apps, Mobile Device Management tools and techniques. Digital payments Security: Banking Cards, Unified Payment Interface (UPI), e-Wallets, Unstructured Supplementary Service Data (USSD), Aadhar enabled payments, Digital payments related common frauds and preventive measures. Note: Aadhar Enabled Payments topic as a case study not for the examination point of view. Text Book 1:Chapter 2,4,7, 10	
RBT Levels: 1,2,3,4	
Module-3:	Hrs 5
Computer Security Concepts : A Definition of Computer Security, The Challenges of Computer Security, Security Attacks, Security Services, Security Mechanisms, A model for network security, Symmetric Cipher Model, Substitution Techniques. Text Book 4:Chapter 1, 2	
RBT Levels:1,2,3	
Module-4:	Hrs 5
Web security considerations, Secure Socket Layer and Transport Layer Security, HTTPS, Secure Shell(SSH). Wireless Network Security: Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN, IEEE 802.11i Wireless LAN Security. Text Book 4:Chapter 17	
RBT Levels:1,2,3.	
Module-5:	**Hrs 5**
E-Mail Security: Pretty Good Privacy, S/MIME IP Security: IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, Combining security associations, Internet Key Exchange. Text Book 4:Chapter 19	
RBT Levels:1,2,3	

III(b). PRACTICAL PART

Sl. No.	Experiments / Programs / Problems
1	Phishing simulations (Google, LUCY and GoPhish).
2	Packet analysis using Wireshark.
3	Perform SQL injection using BurpSuite
4	Ransomware tabletop exercise on insider threat.
5	Crypt analysis of symmetric ciphers using Cryptool.
6	Crypt analysis of asymmetric ciphers using Cryptool.
7	Pwning machines (HackTheBox). – Demonstration

IV. COURSE OUTCOMES

The student will be able to:

CO1	Define the various types of cyber threats and attacks, and simulate various types of attacks.
CO2	Classify various attacks and security aspects in Digital payment.
CO3	Illustrate the various concepts in email and web Security.
CO4	Apply basics concepts of Cryptography.
CO5	Design symmetric and asymmetric ciphers using Cryptool.

V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3	S4
CO1		2			2			2							1	
CO2	1	2			2			2				2				
CO3	2	2	2		2			2				1				
CO4	2	2			1			2		2					2	
CO5	2	2			1			1		2		2			2	

VI. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023.

Continuous Internal Evaluation (CIE): Refer Annexure section 1

Semester End Examination (SEE): Refer Annexure section 1

VII. Learning Resources

VII(a): Textbooks: (Insert or delete rows as per requirement)

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher

1	"Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives"	Sumit Belapure , Nina Godbole	2011, reprint 2022	Wiley India
4	Cryptography and Network Security, Principles and Practice:	William Stallings,		Pearson Education

VII(b): Reference Books: (Insert or delete rows as per requirement)

1. Cyber Security Essentials by James Graham, Richard Howard, RyAn Olson, CRD Press, 2011 Taylor and Francis Group. ISBN13: 978-1-4398-5126-5.
2. Information Sustems Security: Security Management, Metrics, Frameworks and Best Practices by NinaGodbole, 2nd Edition, Wiley publishers, 2017,ISBN: 9788126564057.
3. Network Security Bible, Eric Cole, Ronald, Kurtz, James W. Conley, 2nd edition, John Wiley & Sons, 2005, ISBN: 978-0764573972.
4. Security in Digital Age: Social Media Security Threats and Vulnerabilities by Henry A, Oliver, Create Space Independent Publishing Platform, Pearson, 2001, ISBN: 978-0130193223.
5. Cyber Laws: Intellectual Property & E- commerce Security by Kumar K, Dominant Publishers & Distributors, 2011, ISBN: 978-8187336891.

VII(c): Web links and Video Lectures (e-Resources):

WebLinks:

1. https://www.javatpoint.com/kali-linux-course
2. https://www.geeksforgeeks.org/introduction-to-kali-linux/

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quizzes
- Assignments
- Seminar

Semester:	IV	**Course Type:**	ETC		
Course Title: Server Side Scripting					
Course Code:	**23CSE424**			**Credits:**	3
Teaching Hours/Week (L:T:P:O)			2:0:2:0	**Total Hours:**	25 +(10-12 lab slots)
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3

I. Course Objectives:

This course will enable students to:

- Make use of Perl to create CGI apps.
- To generate dynamic content on web pages using CGI.
- Infer Object Oriented Programming capabilities of PHP
- Examine JavaScript frameworks such as jQuery and Backbone.
- To learn the basics of Angular JS framework.

II. Teaching-Learning Process (General Instructions):

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning)Learning in the class.
4. Ask atleast three HOT(Higher order Thinking)questions in the class, which promotes critical thinking.
5. Adopt Practical Based Learning(PBL),which fosters student's Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize and analyze information rather than simply recall it.
6. Discuss how every concept can be applied to the real world and when that's possible, it helps to improve the student's understanding.

III. COURSE CONTENT	
III(a).Theory PART	
Module-1	Hrs 5
Basics of Perl: Origins and uses of Perl, Scalars and their operations, Assignment statements and simple input and output, Control statements, Fundamentals of arrays, Hashes, References, Functions, Pattern matching. **Textbook 1: Chapter 8** **Self Learning:** File input and output, Examples.	
RBT Levels: L1,L2,L3	
Module-2	Hrs 5
Using Perl for CGI Programming: The Common Gateway Interface, CGI linkage, Query string format, CGI.pm module, A survey example. **Textbook 1:Chapter 9** **Self Learning:** Cookies.	
RBT Levels: L1,L2,L3	
Module-3	Hrs 5
PHP Arrays and Superglobals: Arrays, $_GET and $_POST Superglobal Arrays, $_SERVER Array, $_Files Array, PHP Classes and Objects, Object-Oriented Overview, Classes and Objects in PHP, Object Oriented Design, Error Handling and Validation, What are Errors and Exceptions?, PHP Error Reporting, PHP Error and Exception Handling. **Textbook 2: Chapter 9, 10** **Self Learning:** Reading/Writing files using arrays	
RBT Levels:L2,L3,L4	
Module-4:	Hrs 5
Managing State: The Problem of State in Web Applications, Passing Information via Query Strings, Passing Information via the URL Path, Cookies, Serialization, Session State, Caching, Advanced JavaScript and jQuery, JavaScript PseudoClasses, jQuery Foundations. **Textbook 2: Chapter 13, 15** **Self Learning:** , HTML5 Web Storage	
RBT Levels:L2,L3,L4	
Module-5:	Hrs 5
Introducing AngularJS: What Is MVC (Model-View-Controller)?, AngularJS Benefits, The AngularJS Philosophy, Starting Out with AngularJS, Basic AngularJS Directives and Controllers: AngularJS Modules, Creating Our First Controller, Working with and Displaying Arrays, More Directives, Working with ng-repeat. **Textbook 3:Chapter 1,Chapter 2** **Self Learning:** ng-repeat Across Multiple HTML Elements.	
RBT Levels:L2,L3,L4	
III(b). PRACTICAL PART	

Sl. No.	Programs
1	Write a Perl program to display a digital clock which displays the current time of the server.
2	Write a Perl program to accept the User Name and display a greeting message randomly chosen from a list of 4 greeting messages
3	Write a PHP program to store page views count in SESSION, to increment the count on each refresh, and to show the count on web page.
3	Write a PHP program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.
4	Write a PHP program to sort the student records which are stored in the database using selection sort.
5	Write the PHP programs to do the following: a. Implement simple calculator operations. b. Find the transpose of a matrix. c. Multiplication of two matrices. d. Addition of two matrices.
6	Write a PHP program named states.py that declares a variable states with value "Mississippi Alabama Texas Massachusetts Kansas". write a PHP program that does the following: a. Search for a word in variable states that ends in xas. Store this word in element 0 of a list named statesList. b. Search for a word in states that begins with k and ends in s. Perform a case-insensitive comparison. [Note: Passing re.Ias a second parameter to method compile performs a case-insensitive comparison.] Store this word in element1 of statesList. c. Search for a word in states that begins with M and ends in s. Store this word in element 2 of the list. d. Search for a word in states that ends in a. Store this word in element 3 of the list
7	Develop Angular JS program that allows user to input their first name and last name and display their full name. Note: The default values for first name and last name may be included in the program.
8	Develop a simple Angular JS calculator application that can perform basic mathematical operations (addition, subtraction, multiplication, division) based on user input.
9	Write an Angular JS application that can calculate factorial and compute square based on given user input.
10	Develop AngularJS application that displays a details of students and their CGPA. Allow users to read the number of students and display the count. Note: Student details may be included in the program.

IV. COURSE OUTCOMES

The student will be able to**:**

CO1	Apply CGI applications using Perl.
CO2	Make use of Server-Side Scripts using PHP to generate and display the contents dynamically
CO3	Analyse the principles of object oriented development using PHP
CO3	Inspect JavaScript frameworks like jQuery and Backbone which facilitates developer to focus on core features.
CO5	Develop Angular JS programs using basic features

V. CO-PO-PSO MAPPING(mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3	S4
CO1	3	2	2		2									2		
CO2	3	2	2		2									2		

CO3	3	2	2		2									2		
CO4	3	2	2		2									2		
CO5	3	2	2		2									2		

VI. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023.

Continuous Internal Evaluation (CIE): Refer Annexure section 1

Semester End Examination (SEE): Refer Annexure section 1

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Programming the World Wide Web.	Robert W. Sebesta	4th Edition, 2012.	Pearson education
2	Fundamentals of Web Development	Randy Connolly, Ricardo Hoar,	1st Edition	Pearson Education
3	Angular: Up and Running Learning Angular	ShyamSeshadri	2018.	O'Reilly Media

VII(b): Reference Books:

1	PHP Cookbook: Solutions and Examples for PHP Programmers	Adam Trachtenberg	Third edition 2014	O'ReilyMedia
2	Web Technologies-A Computer Science Perspective	Jeffrey C.Jackson:	7th Impression, 2012.	Pearson Education
3	Learning PHP, MySQL & JavaScript with jQuery, CSS and HTML5	Robin Nixon	4th Edition	O'Reilly Publications, 2015

VII(c): Web links and Video Lectures (e-Resources):

1. https://www.w3schools.com/html/default.asp
2. https://www.tutorialspoint.com/html5/html5_overview.htm
3. https://www.w3schools.com/css/default.asp https://getbootstrap.com/docs/4.4/getting-started/introduction/
4. https://docs.angularjs.org/tutorial https://www.tutorialspoint.com/angularjs/index.htm
5. http://www.tutorialspoint.com/php/index.htm

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quizzes
- Assignments
- Seminar

Semester:	IV	**Course Type:**	AEC		
Course Title: Flutter					
Course Code:	**23CSAE41**			**Credits:**	1
Teaching Hours/Week (L:T:P:O)			1:0:0:3	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	2

I. Course Objectives:

- Understand the basics of Flutter and Dart programming language.
- Learn about various Flutter widgets and how to create layouts.
- Understand state management and form handling in Flutter.
- Learn to integrate APIs and manage local databases.
- Dive into advanced concepts and complete a final project.

II. Pre - Requisites:

Having prior experience in below will be very helpful in Learning.

- Knowledge in any of the programming language and OOP's concepts.
- Familiarity with IDE's

III. Teaching-Learning Process (General Instructions):

The Respective Trainer is advised to follow the Below methods.

1. A Power Point Presentation – For Course Overview and Lectures
2. Live Execution of Concepts and Make the students Replicate the same(Not copying).
3. Explain the Concepts step by step with continuous replication for larger concepts
4. Each Session should be combined with hands-on exercises

IV. COURSE CONTENT

Module-1: Introduction to Flutter and Dart Basics	8 Hrs

Introduction to Flutter: What is Flutter? Importance of Flutter in cross-platform development**,** Setting up the Flutter environment (installation and configuration)**,** Overview of Flutter architecture**,**
Introduction to Dart: Basics of Dart programming language**,** Variables and data types**,** Control structures (if, else, switch)**,**Functions and methods
Dart OOP Concepts: Classes and objects, Inheritance and polymorphism, Constructors, Exception handling.
Flutter Basics: Understanding widgets**,** Stateless vs Stateful widgets**,** Building a simple Flutter app**,** Hot reload and hot restart

RBT Levels: L1, L2	
Module-2: User Interface Design	8 Hrs
Basic Widgets: Text, Image, Icon, Button widgets**,**Input and form widgets (TextField, Checkbox, Radio) **Layouts in Flutter:** Container, Padding, Center**,** Row and Column**,** Expanded and Flexible **Advanced Layouts:** ListView and GridView**,** Stack and Positioned**,**Card and CustomScrollView **Navigation and Routing:** Navigation basics**,** Named routes**,** Passing data between screens	
RBT Levels:L1, L2, L3	
Module-3: State Management and Forms	8 Hrs
State Management Basics: Understanding stateful widgets**,** setState() method**,** Lifting state up**,** **Introduction to Provider:** Why use Provider?**,** Setting up Provider**,** Using Provider for state management **Handling Forms:**Form widget and FormField**,**Validation of form inputs**,** Saving and submitting form data**.** **Advanced State Management:** Introduction to Riverpod and Bloc (overview), Choosing the right state management solution	
RBT Levels: L1, L2, L3	
Module-4: Working with APIs and Databases	8 Hrs
Networking in Flutter: HTTP requests (GET, POST)**,** Handling JSON data**,** Error handling in network calls **Parsing JSON:**Manual parsing**,** Using packages like json_serializable **Local Storage:**Shared Preferences**,** SQLite database**,** Introduction to Moor (Room-like database for Flutter) **Firebase Integration:** Introduction to Firebase**,** Setting up Firebase in a Flutter project**,** Basic CRUD operations with Firestore	
RBT Levels: L1, L2, L3	
Module-5: Advanced Flutter Concepts and Final Project	8 Hrs
Animations and Gestures: AnimationController and Tween**,** Hero animations**,** GestureDetector and handling gestures **Custom Widgets:** Building custom widgets**,** Composition and CustomPainter **Publishing Flutter Apps:** Preparing the app for release (Android & iOS)**,** Testing and debugging Publishing to Play Store and App Store(if app good enough) **Final Project:** Planning and designing the app, Implementing features learned throughout the course	
RBT Levels: L1, L2, L3	

V. COURSE OUTCOMES

CO1	Learn the basics of Flutter, Dart programming, and build a simple Flutter app.
CO2	Create complex UIs using various Flutter widgets and layouts, and implement navigation
CO3	Model the state effectively and handle form input and validation in Flutter apps.
CO4	Make use of APIs for data fetching and manage local storage with SQLite and Firebase.

CO5	Implement animations, custom widgets, and publish a fully functional Flutter app.

VI. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3	S4
CO1	2				3							1				
CO2	2				3				2			1				
CO3	2	3			3							1				
CO4	2				3							1				
CO5	2		3		3					2		1				

VII. Assessment Details (CIE & SEE)

General Rules: Refer CIE and SEE guidelines based on course type for autonomous scheme 2023.

Continuous Internal Evaluation (CIE): Refer Annexure section 5

Semester End Examination (SEE): Refer Annexure section 5

VIII. Learning Resources

VIII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	**Flutter Apps Development: Build Cross-Platform Flutter Apps with Trust**	**Mouaz M. Al-Shahmeh**	**1st Edition 2023**	**N/A**
2	**Beginning App Development with Flutter: Create Cross-Platform Mobile Apps**	**Rap Payne**	**1st Edition 2019**	**Apress**

VIII(b): Web links and Video Lectures (e-Resources):

Title - The Complete Dart & Flutter Developer Course
Link - https://youtu.be/CzRQ9mnmh44?si=636GWHN2YznLR9lh
Title - Flutter Tutorial For Beginners
Link - https://youtu.be/BiOSCpV-lts?si=fZJ9ITfsU5OpSwMb

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

- Code-Along Sessions
- Quizzes
- Pair Programming

Semester:	IV	**Course Type:**	NCMC		
Course Title: Mindful Mastery : Aptitude And Soft skill Integration					
Course Code:	**23PDSN04**			**Credits:**	PP/NP
Teaching Hours/Week (L: T: P: O)			0:0:0:2	**Total Hours:**	24
CIE Marks:	50	**SEE Marks:**	NA	**Total Marks:**	50
SEE Type:	NA			**Exam Hours:**	NA

I. Course Objectives:

- To gain a deep understanding of numerical concepts including place value, fractions, decimals, percentages, ratios, and proportions.
- To acquire skills to prioritize tasks and activities effectively based on their importance and urgency.
- To develop the ability to interpret and utilize various data representations, including tables, charts, graphs, and diagrams.
- To learn to interpret different body language signals and understand their underlying meanings in interpersonal communication.
- To acquire strategies for breaking down complex problems into manageable steps, enhancing problem-solving abilities.

II. Teaching-Learning Process (General Instructions):

The following are some of the strategies that teachers can employ to facilitate the achievement of various course outcomes:

1. **Diverse Teaching Methods**: Instead of relying solely on traditional lecture methods, can explore alternative and effective teaching approaches. These might include interactive discussions, hands-on activities, or multimedia presentations.
2. **Visual Aids**: Utilize videos and animations to elucidate complex concepts. Visual representations enhance understanding and engagement among students.
3. **Collaborative Learning**: Encourage group learning within the classroom. Collaborative activities foster teamwork, communication, and a deeper grasp of subject matter.
4. **Higher Order Thinking (HOT) Questions**: Pose at least three thought-provoking questions during class. These questions stimulate critical thinking and encourage students to analyze and evaluate information.
5. **Problem-Based Learning (PBL):** Implement PBL, which nurtures analytical skills. PBL goes beyond rote memorization by challenging students to design solutions, evaluate evidence, and think critically.
6. **Multiple Representations**: Introduce topics using various representations. Visuals, diagrams, and real-world examples cater to diverse learning styles.
7. **Creative Problem Solving**: Present different approaches to solving the same problem. Encourage students to think outside the box and devise their own innovative solutions.
8. **Real-World Application**: Discuss how each concept relates to practical scenarios. Connecting theoretical knowledge to real-world contexts enhances students' comprehension and retention.

□ Chalk & Talk □ Stud. Assignment □Web Resources □LCD/Smart Boards □Stud. Seminars

III. COURSE CONTENT

Module-1: Arithmetical Ability	5Hrs

Problems on Pipes Cisterns , Time , Work and Averages
Textbook: Textbook 1; Section-1;Page no-510to525

Prerequisites: Have the basic knowledge of Mathematics and logics

Module-2: Time management and Presentation skills	5Hrs

Misconceptions of Time, Symptoms of Poor Time Management, the 'Five Time Zone' Concept, Elements of Effective Time Management. ABC of presentation / Accent and pronunciation / Practice to Perform / Impact of voice modulation, eye contact and body language during presentation. Evaluation, Feed back
Textbook : Textbook 2; Chapter-2

Prerequisites: (Self learning): Basic Presentation ideas and Time management.

Module-3: Quantitative section and Data Interpretation	5Hrs

Simple interest and compound interest problems, Bar graphs, Pie charts and Line graphs concepts and problem.

Textbook: Textbook 1;Section-I; Page no 641-687

Prerequisites: Basic Calculation knowledge.

Module-4: Body language and Postures	5Hrs

Facial expressions, Gestures, Handshakes, tone of voice, Attitude, Universal vs. Culture specific.
Textbook: Textbook 3

Module-5: Mental ability	4Hrs

Puzzle based question and Psychometric based interview Question
Reference link: https://www.hitbullseye.com/puzzle/logical-puzzle-questions-with-answers.php

IV. COURSE OUTCOMES:

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

CO1	Apply problem-solving techniques in Pipes, Cisterns, Time, Work, and Averages, showcasing arithmetical ability.
CO2	Develop efficient time management skills, recognizing misconceptions, symptoms, and implementing effective strategies.
CO3	Apply quantitative analysis and data interpretation, handling problems in simple interest, compound interest, and graphical data interpretation.
CO4	Apply effective body language and postures in communication, distinguishing universal cues from culture-specific ones.
CO5	Apply mental agility through puzzle-solving and psychometric interview preparation, refining problem-solving and cognitive abilities.

V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3	S4
CO1		3		3				2				1	2		1	2
CO2								2	2			2		2		
CO3	3	2						2	2		2	2	2			
CO4						2		2		2		2		2	2	1
CO5	2	2	3									3	1		2	2

VI. Assessment Details (CIE & SEE)

General Rules: Refer Annexure-1 section 8

Continuous Internal Evaluation (CIE): Refer Annexure-1section 8

Semester End Examination (SEE):

VII. Learning Resources

VII(a): Textbooks:				
Sl. No.	**Title of the Book**	**Name of the author**	**Edition and Year**	**Name of the publisher**
1	Quantitative Aptitude for Competitive examination	R S Agarwal	2017	S Chand
2	Time Management	Marc Mincini	2003	Mcgraw Hill
3	Gestures and Body Language	Aparna majumdar	2017	V& S Publisher
VII(b): Reference Books:				
1	Gestures and Body Language	Aparna majumdar	2017	V& S Publisher
2	A modern approach to logical reasoning	R S Agarwal	2019	S Chand

VII(c): Web links and Video Lectures (e-Resources):

1. https://youtu.be/-iQEzSd9QUQ?si=qwWVOnDiky3vyuju
2. https://youtu.be/MV00SQU_f7E?si=Rq0EAIZKzCU-EVOp
3. https://youtu.be/MV00SQU_f7E?list=PLOoogDtEDyvvDNHO_Ba58OrE567nCzzl2

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

Assignments, Quizzes and Seminar, group discussions etc.

Annexure

|| Jai Sri Gurudev ||
SRI ADICHUNCHANAGIRI SHIKSHANA TRUST (R)
SJB Institute of Technology
An Autonomous Institution under VTU
Approved by AICTE-New Delhi , Recognized by UGC with 2(f) &12(B)
Accredited by NAAC with 'A+' Grade
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ANNEXURE

CIE & SEE evaluation for Autonomous Scheme 2023 – UG

Note: Revised as per approvals of 4th Academic Council Meeting held on 05/02/2025

S. #	Course Type /Credits	Continuous Internal Evaluation (CIE)																					Semester End Examination (SEE)									Min. pass % (CIE + SEE)
		Total CIE marks	Min. Eligty.	I. Theory Component									II. Practical Component									Total CIE marks	Dur. In hrs.	Theory			Practical			Total SEE marks	
						A. Unit test			B. Formative Assessments			Tot. Theory marks			C. Weekly Evaluation		D. Internal Test			E. Prj	Tot. marks										
						Nos.	Marks / Each	Tot.	Nos.	Marks / Each	Tot.	(I)	Marks	Min. Eligty.	Each week	Tot. marks	Nos.	Marks / Each	Total marks	Marks	(II)			Max. conducted marks	Max. considered marks	min. pass %	Max. conducted marks	Max. considered marks	min. pass %		
1	BSC/ESC/PCC/ETC /PEC/OEC (3 or 4 Credit courses)	50	40%	50	40%	2	50	50 (avg. of 2)	2	50	50 (avg. of 2)	50 (avg. of A & B)	--	--	--	--	--	--	--	--	--	50 (I)	03	100	50	35%	--	--	--	50	40%
2	IBSC/IESC/IPCC/ ETC (4 Credit courses)	50	40%	50	40%	2	50	50 (avg. of 2)	2	50	50 (avg. of 2)	50 (avg. of A & B)	50	40%	50	50 (Avg. of all)	1	50	50	50	50 (Avg. of C & [D or E])	50 (Avg. of I & II)	03	100	50	35%	--	--	--	50	40%
3	IESC - CAED (4 credit course)	50	40%	--	--	--	--		--	--		--	50	40%	50	50 (Avg. of all)	1	50	50	--	50 (Avg. of C & D)	50	03	--	--	--	100	50	35%	50	40%
4	PCCL (1 Credit courses)	50	40%	--	--	--	--		--	--		--	50	40%	50	50 (Avg. of all)	1	50	50	50	50 (Avg. of C & [D or E])	50 (II)	03	--	--	--	100	50	35%	50	40%
5	AEC- IDT, Skill Development courses (1 credit course)	50	40%	50	40%	1	50		1	50		50 (Avg. of 2)	--	--	--	--	--	--	--	--	--	50 (I)	02	50	50	35%	--	--	--	50	40%
6	HSMC- CIP, Env studies, SFH, UHV (1 credit course)	50	40%	50	40%	1	50		1	50		50 (Avg. of 2)	--	--	--	--	--	--	--	--	--	50 (I)	02	50	50	35%	--	--	--	50	40%
7	HSMC - English, Kannada (No credits)	50	40%	50	40%	1	50		1	50		50 (Avg. of 2)	--	--	--	--	--	--	--	--	--	50 (I)	--	--	--	--	--	--	--	--	40%
8	NCMC - Personality Development courses, PE, Yoga, NCC, NSS, IKS (No credits)	50	40%	50	40%	--	--		1	50		50	--	--	--	--	--	--	--	--	--	50 (I)	--	--	--	--	--	--	--	--	40%

 # Formative (Successive) Assessments: Assignments/quiz/ seminars/field survey and report presentation/course project/group discussions/etc. based on the faculty & dept. planning. **# Practical Conduction:** The conduction of each experiment/program per week should evaluate for 50 Marks and average of all shall be taken. **# In case of Integrated course,** minimum eligibility shall be attained as prescribed in both the theory and practical components.
 # Self Learning Courses (SLC) Courses, Internship, Mini project & Major Project: Rubrics & Methodology shall be defined seperately

Academic Dean 10/2/25

Principal 10.2.2025

Academic Director 10/2/25

ANNEXURE

II Jai Sri Gurudev II
SRI ADICHUNCHANAGIRI SHIKSHANA TRUST (R)
SJB Institute of Technology
An Autonomous Institution under VTU
Approved by AICTE-New Delhi , Recognized by UGC with 2(f) &12(B)
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CIE and SEE guidelines for Autonomous Scheme 2023 –ಆ

Note: Revised as per approvals of 4th Academic Council Meeting held on 05/02/2025

Continuous Internal Evaluation (CIE)	Semester End Examination (SEE)	Final Passing requirement
1. BSC/ESC/PCC/ ETC/PEC/OEC – Theory Course (03 & 04 Credit courses)		
The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.		
Continuous Internal Evaluation: The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). CIE will be conducted by the department and it will have only 01 component (I): **I. Theory component:** Theory Component will consist of A. Internal Assessment Test (IAT). B. Formative Assessments (FA). **A. Internal Assessment Test:** i) There are 02 tests each of 50 marks conducted during 8th week & 15th week, respectively. ii) The question paper will have four questions (max of 3 sub questions) from the notified syllabus. Each question is set for 25 marks. iii) The student must answer 2 full questions (one from 1st & 2nd questions and another from 3rd & 4th question).	**Semester-End Examination:** The minimum passing mark for SEE is 35% of the maximum marks (18 out of 50 marks). Duration of 03 hours and total marks of 100. i) The question paper will have ten questions. Each question is set for 20 marks. ii) There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module. iii) The students have to answer 5 full questions, selecting one full question from each module. iv) Marks scored shall be proportionally reduced to 50 marks.	The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE and SEE taken together.

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Principal 10.2.2025

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iv) IAT QP shall be designed to attain the different levels of Bloom's taxonomy as per the outcomes defined for the course. **B. Formative assessments:** i) 02 formative assessments each of 50 marks shall be conducted by the course coordinator based on the dept. planning during random times. ii) One formative assessment shall be completed before 5th week and second shall be completed before 12th week. iii) The syllabus content for the formative assessment shall be defined by the course coordinator. iv) The formative assessments include Assignments/seminars/case study/field survey/ report presentation/course project/etc. v) The assignment QP or Quiz QP shall indicate marks of each question and the relevant COs & RBT levels. vi) The rubrics required for the other type of formal assessments shall be defined by the departments along with mapping of relevant COs & POs and get it approved from academic dean. **The final CIE marks will be 50:** CIE = Avg. {Avg. of two tests + Avg. of two FA} **The documents of all the assessments shall be maintained meticulously.**		
2. IBSC/IESC/IPCC– Integrated with Theory & Practical (04 credit courses), ETC (if offered as integrated course)		
The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.		
Continuous Internal Evaluation: The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). Minimum eligibility of 40% marks shall be attained separately in both the theory component and practical component. CIE will be conducted by the department and it will have 02 component: I. Theory Component. II. Practical Component. **I. Theory Component:** Theory component will consist of A. Internal Assessment Test (IAT). B. Formative assessments (FA).	The minimum passing mark for SEE is 35% of the maximum marks (18 out of 50 marks). **Semester-End Examination:** Only theory SEE for duration of 03 hours and total marks of 100. i) The question paper will have ten questions. Each question is set for 20 marks. ii) There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.	The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE and SEE taken together.

A. Internal Assessment Test: i) There are 02 tests each of 50 marks conducted during 8th week & 15th week, respectively. ii) The question paper will have four questions (max of 3 sub questions) from the notified syllabus. Each question is set for 25 marks. iii) It is suggested to include questions on laboratory content in the Internal Assessment test Question papers. iv) The student must answer 2 full questions (one from 1st & 2nd questions and another from 3rd & 4th question). v) IAT QP shall be designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course. **B. Formative assessments:** i) 02 formative assessments each of 50 marks shall be conducted by the course coordinator based on the dept. planning during random times. ii) One formative assessment shall be completed before 5th week and second shall be completed before 12th week. iii) The syllabus content for the formative assessment shall be defined by the course coordinator. iv) The formative assessments include Assignments/seminars/case study/field survey/ report presentation/course project/etc. v) The assignment QP or Quiz QP shall indicate marks of each question and the relevant COs & RBT levels. vi) The rubrics required for the other type of formal assessments shall be defined by the departments along with mapping of relevant COs & POs and get it approved from academic dean. **II. Practical Component:** **C.** Conduction of each experiment/program should be evaluated for 50 marks and average of all the experiments/programs shall be taken. (rubrics will be published by the concerned committee) **D.** One laboratory Internal Assessment test will be conducted during the 14th week for 50 marks. (rubrics will be published by the concerned committee) **E.** If the course project / mini project is involved in the laboratory component. **The evaluation shall be completed by 14th week of the semester.** The rubrics required for the evaluation of the project shall be defined by the departments along with mapping of relevant COs & POs and get it approved from academic dean.	iii) The laboratory content must be included in framing the theory question papers. iv) The students have to answer 5 full questions, selecting one full question from each module. v) Marks scored shall be proportionally reduced to 50 marks. **No Practical SEE for Integrated Course.** **Note:** CAED Course shall not be considered here. It shall be considered as in sl. No. 3 in the next row	

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Note:

i) If component 'E' is involved in the course, either component 'D' or 'E' along with component 'C' shall be considered for average of item II.

ii) Otherwise, components 'C' & 'D' shall be considered for average of item II.

The final CIE marks will be 50:

CIE= Avg. {**I** [Avg. of two tests + Avg. of two FA] + **II** [Avg. of (C & (D or E))]}

The documents of all the assessments shall be maintained meticulously.

Note: CAED Course shall not be considered here, it shall be considered as in sl. no. 3 in the next row.

3. IESC: CAED Course (4 credits)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.

The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50).

i) CIE shall be conducted for max. marks of 100 and shall be scaled down to 50 marks

ii) CIE component should comprise of both Manual and computer drafting i.e. 50% manual and 50% computer drafting out of total 100 marks

iii) CIE component should comprise of Continuous evaluation of drawing work of students as and when the modules are covered based on below detailed weightage.

Module	Module Max. Marks	Evaluation Weightage in marks	
		Computer display and print out	Manual Sketching
Module 1	20	10	10
Module 2	20	10	10
Module 3	20	10	10
Module 4	20	10	10
Module 5	20	10	10
TOTAL	**100**	**50**	**50**

The minimum passing mark for SEE is 35% of the maximum marks (18 out of 50 marks).

Semester-End Examination:

SEE for duration of 03 hours and total marks of 100.

i) SEE shall be conducted and evaluated for maximum marks of 100 and shall be scaled down to 50 marks.

ii) Question paper shall be made available for each batch as per schedule.

iii) Evaluation shall be carried jointly by both the internal & external examiners.

iv) Scheme of Evaluation: To be defined by both the examiners jointly.

v) Maximum 3 questions shall be set as per the following pattern.

The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE and SEE taken together.

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iv) At least one Test covering all the modules is to be conducted for 100 marks during 14th week and the same is to be scaled down to **25 Marks.**

v) Assignments = **10 Marks from each module. (50 marks scaled down to 25 Marks)**

vi) The final CIE 50 marks = Test (25 marks) + Assignment (25 marks).

From Module	Marks Allotted
Module 01 (Choice between Lines or Planes)	30
Module 02 (Compulsory question)	40
Module 03 or Module 04 or Module 05	30
TOTAL	**100**

Q. No.	Manual Sketching	Computer display and print out	TOTAL MARKS
1	15	15	30
2	20	20	40
3	15	15	30
TOT.	**50**	**50**	**100**

4. PCCL: Laboratory course (01 credit course)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.

Continuous Internal Evaluation: The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50).

CIE will be conducted by the department and it will have only 01 component:

I. Theory Component. (Not required for Laboratory course)

II. Practical Component.

II. Practical Component:

C. Conduction of each experiment/program should be evaluated for 50 marks and average of all the experiments/program shall be taken (rubrics will be published by the concerned committee).

D. One laboratory Internal Assessment test will be conducted for 50 marks (rubrics will be published by the concerned committee).

E. If the course project / mini project is involved in the laboratory component. **The evaluation shall be completed by 14th week of the semester.** The rubrics required for the evaluation of the project shall be defined by the departments along with mapping of relevant COs & POs and get it approved from academic dean.

The minimum passing mark for SEE is 35% of the maximum marks (18 out of 50 marks).

Semester-End Examination:

Only laboratory SEE will be conducted jointly by the internal examiner and external examiner appointed by COE as per the scheduled timetable for duration of 03 hours.

i) The examination shall be conducted for 100 marks and shall be reduced to 50 marks proportionately.

ii) All laboratory experiments/programs are to be included for practical examination.

iii) Breakup of marks (Rubrics) and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners (OR) based on the course

The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE and SEE taken together.

Academic Dean

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Note: **i)** If component 'E' is involved in the course either component 'D' or 'E' along with component 'C' shall be considered for average of item II. **ii)** Otherwise, components 'C' & 'D' shall be considered for average of item II. **The final CIE marks will be 50** = Avg. of (C & [D or E]) **The documents of all the assessments shall be maintained meticulously.**	requirement evaluation rubrics shall be decided jointly by examiners. iv) Students can pick one question (experiment/program) from the questions lot prepared by the internal /external examiners jointly. v) Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners. vi) General rubrics suggested for SEE: writeup-20%, Conduction procedure and results-60%, Viva-voce 20% of maximum marks. vii) Change of experiment is allowed only once and shall be assessed only for 85% of the maximum marks.	

5. AEC: Ability Enhancement Courses (01 credit courses)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.

The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). **Continuous Internal Evaluation:** CIE will be conducted by the department and will have only 01 component: **I. Theory component.** Theory Component will consist of A. Internal Assessment Test (IAT). B. Formative Assessments (FA). **A. Internal Assessment Test:** i) 01 test of 50 marks conducted during 15th week. ii) The question paper will be of Multiple-Choice Questions (MCQ). iii) The student must answer all questions. iv) IAT QP shall be designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.	The minimum passing mark for SEE is 35% of the maximum marks (18 out of 50 marks). **Semester-End Examination:** Theory SEE will be conducted by COE as per the scheduled timetable for duration of 02 hours and total marks of 50. i) Multiple choice Question paper. ii) The students have to answer all questions.	The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE and SEE taken together.

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B. Formative assessments: i) 01 formative assessment of 50 marks shall be conducted by the Course coordinator based on the dept. planning during 12th week. ii) The formative assessments include Assignments/seminars/case study/field survey/ report presentation/course project/etc. iii) The assignment QP shall indicate marks of each question and the relevant COs & RBT levels. iv) The rubrics required for the other type of formal assessments shall be defined by the departments along with mapping of relevant COs & POs. **The final CIE marks will be 50:** CIE = Avg. of 02 events (01 IAT and 01 FA). **The documents of all the assessments shall be maintained meticulously.**		

6. HSMC: (01 credit course)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.

Continuous Internal Evaluation: The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). CIE will be conducted by the department and will have only 01 component: **I. Theory component.** Theory Component will consist of A. Internal Assessment Test (IAT). B. Formative Assessments (FA). **A. Internal Assessment Test:** i) 01 test of 50 marks conducted during 15th week. ii) The question paper will be of Multiple-Choice Questions (MCQ). iii) The student must answer all questions. iv) IAT QP shall be designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course **B. Formative assessments:** i) 01 formative assessment of 50 marks shall be conducted by the faculty based on the dept. planning during 12th week. ii) The formative assessments include Assignments/seminars/case study/field survey/ report presentation/course project/etc.	The minimum passing mark for SEE is 35% of the maximum marks (18 out of 50 marks). **Semester-End Examination:** Theory SEE will be conducted by COE as per the scheduled timetable for duration of 02 hours and total marks of 50. i) Multiple choice Question paper. ii) The students have to answer all questions	The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE and SEE taken together.

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iii) The assignment QP shall indicate marks of each question and the relevant COs & RBT levels. iv) The rubrics required for the other type of formal assessments shall be defined by the departments along with mapping of relevant COs & POs. **The final CIE marks will be 50:** CIE = Avg. of 02 events (01 IAT and 01 FA). **The documents of all the assessments shall be maintained meticulously.**		
7. HSMC: (0 credit courses)		
The weightage is only for Continuous Internal Evaluation (CIE).		
Continuous Internal Evaluation: The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). CIE will be conducted by the department and it will have only 01 component: **I. Theory component.** Theory Component will consist of A. Internal Assessment Test (IAT). B. Formative assessments (FA). **A. Internal Assessment Test:** i) 01 test of 50 marks conducted during 15th week. ii) The QP will be of Multiple-Choice Questions (MCQ). iii) The student must answer all questions. iv) IAT QP shall be designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course **B. Formative assessments:** i) 01 formative assessment of 50 marks shall be conducted by the faculty based on the dept. planning during 12th week. ii) The formative assessments include Assignments/seminars/case study/field survey/ report presentation/course project/etc. iii) The assignment QP shall indicate marks of each question and the relevant COs & RBT levels. iv) The rubrics required for the other type of formal assessments shall be defined by the departments along with mapping of relevant COs & POs. **The final CIE marks will be 50:** CIE = Avg. of 02 events (01 IAT and 01 FA). **The documents of all the assessments shall be maintained meticulously.**	No Semester End Examination.	The student is declared as a pass in the course if he/she secures a minimum of 40% (20 marks out of 50) in the CIE.

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8. NCMC: (0 credit course)

The weightage is only for Continuous Internal Evaluation (CIE).

Continuous Internal Evaluation: The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). CIE will be conducted by the department and it will have only 01 component: **I. Theory component.** Theory Component will consist of only 01 assessment A. Internal Assessment Test (not required for NCMC course). B. Formative Assessment (FA). **B. Formative assessments:** i) 01 formative assessment of 50 marks shall be conducted by the faculty based on the dept. planning during random times during 12th week. ii) The formative assessments include Quiz/Assignments/seminars/case study/field survey/ report presentation/course project/etc. iii) The assignment QP shall indicate marks of each question and the relevant COs & RBT levels. iv) The rubrics required for the other type of formal assessments shall be defined by the departments along with mapping of relevant COs & POs. **The final CIE marks will be 50.** **The documents of all the assessments shall be maintained meticulously.**	No Semester End Examination.	The student is declared as a pass in the course if he/she secures a minimum of 40% (20 marks out of 50) in the CIE.

Academic Dean
Dr. Babu N V

Principal
Dr. K V Mahendra Prashanth

Academic Director
Dr. Puttaraju

Academic Dean

Principal 10.2.2025

Academic Director

|| Jai Shree Gurudev ||
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Certified by ISO 9001 – 2015

ATAL Ranking:
Band Performer

Band of 151 to 300 in
Innovation Category

B.E.

Autonomous Scheme & Syllabus

Second Year

Department of Computer Science and Engineering

Department Vision:

To become a Centre of excellence producing "Creators of Innovative Technology" who can contribute positively to the ever changing industrial demands and societal needs.

Department Mission:

M1: To encourage participation of faculty and students in research activities for enhancing their subject knowledge and acquire information regarding current trends

M2: To provide exposure to students on latest tools and technologies in area of Computer Science and Engineering

M3: Preparation of our graduates for leadership in profession and in higher education by providing excellent teaching learning environment enabling them to serve the society