An Autonomous College under VTU

DEPARTMENT OF COMPUTER SCIENCE &ENGINEERING
(Artificial Intelligence &Machine Learning)

Scheme and Syllabus

With effect from Academic Year 2024-25

VISION

To be a centre of excellence with quality education and research in Artificial Intelligence through nurturing collaborative culture, disseminating customer oriented innovations and positive contribution to the welfare ofthe society.

MISSION

- To impart quality technical education to the students to enhance their professional skills and make themglobally competitive.

- To carry out research in cutting out technologies in Artificial Intelligence and its allied fields to meet therequirements of industry and society.

- To create an innovation environment with the collaboration of industry in which students can providesolutions to global problems.

- To inculcate strong ethical and leadership qualities to the minds of students and make them as successfulentrepreneurs.

- To produce the Computer Science and Engineering professionals with a specialization in AIML withpersonal and professional responsibilities and commitment to lifelong learning.

PROGRAM EDUCATIONAL OBJECTIVES(PEOs)

The graduates of Computer Science and Engineering are expected to fulfill the following PEOs after a fewyears of their graduation.

PEO1: Graduates in Computer Science and Engineering will apply the technical knowledge of analysis and design of software used for sustainable societal growth.

PEO2: Graduates of Computer Science and Engineering will demonstrate logical thinking and programming skills**.**

PEO3: Graduates in Computer Science and Engineering will demonstrate good communication skills, dynamic leadership qualities with concern for environmental protection.

PEO4: Computer Science and Engineering graduates will be capable of pursuing higher studies, take up research and development work blended with ethics and human values.

PEO5: Computer Science and Engineering graduates will have the ability to be come entrepreneurs there by switching over from responsive engineer to creative engineer.

PROGRAM OUTCOMES (POs):
Graduates of the Computer Science and Engineering Programme will be able to achieve the following POs:

PO1:Engineering Knowledge:
Apply the knowledge of mathematics, science, engineering fundamentals, and **Computer Science and Engineering** principles to the solution of complex problems in **Computer Science and Engineering.**

PO2: Problem Analysis:
Identify, formulate, research literature, and analyze complex **Computer Science and Engineering** problems reaching substantiated conclusions using first principles of mathematics and engineering sciences.

PO3:Design/Development of Solutions:
Design solutions for complex **Computer Science and Engineering** problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of Complex problems:
Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions related to **Computer Science and Engineering** problems.

PO5: Modern Tool Usage:
Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex **Computer Science and Engineering** activities with an understanding ofthe limitations.

PO6: The Engineer and Society:
Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional **Computer Science and Engineering**practice.

PO7: Environment and Sustainability:
Understand the impact of the professional **Computer Science and Engineering** solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics:
Apply ethical principles and commit to professional ethics and responsibilities and norms of the **Computer Science and Engineering** practice

PO9: Individual and Teamwork:
Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication:
Communicate effectively on complex **Computer Science and Engineering** activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project Management and Finance:
Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage **Computer Science and Engineering** projects and in multidisciplinary environments.

PO12: Life Long Learning:
Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs):
Program Specific Outcomes (PSOs) are what the graduates of a specific undergraduate engineering programshould be able to do at the time of graduation.

PSO1: Professional Skills:
The ability to understand, analyze and develop computer programs in the areas related to system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems ofvarying complexity

PSO2: Problem-Solving Skills:
The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.

PSO3: Foundation of mathematical concepts:
Ability to apply mathematical concepts to solve real world problems using appropriate data structure andsuitable algorithms.

Nagarjuna College of Engineering and Technology
B.E. in CSE (AI&ML)
Scheme of Teaching and Examinations 2023
Outcome Based Education (OBE) and Choice Based Credit System(CBCS)
(Effective from the academic year 2024-25)

III SEMESTER

Sl. No	Course	Course Code	Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination					Credits
					Theory Lecture	Tutorial	Practical/ Drawing	SDA	Duration in hours	CIE Marks	SEE Marks	Total Marks		
					L	T	P	S						
1	MAT	23MATS31	Mathematics for Computer Science	Maths Dept	2	2	0	0	03	50	50	100		3
2	IPCC	23CII32	Data Structures and Applications	CSE Board	3	0	2	0	03	50	50	100		4
3	IPCC	23CII33	Database Management Systems		3	0	2	0	03	50	50	100		4
4	PCC	23CIT34	Operating System		3	0	0	0	03	50	50	100		3
5	PCCL	23CIL35	Object Oriented Programming Lab using Java		0	0	2	0	03	50	50	100		1
6	ESC	23CIT36x	ESC/ETC/PLC		3	0	0	0	03	50	50	100		3
7	UHV	23UHV37	Social Connect and Responsibility	Any Department	0	0	2	0	01	100	0	100		1
8	AEC / SEC	23CIL38x	Ability Enhancement Course/Skill Enhancement Course - III		If the course is a Theory				01	50	50	100		1
					1	0	0	0						
					If a course is a laboratory				02					
					0	0	2	0						
9	MC	23NS39	National Service Scheme (NSS)	NSS coordinator	0	0	2	0	02	100	0	100		0
		23PE39	Physical Education(PE) (Sports and Athletics)	Physical Education Director										
		23YO39	Yoga	Yoga Teacher										
									Total	550	350	900		20

PCC: Professional Core Course, **PCCL**: Professional Core Course laboratory, **UHV**: Universal Human Value Course, **MC**: Mandatory Course (Non-credit), **AEC**: Ability Enhancement Course, **SEC**: Skill Enhancement Course, **L:** Lecture, **T**: Tutorial, **P**: Practical **S= SDA**: Skill Development Activity, **CIE**: Continuous Internal Evaluation, **SEE**:Semester End Evaluation. K : This letter in the course code indicates common to all the stream of engineering. ESC: Engineering Science Course, ETC: Emerging
Technology Course, PLC: Programming Language Course

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Engineering Science Course (ESC/ETC/PLC)			
22CIT361	Object Oriented Programming	22CIT363	Business Process Fundamentals
22CIT362	Software Engineering	22CIT364	Analog and Digital Systems
Ability Enhancement Course – III (All are Laboratory Courses 0-0-2)			
22CIL381	Technical Writing using Latex	22CIL383	Full Stack Web Development
22CIL382	Data analytics with Excel	22CIL384	Unix Shell Programming

Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practical's of the same course. Credit for IPCC can be 04 and its Teaching– Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. For more details, the regulation governingthe Degree of Bachelor of Engineering /Technology (B.E./B.Tech.) 2022-23 may please be referred.

National Service Scheme /Physical Education/Yoga: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE)(Sports and Athletics), and Yoga(YOG) with the concerned coordinator of the course during the first week of III semesters. Activities shall be carried out between III semesters to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities. These courses shall
not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of degree.

Mathematics for Computer Science					
Course Code	**L:T:P:S**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
23MATS31	2:2:0:0	3	CIE:50 SEE:50	3 Hours	PCC

Pre-Requisites:
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Objectives :

The goal of the course **Mathematics for Computer Science** is to,
1. Introduce the concept of random variables, probability distributions, specific discrete and continuous distributions with practical application in Computer Science Engineering and social life situations.
2. Provide the principles of statistical inferences and the basics of hypothesis testing with emphasis on some commonly encountered hypotheses.
3. Determine whether an input has a statistically significant effect on the system's response through ANOVA testing.

Teaching-Learning Process

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

1. In addition to the traditional lecture method, different types of innovative teaching methods maybe adopted so that the delivered lessons shall develop students theoretical and applied mathematical skills.
2. State the need for Mathematics with Engineering Studies and Provide real-life examples.
3. Support and guide the students for self–study.
4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress.
5. Encourage the students for group learning to improve their creative and analytical skills.
6. Show short related video lectures in the following ways:
     • As an introduction to new topics (pre-lecture activity).
     • As a revision of topics (post-lecture activity).
     • As additional examples (post-lecture activity).
     • As an additional material of challenging topics (pre-and post-lecture activity).
     As a model solution of some exercises (post-lecture activity).

Module I

Probability Distributions:
Review of basic probability theory. Random variables (discrete and continuous), probability mass and density functions. Mathematical expectation, mean and variance. Binomial, Poisson and normal distributions- problems (derivations for mean and standard deviation for Binomial and Poisson distributions only).   .   **8 Hours.**
[Text 1: 26.1, 26.2, 26.7, 26.8, 26.9, 26.10, 26.13, 26.14, 26.15, 26.16]
[RBT Levels: L1, L2 and L3]
Self-Study: Exponential distribution.
 Applications: Used for Modeling and prediction, analyzing data, algorithm design, cryptography, error detection, machine learning, computer vision, computer graphics, random number generation and natural language processing.

Module II

Joint probability distribution & Markov Chain:
Joint probability distribution: Joint Probability distribution for two discrete random variables,expectation, covariance and correlation.
Markov Chain: Introduction to Stochastic Process, Probability Vectors, Stochastic matrices, Regular stochastic matrices, Markov chains, Higher transition probabilities, Stationary distribution of RegularMarkov chains and absorbing states. **8 Hours.**
[Text 3: 8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 5.6, 5.7]
[RBT Levels: L1, L2 and L3]
Self-Study: Joint Probability distribution for two continuous random variables.
Applications: Joint distribution for system design and maintenance decisions. Markov chain for algorithmic design and networking.

Module III

Statistical Inference 1:
Introduction, sampling distribution, standard error, testing of hypothesis, levels of significance, test of significances, confidence limits, simple sampling of attributes, test of significance for large samples, comparison of large samples. Sampling variables, central limit theorem and confidence limit for unknown mean. Test of Significance for means of two large samples.

8 Hours.

[Text 1: 27.1, 27.2, 27.3, 27.4 27.5, 27.6, 27.7, 27.8, 27.9, 27.10, 27.11, 27.12]

[RBT Levels: L1, L2 and L3]
Applications: Decision making and problem solving, software testing and quality control

Module IV

Statistical Inference 2:
Sampling of variables-small samples, students 't' distribution, Chi-square distribution as a test ofgoodness of fit. F-Distribution. **8 Hours.**
[Text 1: 27.13, 27.14, 27.15, 27.16, 27.17, 27.18, 27. 19]

[RBT Levels: L1, L2 and L3]
Self-Study: Fisher's Z-Distribution.
Applications: Algorithm performance evaluation, Software testing, Hardware testing, Quality assurance, Biometric systems, Network security, database management, Biomedical informatics,
  Information retrieval, signal processing and image processing.

Module V

Design of Experiments and ANOVA:
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, and Analysis of Co-Variance.
8 Hours.

[Text 2:]

[RBT Levels: L1, L2 and L3]
  Applications: Algorithm Optimization, Network performance, Database management,
  User experience design and Hardware design..
08 Hours

Assessment Details (both IAT and SEE)

Theory Component	IAT-1 after completion 45 to 50% Syllabus	25 Marks
	IAT-2 after completion 95 to 100% Syllabus	25 Marks
	Average of two IATs	**25 Marks**
	CCE-1	25 Marks
	CCE-2	25 Marks
	Average of two CCEs	**25 Marks**
Grand Total of IAT Marks (min marks 20 / 50)		**50 Marks**
SEE conducted for 100 and scaled down to 50 **(min marks 18/50)**		**50 Marks**
IAT + SEE (min marks 40)		**100 Marks**

Course Outcomes (Course Skill Set):

After successfully completing the course, the students will be able to:

1. Understand the basic concepts of probability, random variables, probability distribution and apply suitable probability distribution models for the given scenario.
2. Learn the concept of joint distribution and make use of the notion of a discrete-time Markovchain and n-step transition probabilities to solve the engineering application problem
3. Use statistical methodology and tools in the sampling analysis.
4. Compute the confidence intervals for the mean of the population by using different tests. Apply the ANOVA test related to engineering problems.

Suggested Learning Resources:

Text Books:

1. **B. S. Grewal**: "Higher Engineering Mathematics", Khanna publishers, 44th Ed.2021.
2. **Ronald E. Walpole, Raymond H Myers, Sharon L Myers & Keying Ye** "Probability & Statistics for Engineers & Scientists", Pearson Education, 9th edition, 2017.
3. **Seymour Lipschutz and Marc Lars Lipson:** "Probability", (Chapters: 5 and 8), McGraw Hill Education (India) Private Limited, Chennai, Special Indian Edition, 2010.

Reference Books:

1. **Erwin Kreyszig**, "Advanced Engineering Mathematics", John Wiley &Sons,9th Edition, 2006.
2. **Peter Bruce, Andrew Bruce & Peter Gedeck** "Practical Statistics for DataScientists" O'Reilly Media, Inc., 2nd edition **2020**.
3. **G Haribaskaran** "Probability, Queuing Theory & Reliability Engineering",LaxmiPublication, Latest Edition, 2006.
4. **Irwin Miller & Marylees Miller,** John E. Freund's "Mathematical Statistics withApplications" Pearson. Dorling Kindersley Pvt. Ltd. India, 8th edition, 2014.
   S C Gupta and V K Kapoor, "Fundamentals of Mathematical Statistics", S Chand andCompany, Latest edition.
6. **Robert V. Hogg, Joseph W. McKean & Allen T. Craig**. "Introduction to Mathematical Statistics", Pearson Education 7th edition, 2013.
7. **Jim Pitman**. Probability, Springer-Verlag, 1993.

8. **Sheldon M. Ross,** "Introduction to Probability Models" 11th edition. Elsevier,2014.

9. **A. M. Yaglom and I. M. Yaglom**, "Probability and Information". D. Reidel PublishingCompany. Distributed by Hindustan Publishing Corporation (India)Delhi, 1983.

10. **P. G. Hoel, S. C. Port and C. J. Stone**, "Introduction to Probability Theory", UniversalBook Stall, (Reprint), 2003.

11. **S. Ross**, "A First Course in Probability", Pearson Education India, 6th Ed., 2002.

12. **W. Feller**, "An Introduction to Probability Theory and its Applications", Vol. 1,Wiley, 3rd Ed., 1968.

13. **N.P. Bali and Manish Goyal**, A Textbook of Engineering Mathematics,LaxmiPublications, Reprint, 2010.

14. **Veerarajan T**, Engineering Mathematics (for semester III), Tata McGraw-Hill,NewDelhi, 2010.

E-Resources:
1. http://.ac.in/courses.php?disciplineID=111
2. http://www.class-central.com/subject/math(MOOCs)
3. http://academicearth.org/
4. VTU e-Shikshana Program
5. VTU EDUSAT Program

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning
6. Quizzes
7. Assignments
8. Seminars

CO-PO-PSO Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
23MATS31.1	3	3	1									
23MATS31.2	3	3	2									
23MATS31.3	3	3										
23MATS31.4	3	3										
23MATS31.5	2	3	1									
Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped												

DATA STRUCTURES AND APPLICATIONS					
Course Code	**L:T:P:S**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
23CII32	**(3:0:2:0)**	4	CIE:50 SEE:50	3 Hours	IPCC

Pre-Requisites:
- Basic knowledge of common programming concepts, including loops, arrays, structures, and recursion.

Objectives :
1. Understand the basics of pointers and dynamic memory allocation.
2. Learn concepts of structure and its application in programming.
3. Gain knowledge to choose the specific linked lists for implementing real world problems.
4. Grasp the use of stacks and queues in solving complex problems.
5. Acquire knowledge of nonlinear data structure like trees.

Teaching-Learning Process

These are sample Strategies, used in DSA to accelerate the attainment of the various course outcomes.

1. Chalk and talk
2. Pre-video links of the concept are sent to students well in advance so that students will be able to grasp the topics that is taken in class.
3. After the class quiz is been asked in the class with respect to the topics to know their understanding level and which also promotes critical thinking.
4. Problem Based Learning (PBL) is adopted, which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
5. Every concept can be applied to the real world - and when that's possible, is taught in the class which helps improve the students' understanding.
6. Encourage collaborative(Group) Learning in the class
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.

Module I

Introduction: Data Structures, Classifications (Primitive & Non Primitive), Data Structures operations, Abstract Data Types (ADT), Arrays - operations on arrays, Structures, Self-Referential Structures, Pointers, Pointer as function arguments, Functions returning pointers, Dynamic Memory Allocation Functions.

08 Hours

Module II

Stacks: Stack, Stack- ADT, Array Representation of Stack, Stack Operations, Stack Applications: Polish notation, Infix to Postfix conversion, Infix to Prefix conversion, Evaluation of postfix expression,

Recursion: Introduction to Recursion, Examples of Recursion.

Queues: Queues, ADT- Queue, Array Representation, Queue Operations, Circular Queues, Programming Examples.

08 Hours

	Module III	
	.
	Linked Lists: Definition, Representation of linked lists in Memory, Memory allocation; Garbage Collection. Linked list operations: Traversing, Searching, Insertion, and Deletion. Stacks and Queues implementation using Linked Lists. Programming Examples. **Doubly Linked Lists-** Basic operations: Insert, Delete and Display with programming examples	
		08 Hours
	Module IV	
	Circular lists: Circular Singly and Doubly linked lists. Application: Adding Polynomials. **Trees**: Terminology, Binary Trees, Properties of Binary trees, Array and linked Representation of Binary Trees, Binary Tree Traversals - Inorder, Postorder, Preorder, Binary tree from inorder, preorder and postorder traversal.	
		08 Hours
	Module V	
	Binary Search Trees – Definition, Insertion, Deletion, Traversal, Searching, **AVL trees –** introduction, insertion and deletion operations on AVL trees**,** Application: Evaluation of Expression. **Graphs:** Definitions, Terminologies**,** Matrix and Adjacency List Representation of Graphs, Traversal methods: Breadth First Search and Depth First Search.	
		08 Hours
	LIST OF LABORATORY PROGRAMS	
1	Design, develop and execute a program in C based on the following requirements: An EMPLOYEE structure is to contain the following members: Employee_Number (an integer), Employee_Name (a string of characters), Basic_Salary (an integer), All_Allowances (an integer), IT (an integer), Net_Salary (an integer). Write a function to read the data of an employee, to calculate Net_Salary and to print the values of all the structure members. (All_Allowances = 123% of Basic, Income Tax (IT) = 30% of the gross salary (gross salary = Basic_Salary + All_Allowance), Net_Salary = Basic_Salary + All_Allowances –IT). Display the above data for at least 5 employees.	
2	Write a program to Store Roll number of N students. Perform Insert and delete Roll_No at a given valid position (POS) using pointers. Display the status of array elements at any given point of time. Support the program with functions for each operations.	
3	Develop an array implementation on stack and perform Push and Pop operations. Check for overflow and underflow conditions. Display the status of the stack for all the operations performed. Support the program with appropriate functions for each of the above operations.	
4	Write a Program to convert the given infix expression to postfix and evaluate the same.	
5	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) E x i t Support the program with appropriate functions for each of the above operations
6	Implement a Menu driven Program in C for the following operations on Singly Linked List (SLL) of Student Data with the fields: *USN, Name, Avg_Marks* a. Create N number of Students Data by inserting at end of the list. b. Insert and Delete at front of the list c. Delete at the end of list d. Display the status of SLL d. Demonstration stack and queue e. Exit
7	Design and Develop following operations on Doubly Linked List (DLL) of Employee Data with the fields: *SSN, Name, Dept etc.* a. Create a Node of N Employees Data by inserting in front. b. Insert a new node to the right of key value. c. Perform Insertion and Deletion at End of DLL d. Display the status of DLL and count the number of nodes e. Exit
8	Design and Develop a Program in C to represent add two polynomials.
9	Design and Develop a program in C for the following operations on Binary Search Tree (BST) of Integers. a. Create a BST of N Integers b. Traverse the BST using Inorder, Preorder and Post Order techniques c. Search a KEY element in BST and display the appropriate message
10	Design, Develop and Implement 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

Assessment Details (both IAT and SEE)

	IAT-1 after completion 45 to 50% Syllabus	25 Marks
	IAT-2 after completion 95 to 100% Syllabus	25 Marks
	Average of two IATs	**25 Marks**
Theory Component	**Total 25 Marks : Reduced to 15 Marks**	
	CCE-1	25 Marks
	CCE-2	25 Marks
	Average of two CCEs	**25 Marks**
	Total 25 Marks : Reduced to 10 Marks	
Lab Component	Lab Record and execution of programs	**15 Marks**
	Lab Test at the end of 15th week	**10 Marks**
	Total	**25 Marks**
Grand Total of IAT Marks		**50 Marks**
Obtaining 40% of marks in both theory and lab component is essential for appearing for SEE		

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

1. Define and explain the concepts of Data Structures and explore pointers, structures, functions and heterogeneous data types to implement for the given problem statement
2. Analyze and develop linear data structures Stack, Queue and its applications in solving real time problems.
3. Develop a solution for the problems by using various operations of singly and doubly linked lists.
4. Analyze usage of circular linked lists for application oriented problems and understand the nonlinear data structure in organizing the data.
5. Develop different methods of organizing the data using either linear or nonlinear data structures.

Text Books:
1. Ellis Horowitz and Sartaj Sahani, Fundamentals of Data Structures in C, 2nd Ed, Universities Press, 2014.
2. Reema Thareja, Data Structures using C, 3rd Ed, Oxford press, 2012.

Textbook 1: Chapter 1: 1.1, 1.2; Chapter 2: 2.2; Chapter 3: 3.2 & 3.4; Chapter 4: 4.3 & 4.8 ; Chapter 5: 5.1 – 5.3, 5.7;

Textbook 2: Chapter 2: 2.1 – 2.7; Chapter 3: 3.1 – 3.8, Chapter 5: 5.1 to 5.10 & 5.14 to 5.16; Chapter 7: 7.1 to 7.5; Chapter 8: 8.5 – 8.8; Chapter 9: 9.1 to 9.3, 9.7 & 9.8, 9.11 - 9.13

Reference Books:
1. Gilberg & Forouzan, Data Structures: A Pseudo-code approach with C, 2nd Ed, Cengage Learning,2014.
2. Seymour Lipschutz, Data Structures Schaum's Outlines, Revised 1st Ed, McGraw Hill, 2014.
   5.1 – 5.8, 6.6 – 6.7, 8.3.

CO-PO-PSO Mapping

PO'S	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO 9	PO1 0	PO1 1	PO 12	PSO 1	PSO 2	PSO 3
CO1	3											1			2
CO2		2										2	2		2
CO3		3	2									2	2		2
CO4		3										2	2		2
CO5		3	2									2	2		2
	3	2	2									2	2		2

JUSTIFICATION

- The students will be able to identify, formulate and analyse computing problems through the knowledge of all abstract data types and their implementations to arrive at feasible solutions. Hence, on an average, the COs are mapped with PO1 with a strength of 3 and PO2 with a strength of 2.

- The students will be able to design the solution for complex engineering problems by applying concepts like arrays, structures, lists and trees. Hence, on an average, the COs are mapped with PO3 with a strength of 2.

- Recognizing the need and the importance of the course, data structures with C in articulating solutions for engineering and societal problems, the COs are mapped with PO12 with a strength of 2.

- On an average, the COs are mapped to PSO1 and PSO3 with a strength of 2, because fundamental knowledge of data structures and implementation is required to solve any real world problems.

DATABASE MANAGEMENT SYSTEMS					
Course Code	**L:T:P:S**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
23CII33	3:0:2:0	4	CIE:50SEE:50	3 Hours	PCC

Pre-Requisites:

- **Basic Computer Skills**: Familiarity with operating systems, file management, and general computer usage.
- **Understanding of Data Structures**: Knowledge of basic data structures (like arrays, linked lists, stacks, queues, trees, and graphs) is important for understanding how data is organized and accessed.
- **Programming Skills**: Proficiency in at least one programming language (such as Python, Java, or C++) is beneficial, as many DBMS systems provide APIs or require procedural code for database manipulation.
- **Mathematics**: A basic understanding of set theory, logic, and mathematical concepts can be helpful, especially when dealing with queries and data relationships.
- **Understanding of Operating Systems**: Knowledge of how operating systems work, including concepts like processes, memory management, and file systems, can provide context for how databases operate.

Objectives :

1. Provide a strong foundation in database concepts, technology, and practice.
2. Practice SQL programming through a variety of database problems.
3. Demonstrate the use of concurrency and transactions in database
4. Design and build database applications for real world problems.

Teaching-Learning Process

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 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
9. helps improve the students' understanding.

Module I

Introduction to Databases: Introduction, Characteristics of database approach, Advantages of using the DBMS approach, History of database applications.

Overview of Database Languages and Architectures: Data Models, Schemas, and Instances. Three schema architecture and data independence, database languages, and interfaces, The Database System environment.

Conceptual Data Modeling using Entities and Relationships: Entity types, Entity sets, attributes, roles, and structural constraints, Weak entity types, ER diagrams, Examples

Textbook 1: Ch 1.1 to 1.8, 2.1 to 2.6, 3.1 to 3.7   **08 Hours**

Module II

Relational Model: Relational Model Concepts, Relational Model Constraints and relational database schemas, Update operations, transactions, and dealing with constraint violations.

Relational Algebra: Unary and Binary relational operations, additional relational operations (aggregate, grouping, etc.) Examples of Queries in relational algebra.

Mapping Conceptual Design into a Logical Design: Relational Database Design using ER-to-Relational mapping.

Textbook 1: Ch 5.1 to 5.3, 8.1 to 8.5, 9.1   **08 Hours**

Module III

SQL: SQL data definition and data types, specifying constraints in SQL, retrieval queries in SQL, INSERT, DELETE, and UPDATE statements in SQL, Additional features of SQL.

Advances Queries: More complex SQL retrieval queries, Specifying constraints as assertions and action triggers, Views in SQL, Schema change statements in SQL.

Textbook 1: Ch 6.1 to 6.5, 7.1 to 7.4;Textbook 2: 6.1 to 6.6   **08 Hours**

Module IV

Normalization: Database Design Theory – Introduction to Normalization using Functional and Multivalued Dependencies: Informal design guidelines for relation schema, Functional Dependencies, Normal Forms based on Primary Keys, Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form. Examples on normal forms.

Normalization Algorithms: Inference Rules, Equivalence, and Minimal Cover, Properties of Relational Decompositions, Algorithms for Relational Database Schema Design, Nulls, Dangling tuples, and alternate Relational Designs, Further discussion of Multivalued dependencies and 4NF, Other dependencies and Normal Forms

Textbook 1: Ch 14.1 to -14.7, 15.1 to 15.6   **08 Hours**

Module V

Transaction Processing: Introduction to Transaction Processing, Transaction and System concepts, Desirable properties of Transactions, Characterizing schedules based on recoverability, Characterizing schedules based on Serializability, Transaction support in SQL.

Concurrency Control in Databases: Two-phase locking techniques for Concurrency control, Concurrency control based on Timestamp ordering, Multiversion Concurrency control techniques, Validation Concurrency control techniques, Granularity of Data items and Multiple Granularity Locking.

Textbook 1: Ch 20.1 to 20.6, 21.1 to 21.7;   **08 Hours**

LIST OF LABORATORY PROGRAMS
SQL Programming
Design, develop, and implement the specified queries for the following problems using Oracle, MySQL, MS SQL Server, or any other DBMS under LINUX/Windows environment. Create Schema and insert at least 5 records for each table. Add appropriate database constraints.

1	Aim: Demonstrating creation of tables, applying the view concepts on the tables.
	Program Consider the following schema for a Library Database:
	BOOK(Book_id, Title, Publisher_Name, Pub_Year)
	BOOK_AUTHORS(Book_id, Author_Name)
	PUBLISHER(Name, Address, Phone)
	BOOK_COPIES(Book_id, Programme_id, No-of_Copies)
	BOOK_LENDING(Book_id, Programme_id, Card_No, Date_Out, Due_Date)
	LIBRARY_PROGRAMME(Programme_id, Programme_Name, Address)
	Write SQL queries to
	   1. Retrieve details of all books in the library – id, title, name of publisher, authors, number of copies in each Programme, etc.
	   2. Get the particulars of borrowers who have borrowed more than 3 books, but from Jan 2017 to Jun 2017.
	   3. Delete a book in BOOK table. Update the contents of other tables to reflect this data manipulation operation.
	   4. Partition the BOOK table based on year of publication. Demonstrate its working with a simple query.
	   5. Create a view of all books and its number of copies that are currently available in the Library.
	Reference: https://www.youtube.com/watch?v=AaSU-AOguls
	https://www.youtube.com/watch?v=-EwEvJxS-Fw

2	Aim: Discuss the various concepts on constraints and update operations.
	Program: Consider the following schema for Order Database:
	SALESMAN(Salesman_id, Name, City, Commission)
	CUSTOMER(Customer_id, Cust_Name, City, Grade, Salesman_id)
	ORDERS(Ord_No, Purchase_Amt, Ord_Date, Customer_id, Salesman_id)
	Write SQL queries to
	   1. Count the customers with grades above Bangalore's average.
	   2. Find the name and numbers of all salesman who had more than one customer.
	   3. List all the salesman and indicate those who have and don't have customers in their cities(Use UNION operation.)
	   4. Create a view that finds the salesman who has the customer with the highest order of a day.
	   5. Demonstrate the DELETE operation by removing salesman with id 1000. All his orders mustalso be deleted.
	Reference: https://www.youtube.com/watch?v=AA-KL1jbMeY
	https://www.youtube.com/watch?v=7S_tz1z_5bA

	3	Aim: Demonstrate the concepts of JOIN operations.
		Program: Consider the schema for Movie Database:
		ACTOR(Act_id, Act_Name, Act_Gender)
		DIRECTOR(Dir_id, Dir_Name, Dir_Phone)
		MOVIES(Mov_id, Mov_Title, Mov_Year, Mov_Lang, Dir_id)
		MOVIE_CAST(Act_id, Mov_id, Role)
		RATING(Mov_id, Rev_Stars)

Write SQL queries to
1. List the titles of all movies directed by 'Hitchcock'.
2. Find the movie names where one or more actors acted in two or more movies.
3. List all actors who acted in a movie before 2000 and also in a movie after 2015(use JOINoperation).
4. Find the title of movies and number of stars for each movie that has at least one rating and find the highest number of stars that movie received. Sort the result by movie title.
5. Update rating of all movies directed by 'Steven Spielberg' to 5.

Reference: https://www.youtube.com/watch?v=hSiCUNVKJAo
https://www.youtube.com/watch?v=Eod3aQkFz84

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4 Aim: Introduce concepts of PLSQL and usage on the table.
Program: Consider the schema for College Database:
STUDENT(USN, SName, Address, Phone, Gender)
SEMSEC(SSID, Sem, Sec)
CLASS(USN, SSID)
COURSE(Subcode, Title, Sem, Credits)
IAMARKS(USN, Subcode, SSID, Test1, Test2, Test3, FinalIA)

Write SQL queries to
1. List all the student details studying in fourth semester 'C' section.
2. Compute the total number of male and female students in each semester and in eachsection.
3. Create a view of Test1 marks of student USN '1BI15CS101' in all Courses.
4. Calculate the FinalIA (average of best two test marks) and update the corresponding tablefor all students.
5. Categorize students based on the following criterion:
   If FinalIA = 17 to 20 then CAT = 'Outstanding'
   If FinalIA = 12 to 16 then CAT = 'Average'
   If FinalIA< 12 then CAT = 'Weak'
   Give these details only for 8th semester A, B, and C section students.

Reference: https://www.youtube.com/watch?v=horURQewW9c
https://www.youtube.com/watch?v=P7-wKbKrAhk

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5 Aim: Demonstrate the core concepts on table like nested and correlated nesting queries and also EXISTS and NOT EXISTS keywords.
Program: Consider the schema for Company Database:
EMPLOYEE(SSN, Name, Address, Sex, Salary, SuperSSN, DNo)
DEPARTMENT(DNo, DName, MgrSSN, MgrStartDate)
DLOCATION(DNo,DLoc)
PROJECT(PNo, PName, PLocation, DNo)
WORKS_ON(SSN, PNo, Hours)

Write SQL queries to
1. Make a list of all project numbers for projects that involve an employee whose last name is 'Scott', either as a worker or as a manager of the department that controls the project.

2. Show the resulting salaries if every employee working on the 'IoT' project is given a 10 percent raise.
3. Find the sum of the salaries of all employees of the 'Accounts' department, as well as the maximum salary, the minimum salary, and the average salary in this department
4. Retrieve the name of each employee who works on all the projects controlled by department number 5 (use NOT EXISTS operator).
5. For each department that has more than five employees, retrieve the department number and the number of its employees who are making more than Rs.6,00,000.

Reference: https://www.youtube.com/watch?v=Dk8f3ejqKts

Assessment Details (both IAT and SEE)

Theory Component	IAT-1 after completion 45 to 50% Syllabus	25 Marks
	IAT-2 after completion 95 to 100% Syllabus	25 Marks
	Average of two IATs	**25 Marks**
	Total 25 Marks : Reduced to 15 Marks	
	CCE-1	10 Marks
	CCE-2	10 Marks
	Average of two CCEs	**20 Marks**
	Total 25 Marks : Reduced to 10 Marks	
Lab Component	Lab Record and execution of programs	**15 Marks**
	Lab Test at the end of 15th week	**10 Marks**
	Total	**25 Marks**
Grand Total of IAT Marks		**50 Marks**
Obtaining 40% of marks in both theory and lab component is essential for appearing for SEE		

Course Outcomes

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

1. Identify, analyze and define database objects, enforce integrity constraints on a database using RDBMS
2. Use Structured Query Language (SQL) for database manipulation and also demonstrate the basic of query evaluation.
3. Design and build simple database systems and *relate* the concept of transaction, concurrency control and recovery in database
4. Develop application to interact with databases, relational algebra expression.
5. Develop applications using tuple and domain relation expression from queries.

Text Books:

1. Fundamentals of Database Systems, Ramez Elmasri and Shamkant B. Navathe, 7th Edition, 2017,Pearson.
2. Database management systems, Ramakrishnan, and Gehrke, 3rd Edition, 2014, McGraw Hill

Textbook 1: Chapter 1.1 to 1.8, Chapter 2.1 to 2.6, Chapter 3.1 to 3.7, Chapter 5.1 to 5.3, Chapter 8.1 to 8.5, Chapter 9.1, Chapter 6.1 to 6.5, Chapter 7.1 to 7.4, Chapter 14.1 to - 14.7, Chapter 15.1 to 15.6, Chapter 20.1 to 20.6, Chapter 21.1 to 21.7.
Textbook 2: Chapter 6.1 to 6.6

Reference Books:

1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan's Database System Concepts 6thEditionTata Mcgraw Hill Education Private Limited

E-Resources:

1. https://www.youtube.com/watch?v=3EJlovevfcA
2. https://www.youtube.com/watch?v=9TwMRs3qTcU
3. https://www.youtube.com/watch?v=ZWl0Xow304I
4. https://www.youtube.com/watch?v=4YilEjkNPrQ
5. https://www.youtube.com/watch?v=CZTkgMoqVss
6. https://www.youtube.com/watch?v=Hl4NZB1XR9c
7. https://www.youtube.com/watch?v=EGEwkad_llA
8. https://www.youtube.com/watch?v=t5hsV9lC1rU

CO-PO-PSO Mapping

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3										1	3		
CO2	2	2	3	1	2							1	3		2
CO3	2	2	3	2	1							1	2		2
CO4	2	2	3	2	1							1	2		2
CO5	2	2	3	1	2							1	3		2
Average	2.2	2.2	3	1.5	1.5							1	2.6		2

OPERATING SYSTEMS					
Course Code	**L:T:P:S**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
23CIT34	3:0:0:0	03	CIE:50 SEE:50	3 Hours	PCC

Pre-Requisites:

1. Computer systems organization: You should have a basic understanding of the hardware and software aspects of computer systems organization.

2. Programming: You should be proficient in at least one low-level programming language, like C or Assembly, and one high-level language, like Python or Java.

3. Binary and hexadecimal notation: You should be familiar with hexadecimal and binary notation.

Objectives :

This course will enable students to:
1. To Demonstrate the need for OS and different types of OS
2. To discuss suitable techniques for management of different resources
3. To demonstrate different APIs/Commands related processor, memory, storage and file system management.

Teaching-Learning Process

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 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 to improve the students' understanding.

Module I

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)   **08 Hours**

Module II

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)

08 Hours

Module III

Process Synchronization: Synchronization: The critical section problem; Peterson' 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)

08 Hours

Module IV

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**)

08 Hours

Module V

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)

08 Hours

Assessment Details (Both CIE and SEE)

Theory Courses: 3

Evaluation Type		Component	Max Marks	Marks Reduced to	Min. Marks	Evaluation Details
Theory Component	Internal Assessment Tests(IAT)	IAT-1	25	25	20	Average of two IATs, Scaled down to 25 marks
		IAT-2	25			
	Comprehensive Continuous Evaluations(CCE)	CCE-1	25	25		Any two Assessment methods as scaled down to 25 marks
		CCE-2	25			
Total CIE -Theory				**50**	**20**	Scale down marks of IAT and CCE to 25
SEE			100	**50**	**18**	Conducted for 100 marks and scaled down to 50.
CIE + SEE				**100**	**40**	

Course outcomes (Course Skill Set):

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

CO 1. Explain the structure and functionality of operating system

CO 2. Apply appropriate CPU scheduling algorithms for the given problem.

CO 3. Analyze the various techniques for process synchronization and deadlock handling.

CO 4. Apply the various techniques for memory management

CO 5. Demonstrate storage management strategies and need of protection mechanisms.

Textbooks:

Sl. No.	Title of Book	Authors details	Publisher details	Edition and Year
1	Operating system principles	Abraham Silberschatz , Peter Baer Galvin , Greg gagne	Wiley India	8th Edition, 2015

Reference Books:

12014	Understanding operating system	Ann McHoes Ida M Fylnn	Cengage Learning	6th Edition
2	Operating Systems: A Concept Based Approach	D.M Dhamdhere	McGraw- Hill	3rd Edition 2013
3	An Introduction to Operating Systems Concepts and Practice	P.C.P. Bhatt	PHI(EEE),	4TH edition 2014
4	Operating Systems: Internals and Design Principles	William Stallings	Pearson	6th edition

E-Resources:

1. https://youtu.be/mXw9ruZaxzQ
2. https://youtu.be/vBURTt97EkA
3. https://www.youtube.com/watch?v=783K
   AB-
   tuE4&list=PLIemF3uozcAKTgsCIj82voMK
   3TMR0YE_f
4. https://www.youtube.com/watch?v=3-ITLMMeeXY&list=PL3pGy4HtqwD0n7bQf
   HjPnsWzkeRn6mkO

CO-PO-PSO Mapping

PO'S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-	2	-	-
CO3	-	-	2	-	-	-	-	-	-	-	-	-	2	-	-
CO4	-	-	3	-	3	-	-	-	-	-	-	-	2	-	-
CO	3	3	2.5	-	3	-	-	-	-	-	-	-	2	-	-

OBJECT PROGRAMMING LAB USING JAVA

Course Code	L : T : P : S	Credits	Exam Marks	Exam Duration	Course Type
23CIL351	0 : 0 : 2 : 0	1	IAT:50 SEE:50	3 Hours	PCCL

Course objectives:

This laboratory course enables students to:

● Use java programming to develop programs for solving real-world problems.

● Reinforce the understanding of basic object-oriented programming concepts.

	PROGRAMS
1	Aim: Introduce the java fundamentals, data types, operators in java. Write a java program that prints all real solutions to the quadratic equation $ax^2+bx+c=0$. Read in a, b, c and use the quadratic formula.
2	Aim: Demonstrating creation of java classes, objects, constructors, declaration and initialization of variables. Write a java program to perform matrix addition and matrix multiplication.
3	Aim: Discuss the various Decision-making statements, loop constructs in java. A. Write a program to compute factorial of a number. B.Write a program for Arithmetic calculator using switch case menu.
4	Aim: Demonstrate the core object-oriented concept of Inheritance, polymorphism Design a super class called Staff with details as StaffId, Name, Phone, Salary. Extend this class by writing three subclasses namely Teaching (domain, publications), Technical (skills), and Contract (period). Write a Java program to read and display at least 3 staff objects of all three categories.
5	Aim: Introduce concepts of method overloading, constructor overloading, overriding. Write a java program demonstrating Method overloading and Constructor overloading.
6	Aim: Introduce the concept of Abstraction, packages. Write a java program to illustrate the concept of abstraction and packages.
7	Aim: Introduction to abstract classes, abstract methods, and Interface in java Write a program to generate the resume. Create 2 Java classes Teacher (data: personal information, qualification, experience, achievements) and Student (data: personal information, result, discipline) which implements the java interface Resume with the method biodata().

8	Aim: Demonstrate creation of threads using Thread class and Runnable interface, multithreaded programming. 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.
9	Aim: Exception handling in java, introduction to throwable class, throw, throws, finally. 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.
10	Aim: Introduce java Applet. Develop an applet that displays a simple message in center of the screen.

Laboratory Outcomes:

The student should be able to:
1. Apply object oriented programming concept to solve real world problems.
2. Analyze the necessity of object oriented programming over structured programming and become familiar with fundamental concepts of OOPs.
3. Develop user friendly applications using Applet concepts.
4. Evaluate and predict the output for a given problem statement

Assessment Details(both CIE and SEE)

Continuous Internal Assessment of Laboratory/Practical Courses		
Lab Test 1	Lab Test 2	Lab Records
15 marks	15 marks	20 marks
Semester End Examination(SEE)		50 marks

Conduct of Practical Examination:
Experiment distribution :
For laboratories having only one part: Students are allowed to pick one experiment from the lot with equal opportunity.
For laboratories having PART A and PART B: Students are allowed to pick one experiment from PART A and one experiment from PART B, with equal opportunity.
● Change of experiment is allowed only once and marks allotted for procedure to be made zero of the changed part only.
● Marks Distribution (Need to change in accordance with university regulations)
  a) For laboratories having only one part → Procedure + Execution + Viva-Voce: 15+70+15 = 100 Marks
  b) For laboratories having PART A and PART B
     i. Part A – Procedure + Execution + Viva = 6 + 28 + 6 = 40 Marks
     ii. Part B – Procedure + Execution + Viva = 9 + 42 + 9 = 60 Marks

CO-PO-PSO Mapping

POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	3	-	3	-	-	-	-	-	-	1	1	1	
CO 2	3	3	3	-	3	-	-	-	-	-	-	1	3	3	
CO 3	3	3	3	2	3	-	-	-	-	-	-	1	2	3	
CO 4	3	3	3	-	3	-	-	-	-	-	-	1	1	1	
Average	3	3	3	2	3							1	1.75	2	

OBJECT ORIENTED PROGRAMMING					
Course Code	**L:T:P:S**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
23CIT361	3:0:0:0	3	CIE:50 SEE:50	3 Hours	ESC

Pre-Requisites:
- Basic knowledge about the fundamentals and syntax of C++, Java, Python, or any other relevant programming language.

Objectives :
1. Learn the basic concepts of object-oriented programming.
2. Understand the basics of JAVA Programming using classes and objects.
3. Gain the knowledge of Inheritance and packages.
4. Expose to the concepts of exceptions that occur while programming in JAVA.
5. Acquire the knowledge of multi-threaded programming in JAVA.

Teaching-Learning Process

These are sample Strategies, used in DSA to accelerate the attainment of the various course outcomes.

1. Chalk and talk
2. After the class quiz is been asked in the class with respect to the topics to know their understanding level and which also promotes critical thinking.
3. Problem Based Learning (PBL) is adopted, which fosters student's Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.

Module I
Introduction to Object Oriented Concepts: Procedure–Oriented Programming system, Object Oriented Programming System, Comparison of Object Oriented Language with C. Console I/O, variables and reference variables, Function Prototyping, Function Overloading.

Class and Objects: Introduction, member functions and data, objects and functions, objects and arrays, Namespaces, Nested classes, Constructors, Destructors. **08 Hours**

Module II
Introduction to Java: Java's magic: the Byte code; Java Development Kit (JDK); the JavaBuzzwords, Object-oriented programming; Simple Java programs. Data types, variables and

arrays, Operators, Control Statements. **08 Hours**

Module III
Classes: Classes fundamentals; Declaring objects; Constructors, this keyword, garbage collection.

Inheritance: Inheritance basics, using super, creating multi-level hierarchy, method overriding.

Exception handling: Exception handling in Java. Packages, Access Protection, Importing Packages, Interfaces. **08 Hours**

Module IV	
Multi Threaded Programming: What are threads? How to make the classes threadable ; Extending threads; Implementing runnable; Synchronization; Changing state of the thread. **Event Handling:** Two event handling mechanisms; The delegation event model; Event classes; Sources of events; Event listener interfaces; Using the delegation event model; Adapter classes; Inner classes.	**08 Hours**

Module V	
The Applet Class: Introduction, Two types of Applets; Applet basics; Applet Architecture; An Applet skeleton; Simple Applet display methods; Requesting repainting; Using the Status Window; The HTML APPLET tag; Passing parameters to Applets; getDocumentbase() and getCodebase(); ApletContext and showDocument(); The AudioClip Interface. **08 Hours**	

Assessment Details (both CIE and SEE)

Theory Component	IAT-1 after completion 45 to 50% Syllabus	25 Marks
	IAT-2 after completion 95 to 100% Syllabus	25 Marks
	Average of two IATs	**25 Marks**
	CCE-1	25 Marks
	CCE-2	25 Marks
	Average of two CCEs	**25 Marks**
Grand Total of CIE Marks (min marks 20 / 50)		**50 Marks**
SEE conducted for 100 and scaled down to 50 **(min marks 18/50)**		**50 Marks**
CIE + SEE (min marks 40)		**100 Marks**

Course Outcomes
The Student will be able to:

CO1. Gain knowledge on Object Oriented Programming and develop basic JAVA programs.

CO2. Solve real world problems using advanced concepts like Inheritance, packages and interfaces.

CO3. Demonstrate the programs using multi-threaded concepts and event handling.

CO4. Develop simple GUI interfaces for a computer program to interact with users, and to comprehend the event-based GUI handling principles using Applets.

Text Books:
1. Herbert Schildt, ―Java The Complete Reference‖, 7th Edition, Tata McGraw Hill, 2013, ISBN-13: 978-0072263855,().
2. Sourav Sahay, Object Oriented Programming with C++ , 2nd Ed, Oxford University Press,2006 (Chapters 1, 2, 4).

Textbook 1: Chapters 1, 2, 3, 4, 5, 6, 8, 9,10, 11, 21, 22, 29, 30.
Textbook 2: Chapters 1, 2,

Reference Books:
1. Herbert Schildt, ―The Complete Reference C++‖, 4th Edition, Tata McGraw Hill, 2013, ISBN- 13: 978-0072226805.
2. E Balagurusamy, ―Programming with Java-A primer‖, 2nd Edition, Tata McGraw Hill companies,2009, ISBN-13: 978-9351343202.

E - Resources:
1. https://www.geeksforgeeks.org/java/
2. https://www.javatpoint.com/java-tutorial
3. https://www.w3schools.com/java/
4. https://www.programiz.com/java-programming/online-compiler/

CO-PO-PSO Mapping

POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO 1	3		2	2	3								3	2	3
CO 2	3	3	3	3	3								3	3	3
CO 3	3	3	3	3	3								3	3	3
CO 4	3	3	3	3	3								3	3	3
Avg	3	3	2.8	2.8	3								3	2.8	3

Social Connect & Responsibility		Semester	III
Course Code	**23UHV37**	CIE Marks	**100**
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	------
Total Hours of Pedagogy	30 hour Practical Session	Total Marks	**100**
Examination nature (No SEE – Only CIE)	For CIE Assessment - Activities Report Evaluation by College NSS Officer / HOD / Sports Dept / Any Dept.		
Credits	01 - Credit		

Course objectives: The course will enable the students to:
1. Provide a formal platform for students to communicate and connect to the surrounding.
2. create a responsible connection with the society.
3. Understand the community in general in which they work.
4. Identify the needs and problems of the community and involve them in problem –solving.
5. Develop among themselves a sense of social & civic responsibility &
   utilize their knowledge in finding practical solutions to individual
   andcommunity problems.
6. Develop competence required for group-living and sharing of responsibilities & gain skills
   in mobilizing community participation to acquire leadership qualities and democratic
   attitudes.

General Instructions - Pedagogy :
These are sample Strategies, which teachers can use to accelerate the attainment of the various
course outcomes.
1. In addition to the traditional lecture method, different types of innovative teaching
   methods may be adopted sothat the activities will develop students' theoretical and
   applied social and cultural skills.
2. State the need for activities and its present relevance in the society and Provide real-life
   examples.
3. Support and guide the students for self-planned activities.
4. You will also be responsible for assigning homework, grading assignments and quizzes,
   and documenting
   students' progress in real activities in the field.
5. Encourage the students for group work to improve their creative and analytical skills.

Contents :
The course is mainly activity-based that will offer a set of activities for the student that enables
them to connect with fellowhuman beings, nature, society, and the world at large.

The course will engage students for interactive sessions, open mic, reading group, storytelling
sessions, and semester-longactivities conducted by faculty mentors.

In the following a set of activities planned for the course have been listed:

Social Connect & Responsibility – Contents

Module-I
Plantation and adoption of a tree:
Plantation of a tree that will be adopted for four years by a group of BE / B.Tech students. (ONE STUDENT ONE TREE)They will also make an excerpt either as a documentary or a photo blog describing the plant's origin, its usage in daily life, its appearance in folklore and literature. **6 hrs**

Module-II
Heritage walk and crafts corner:
Heritage tour, knowing the history and culture of the city, connecting to people around through their history, knowing the city and its craftsman, photo blog and documentary on evolution and practice of various craft forms.   6 hrs

Module-III

Organic farming and waste management:
Usefulness of organic farming, wet waste management in neighboring villages, and implementation in the campus.   6 hrs

Module-IV
Water conservation:
Knowing the present practices in the surrounding villages and implementation in the campus, documentary or photo blog presenting the current practices.   6 hrs

Module-V
Food fest:
City's culinary practices, food lore, and indigenous materials of the region used in cooking/ food festivals.   6 hrs

Course Outcomes:
The students will be able to :
1. Create a responsible connection with the society to address real-world societal challenges, including issues of corporate social responsibility (CSR) and sustainability.
2. Identify the needs and problems of the community and involve them in problem –solving.
3. Implement practices that promote sustainability in personal and professional life, contributing to long-term societal welfare.
4. Work collaboratively in teams to solve complex social problems, demonstrating teamwork, empathy, and collective responsibility.
5. Demonstrate the implemented idea through presentation and report.

E-Resources:

https://ffreedom.com/english/about-app?gad_source=1&gclid=CjwKCAjw74e1BhBnEiwAbqOAjBOnuaO-a6CMVTjwubTiz2e13DWkkZ7ZpwX8PELXz5NRhe2a5cG2dBoCjwQQAvD_BwE
https://prasarbharati.gov.in/dd-kisan-homepage/

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1							3	3				
CO2						3						
CO3							3					3
CO4								2	3	3		
CO5									3	3		
Avg						3	3	3	3	3	-	3

ACTIVITIES:

Jamming session, open mic, and poetry: Platform to connect to others. Share the stories withothers. Share the experience of Social Connect. Exhibit the talent like playing instruments, singing, one-act play, art-painting, and fine art.

PEDAGOGY:
The pedagogy will include interactive lectures, inspiring guest talks, field visits, social immersion, and a course project. Applying and synthesizing information from these sources to define the social problem to address and take up the solution as the course project, with your group. Social immersionwith NGOs/social sections will be a key part of the course. Will all lead to the course project that will address the needs of the social sector?

COURSE TOPICS:
The course will introduce social context and various players in the social space, and present approaches to discovering and understanding social needs. Social immersion and inspiring conversional will culminate in developing an actual, idea for problem-based intervention, basedon an in-depth understanding of a key social problem.

Duration :
A total of 40 - 50 hrs engagement per semester is required for the 3rd semester of the B.E. /B.Tech. program. The students will be divided into groups. Each group will be handled by faculty mentor. Faculty mentor will design the activities (particularly Jamming sessions open mic ,and poetry) Faculty mentors has to design the evaluation system as per VTU guidelines of scheme & syllabus.

Guideline for Assessment Process:

Continuous Internal Evaluation (CIE):

After completion of the course, the student shall prepare, with daily diary as reference, a comprehensive report in consultation with the mentor/s to indicate what he has observed and learned in the social connect period. The report should be signed by the mentor. The report shall be evaluated on the basis of the following criteria and/or other relevant criteria pertaining to the activity completed. Marks allotted for the diary are out of 50. Planning and scheduling the social connect Information/Data collected during the social connect Analysis of the information/data and report writing Considering all above points allotting the marks as mentioned below

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

Special Note :

NO SEE – Semester End Exam – Completely Practical and activities based evaluation

Pedagogy – Guidelines :

It may differ depending on local resources available for the study as well as environment and climatic differences, location and time of execution.

Sl No	Topic	Group size	Location	Activity execution	Reporting	Evaluation Of the Topic
1.	**Plantation and adoption of a tree:**	May be individual or team	Farmers land/ parks / Villages / roadside/ community area / College campus etc…..	Site selection /proper consultation/Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by Faculty
2.	**Heritage walk and crafts corner:**	May be individual or team	Temples / monumental places / Villages/ City Areas / Grama panchayat/ public associations/Governme nt Schemes officers/ campus etc…..	Site selection /proper consultation/Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by Faculty
3.	**Organic farming and waste management:**	May be individual or team	Farmers land / parks /Villages visits / roadside/ community	Group selection / proper consultation / Continuous monitoring /	Report should be submitted by individual to	Evaluation as per the rubrics Of scheme and

			area / College campusetc…..	Information board	theconcerned evaluation authority	syllabus by Faculty

4.	**Water conservation:** & conservation techniques	May be individual or team	Villages/ City Areas / Grama panchayat/ public associations/Government Schemes officers / campus etc…..	site selection / proper consultation/Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by Faculty
5.	**Food fest: Practices in society**	May be individual or team	Villages/ City Areas / Grama panchayat/ public associations/Government Schemes officers/ campus etc…..	Group selection / proper consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by Faculty

Plan of Action (Execution of Activities)

Sl.NO	Practice Session Description
1	Lecture session in field to start activities
2	Students Presentation on Ideas
3	Commencement of activity and its progress
4	Execution of Activity
5	Execution of Activity
6	Execution of Activity
7	Execution of Activity
8	Case study based Assessment, Individual performance
9	Sector/ Team wise study and its consolidation
10	Video based seminar for 10 minutes by each student At the end of semester with Report.

- Each student should do activities according to the scheme and syllabus.
- At the end of semester student performance has to be evaluated by the faculty for the assigned activity progressand its completion.
- At last consolidated report of all activities from 1st to 5th, compiled report should be submitted asper the instructions and scheme.

Assessment Details for CIE (both CIE and SEE)

Weightage	CIE – 100%
Field Visit, Plan, Discussion	10 Marks
Commencement of activities and its progress	20 Marks
Case study based Assessment Individual performance with report	20 Marks
Sector wise study & its consolidation 5*5 = 25	25 Marks
Video based seminar for 10 minutes by each student At the end of semester with Report. Activities 1 to 5, 5*5 = 25	25 Marks
Total marks for the course in each semester	100 Marks

- Implementation strategies of the project (NSS work).
- The last report should be signed by NSS Officer, the HOD and principal.
- At last report should be evaluated by the NSS officer of the institute.
- Finally the consolidated marks sheet should be sent to the university and also to be made available at LIC visit.

For each activity, 20 marks CIE will be evaluated for IA marks at the end of semester, Report and assessment copy should be made available in the department.

Students should present the progress of the activities as per the schedule in the prescribed practical session in the field. There should be positive progress in the vertical order for the benefit of society in general through activities.

TECHNICAL WRITING USING LATEX

Course Code	L : T : P : S	Credits	Exam Marks	Exam Duration	Course Type
23CIL381	0 : 0 : 2 : 0	1	IAT:50 SEE:50	3 Hours	AEC

Course objectives:

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

- ➢ Introduce Document Preparation Using LaTeX
- ➢ Develop Skills in Structuring and Formatting Documents
- ➢ Equip Students with Mathematical Typesetting Capabilities
- ➢ Introduce the Use of Figures, Tables, and Graphics in LaTeX
- ➢ Prepare Students for Independent Document Creation

	PART - A PROGRAMS
1	Getting Started with LaTeX Basics.
2	Develop a LaTeX script to create a simple document that consists of 2 sections [Section1, Section2], and a paragraph with dummy text in each section. And also include header [title of document] and footer [institute name, page number] in the document
3	Develop a LaTeX script to create a document that displays the sample Abstract/Summary of your semester and include subjects with itemized format and insert an image in the document
4	Develop a LaTeX script to create Document Structuring with Sections and Table of Contents, typesetting Mathematical Equations and Symbols
5	Develop a LaTeX script to Construct and Format Tables
6	Develop a LaTeX script to Create a Presentation in LaTeX Using Beamer
7	Develop a LaTeX script to Create a Presentation in LaTeX Using Beamer consisting of figures, tables.
8	Develop a LaTeX script to Manage Citations and Bibliography with BibTeX
9	Develop a LaTeX script Cross-Referencing Figures, Tables, and Equations
	PART-B
	Student has to Develop a document consisting all the programs as an assignment and submit to the Lab incharge

Laboratory Outcomes:

The student should be able to:

1. CO1:Develop Proficiency in Basic LaTeX Syntax and Structure
2. CO2:Create Professionally Formatted Documents
3. CO3:Implement Mathematical Notation and Equations
4. CO4:Create Referencing and Citations in LaTeX

Assessment Details(both CIE and SEE)

Continuous Internal Assessment of Laboratory/Practical Courses		
Lab Test 1	Lab Test 2 Assignment	Lab Records
20 marks	10 marks	20 marks
Semester End Examination(SEE)		50 marks

Conduct of Practical Examination:
Experiment distribution :
For laboratories having only one part: Students are allowed to pick one experiment from the lot with equal opportunity.

- Change of experiment is allowed only once and marks allotted for procedure to be made zero of the changed part only.
- Marks Distribution (Need to change in accordance with university regulations)
  a) For laboratories having only one part → Procedure + Execution + Viva-Voce:
     15+70+15 = 100 Marks

CO-PO-PSO Mapping

POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3														
CO 2		3													
CO 3			3												
CO 4				2	2										