Centenary Celebrated Sharnbasveshwar Vidya Vardhaka Sangha's



ಶರಣಬಸವ ವಿಶ್ವವಿದ್ಯಾಲಯ

Sharnbasva University

(Under the agesis of Cantenary Celebrated Sharnbasvshwar Vidya Vardhaka Sangha)
Kalaburagi - 585 103 Karnataka, India


Faculty of Engineering and Technology

Department of Computer Science and Engineering

B. Tech 2nd year (III and IV Semester)

Scheme of Teaching and Examination

Outcome Based Education (OBE) & Choice Based Credit System (CBCS)

(Effective from the academic year 2024-25)

VISION OF FACULTY OF ENGINEERING AND TECHNOLOGY(Co-Ed)

To be a premier technological institution that contribute for sustainable development of our nation & the world at large through achieving excellence in technical education and research which facilitating transformation of students into socially responsible citizens and competent professionals of the highest quality.

MISSION OF FACULTY OF ENGINEERING AND TECHNOLOGY(Co-Ed)

- Provide the affordable and quality education and achieve excellence in teaching learning by designing industry need based curriculum.
- Create good research environment that produces innovations and nurture research scholars.
- Collaborate with industries and other institutions of excellence in order to exchange of expertise.
- To inculcate the significance of human values based on the concept of Dasoha Philosophy of Lord Sharnbasveshwara i.e , “service to Humanity in Service to God” and professional ethics to serve the society.

VISION OF DEPARTMENT

To be recognized globally as a department of computer science and engineering focusing on social issues, embracing new technologies, providing highly talented technocrats and entrepreneurs with sound knowledge in ethics occupying top positions and are adaptable and sustainable in ever changing technological realm. To build a strong research and teaching environment par with the latest needs.

MISSION OF DEPARTMENT

M1: To impart quality technical education by designing curriculum in collaboration with industry requirements
M2: To transform young talents into highly competent individuals who work well in a team or as a single.
M3: To train the computer science Engineering graduates to cater to the needs of society and solve real-world problems by providing strong foundation.
M4: To develop a strong, inter and multi-research culture in the department by collaborating with other department of the university.

PROGRAM EDUCATIONAL OBJECTIVES (PEO'S)

PEO 1	Apply basic knowledge, principles and skills in the field of Computer Science to meet the job specification. (Knowledge / Practical Skills)
PEO 2	Implement the responsibility for solving problems analytically, critically, effective, innovative and market- oriented. (Critical Thinking and Problem Solving / Life-long Learning and Information Management / Entrepreneurship Skills/Researcher)
PEO 3	Acts effectively as an individual or in a group to convey information within the organization and community. (Team Working Skills / Communication Skills)
PEO 4	Practicing good values and ethics in a professional manner in the community and able to act as a leader. (Professional, Social, Ethics, and Humanity / Leadership Skills)

PROGRAM OUTCOMES (PO'S)

PO1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals and computing to solve Computer Science and Engineering related problems.

PO2: Problem Analysis : Identify, formulate , Research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

PO3: Design / Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural ,societal

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.

PO5: Modern tool usage :Create, select and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities related to Computer Science and Engineering with an understanding of the 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 engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional 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 engineering practice.

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

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective report 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 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 OUTCOME(PSO'S)

Graduates of the Computer Science and Engineering program will be able to

PSO 1: Understand and recognize the fundamental concepts in basic science, humanities and programming languages like C/C++/java etc. to solve engineering problems.

PSO 2: Design, develop, apply concepts from diverse fields , analyse various computer science engineering design and management principles, mathematical foundations, sustainability and emerging challenges in the computation domain for effective computational solutions for real-life and research problems.

PSO 3: Apply modern programming languages, frameworks, and software tools in engineering and emerging trends principles to develop viable solutions for Information Technology Enabled Services and diverse fields.

Sharnbasva University, Kalaburagi
Scheme of Teaching and Examination 2022-23
[As Per NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Scheme]
(Effective from the academic year 2022-23)

Programme: B.Tech: Computer Science and Engineering

III SEMESTER

Sl. No.	Course Code		Course Title	Teaching Department	Teaching Hours/ week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	BS	22MATS31	Mathematics For CSS-III	Mathematics	3			3	50	50	100	03
2	PCC	22CS32	Digital Design and Computer Organization	CSE	3		2	3	50	50	100	04
3	PCC	22CS33	Data Structures and Applications	CSE	3			3	50	50	100	03
4	PCC	22CS34	Operating System	CSE	3			3	50	50	100	03
5	PCC	22CS35	Object Oriented Programming with Java	CSE	3			3	50	50	100	03
6	PCC	22CSL36	Data Structures and Applications Lab	CSE			2	3	50	50	100	01
7	PCC	22CSL37	Operating System Lab	CSE			2	3	50	50	100	01
8	PCC	22CSL38	Object Oriented Programming with Java Lab	CSE			2	3	50	50	100	01
9	PW	22PRJ39	Project-III	CSE			2	3	50	50	100	01
10	HSS	22HSM310A	Soft Skills and Personality Development	Humanities	1			2	50	50	100	01
11	AEC	22AEC311X	Ability Enhancement Course-III				2	3	50	50	100	01
Total					**16**		**12**	**+32**	**550**	**550**	**1100**	**22**

Note: BS-Basic Science, PCC- Programme Core Course, PW-Project Work, AEC- Ability Enhancement Course, HSS-Humanity and Social Science, NCMC-Non Credit Mandatory Course

Project(PRJ): A Batch of 4 students (Same Branch or Different Branches with a Guide, May undertake one project.

Ability Enhancement Course-III	
Course code under 22AEC311X	**Course Title**
22AEC311A	Unix and Shell Programming
22AEC311B	Data Analytics with Excel

Courses prescribed to lateral entry Diploma holders admitted to III semester of Engineering programs

12	NCMC	22MATDIP31	Additional Mathematics– I	Mathematics	3	1	-	3	00	100	100	00

1) Non Credit Mandatory Courses (NCMC) Additional Mathematics-I and II prescribed for III and IV semesters respectively, to the lateral entry Diploma holders admitted to III semester of B. Tech. programs, shall attend the classes during the respective semesters to complete all the formalities of the course and appear for the university examination. In case any student fails to register for the said course/fails to secure the minimum 50% of the prescribed CIE marks, he/she shall be deemed to have secured F grade. In such a case, the students have to fulfill the requirements during subsequent semester/s to appear for SEE.
2) These courses shall not be mandatory for vertical progression, but completion of the courses shall be mandatory for the award of degree.

Courses prescribed to lateral entry B.Sc. degree holders admitted to III semester of Engineering programs

Lateral entry students from B.Sc. stream, shall clear the non credit courses Computer Aided Engineering Drawing, Elements of Civil Engineering of First Year Engineering Programme. These Courses shall not be considered for vertical progression, but completion of the courses shall be mandatory for the award of degree.

AICTE Activity Points to be earned by students admitted to B.Tech. programme(For more details refer to Chapter 6,AICTE Activity Point Programme,Model Internship Guidelines):

Over and above the academic grades, every regular student admitted to the 4 years Degree programme and every student entering 4 years Degree programme through lateral entry, shall earn 100 and 75 Activity points respectively for the award of degree through AICTE Activity Point Programme. Students transferred from other universities to fifth semester are required to earn 50 activity points from the year of entry to Sharnbasva University. The-Activity Points earned shall be reflected on the students eighth semester Grade card.

The activities can be spread over the years, anytime during the semester weekends holidays, as per the liking and convenience of the student from the year of entry to the programme. However, minimum hours requirement should be fulfilled. Activity Points(non credit) have no effect on SGPA/CGPA and shall not be considered for vertical progression.

In case students fail to earn the prescribed activity points, Eighth semester Grade Card shall be issued only after earning the required activity points. Student shall be admitted for the award of the degree only after the release of the Eighth semester Grade Card.

Sharnbasva University, Kalaburagi Scheme of Teaching and Examination 2022-23
[As Per NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Scheme]
(Effective from the academic year 2022-23)

Programme: B.Tech: Computer Science and Engineering

IV SEMESTER

Sl. No.	Course Code		Course Title	Teaching Department	Teaching Hours/ week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	BS	22MATS41	Mathematics For CSS-IV	Mathematics	3			3	50	50	100	03
2	PCC	22CS42	Analysis and Design of Algorithms	CSE	3			3	50	50	100	03
3	PCC	22CS43	Database Management System	CSE	3			3	50	50	100	03
4	PCC	22CS44	Python Application Programming	CSE	3			3	50	50	100	03
5	PCC	22CS45	Automata Theory and Computability	CSE	2	1		3	50	50	100	03
6	PCC	22CSL46	Algorithms Lab	CSE			2	3	50	50	100	01
7	PCC	22CSL47	Database Management System Lab	CSE			2	3	50	50	100	01
8	PCC	22CSL48	Python Lab	CSE			2	3	50	50	100	01
9	PW	22PRJ49	Project-IV	CSE			2	3	50	50	100	01
10	HSS	22UHV410	Universal Human Values	Humanities	3			3	50	50	100	03
11	AEC	22ACS411X	Ability Enhancement Course-IV				2	3	50	50	100	01
Total					**17**	**1**	**10**	**33**	**550**	**550**	**1100**	**23**

Note: BS-Basic Science, PCC- Programme Core Course, PW-Project Work, AEC- Ability Enhancement Course, HSS-Humanity and Social Science, NCMC-Non Credit Mandatory Course

Project(PRJ): A Batch of 4 students (Same Branch or Different Branches with a Guide, May undertake one project.

Ability Enhancement Course-IV												
Course code under 22ACS411X				**Course Title**								
22ACS411A				Responsive Web Design with Bootstrap 5.0								
22ACS411B				Scripting Languages								
Courses prescribed to lateral entry Diploma holders admitted to III semester of Engineering programs												
10	NCMC	22MATDIP41	Additional Mathematics – II	Mathematics	3	1	-	3	00	100	100	00

3) Non Credit Mandatory Courses (NCMC) Additional Mathematics-I and II prescribed for III and IV semesters respectively, to the lateral entry Diploma holders admitted to III semester of B. Tech. programs, shall attend the classes during the respective semesters to complete all the formalities of the course and appear for the university examination. In case any student fails to register for the said course/fails to secure the minimum 50% of the prescribed CIE marks, he/she shall be deemed to have secured F grade. In such a case, the students have to fulfill the requirements during subsequent semester/s to appear for SEE.

4) These courses shall not be mandatory for vertical progression, but completion of the courses shall be mandatory for the award of degree.

Courses prescribed to lateral entry B.Sc. degree holders admitted to III semester of Engineering programs

Lateral entry students from B.Sc. stream, shall clear the non credit courses Computer Aided Engineering Drawing, Elements of Civil Engineering of First Year Engineering Programme. These Courses shall not be considered for vertical progression, but completion of the courses shall be mandatory for the award of degree.

AICTE Activity Points to be earned by students admitted to B.Tech. programme (For more details refer to Chapter 6,AICTE Activity Point Programme, Model Internship Guidelines):

Over and above the academic grades, every regular student admitted to the 4 years Degree programme and every student entering 4 years Degree programme through lateral entry, shall earn 100 and 75 Activity points respectively for the award of degree through AICTE Activity Point Programme. Students transferred from other universities to fifth semester are required to earn 50 activity points from the year of entry to Sharnbasva University. The Activity Points earned shall be reflected on the students eighth semester Grade card.

The activities can be spread over the years, anytime during the semester weekends holidays, as per the liking and convenience of the student from the year of entry to the programme. However, minimum hours requirement should be fulfilled. Activity Points (noncredit) have no effect on SGPA/CGPA and shall not be considered for vertical progression.

In case students fail to earn the prescribed activity points, Eighth semester Grade Card shall be issued only after earning the required activity points. Student shall be admitted for the award of the degree only after the release of the Eighth semester Grade Card.

MATHEMATICS FOR CSS–III
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2023-2024)
SEMESTER –III

Course Code	**22MATS31**	**CIE Marks**	**50**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**50**
Total Number of Lecture Hours	**40**	**Exam Hours**	**03**

CREDITS – 03

Course Objectives:

- Familiarize the importance of Random variable and Probability distribution essential for Computer science engineering.
- Analyze computer science engineering problems applying Statistical methods to fit a curve and understand co-variance of two variables and its correlation coefficient.
- Understand the vector space and associated results.
- Understand the basic concepts of set theory, relations, functions
- Develop the knowledge of solving Mechanical engineering problems numerically.

Modules	**Hours**
Module I	
Probability Distribution: Random variables (discrete and continuous) probability mass/density functions. Binomial distribution, Poisson distribution. Exponential and Normal distributions. Problems. **Self Study: Definition of probability, addition and multiplication rule, Bay's theorem**	**08**
Module II	
Basic Statistics: Measures of central tendency, measures of dispersion, range quartile deviation, mean deviation, standard deviation, coefficient of variation, Skewness and Kurtosis, problems. **Statistical Methods:** Correlation-karl Pearson's co-efficient of correlation problems. Regression analysis lines of regression, Rank correlation (without proof)-problems. **Curve Fitting:** Curve fitting by the method of least square. Fitting of the curves of the form $y = ax + b, y = ax^2 + bx + c$ & $y = ae^{bx}$. **Self-study:** Center and circle of curvature, evolutes and involutes.	**08**
Module III	
Change of Basis, Range and Kernel of linear transformation, Rank and Nullity of a matrix, Non-singular Linear Transformation, Eigen value and Eigen vector of Linear Transformation. **Self Study :** Vector space basis	**08**
Module IV	
Functions: Cartesian Products and Relations, Functions – into, many one One-to-One, Onto, Bijective Functions. The Pigeon-hole Principle, Function Composition and Inverse functions. **Relations:** Definition and different types of relations **Introduction to logic:** Basic Connectives and Truth Tables, Logic Equivalence – The Laws of Logic, Logical Implication – Rules of Inference. **Self Study :**Properties of set theory.	**08**

Module V	
CGraph Theory: introduction to graph theory, definitions of finite and null graphs, loops, multigraphs, pseudo graph, simple graph, degree of a vertex, isolated vertices, connectedness and complete graph, minimum and maximum degree, regular graphs, subgraphs, walk, trial, paths, Euler and Hamilton graphs. **Self Study :** Set theoretical operations and basic number theory concepts	**08**

Course Outcomes (COs):

CO#	Course Outcomes
CO1	Learn to solve the random variable in both discrete and continuous and their probability distribution, Mass on various engineering problems.
CO2	Apply the concept of correlation and regression lines for solving the problems and numerical techniques to solve engineering problems.
CO3	Understand the knowledge of Linear Algebra to solve problems on Linear Transformation.
CO4	Understand the concept of relations , functions and to learn the law of logical Equivalence and Implications.
CO5	Make the use of the models using advanced concept of graphs in the real world applications

Text Books

1. **B.S. Grewal**:"Higher Engineering Mathematics ", Khanna publishers, 44th Ed.,2021.
2. **E. Kreyszig**: "Advanced Engineering Mathematics", John Wiley & Sons, 10thEd., 2018.

Reference Books

1. **V.Ramana:**"Higher Engineering Mathematics "McGraw-Hill Education,11th Ed.,2017
2. **Srimanta Pal & SubodhC.Bhunia**:"Engineering Mathematics "Oxford University Press,3rdEd., 2016.
3. **N.PBali and Manish Goyal**: "A textbook of Engineering Mathematics" Laxmi Publications,10th Ed.,2022.
4. **C.RayWylie,LouisC.Barrett:**"Advanced Engineering Mathematics "McGraw–Hill BookCo., Newyork, 6thEd., 2017.
5. **GuptaC.B,SingS.RandMukeshKumar:**"Engineering Mathematic for Semester I and II ",Mc- Graw Hill Education(India)Pvt.Ltd 2015.
6. **H.K.Dass and Er.RajnishVerma:**"Higher Engineering Mathematics "S.Chand Publication,3rdEd.,2014.
7. **James Stewart:"**Calculus"CengagePublications,7thEd.,2019.
8. **David CLay:**"Linear Algebra and its Applications ",Pearson Publishers,4th Ed.,2018.
9. **Gareth Williams:** "Linear Algebra with applications", Jones Bartlett Publishers Inc., 6thEd., 2017.

Web links and Video Lectures:

1. http://nptel.ac.in/courses.php?disciplineID=111
2. http://www.class-central.com/subject/math
3. http://academicearth.org.

DIGITAL DESIGN AND COMPUTER ORGANIZATION
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2023-2024)
SEMESTER –III

Course Code	**22CS32**	**CIE Marks**	**50**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**50**
Total Number of Lecture Hours	**50**	**Exam Hours**	**03**

CREDITS – 04

Course Objectives:

1. To demonstrate the Boolean functions and logic system.
2. To explain the working of combinational and sequential circuits.
3. To realize the basic structure and machine instructions of computer.
4. To illustrate the working of I/O and memory operations.
5. To gain insights in executing instructions and pipelining.

Modules	**Hours**
Module I	
Introduction to Digital Design: Boolean Functions, Digital Logic Gates, Introduction, The Map Method: Four-Variable Map, Don't-Care Conditions, NAND and NOR Implementation, Other Hardware Description Language – Verilog Model of a simple circuit, The Quine-Mc Clusky method. Textbook 1: 1.3,2.1,3.3,3.6,3.8,3.11,3.9	10
Module II	
Combinational Logic: Introduction, Combinational circuits, Design Procedure, Binary Adder- Subtractor, Decoders, Encoders, Multiplexers. HDL Models of Combinational Circuits – Adder, Multiplexer, Encoder. **Sequential Logic**: Introduction, Sequential Circuits, Storage Elements: Latches, Flip-Flops. **Text book 1: 4.3,4.4,4.5, 4.6,4.1,6.8,6.12** **Text book 2:5.1, 5.2, 5.3, 5.4**	**10**
Module III	
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:** Memory Location and Addresses, Memory Operations, Instruction and Instruction sequencing, Addressing Modes, Basic Input/output organization **Text book 3: 1.2, 1.3, 1.4, 1.6, 2.2, 2.3, 2.4, 2.5, 2.7**	**10**

Module IV	
Input/output Organization: Accessing I/O Devices, Interrupts – Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Direct Memory Access: Bus Arbitration, Buses, Interface circuits, Speed, size and Cost of memory systems. Cache Memories – Mapping Functions, Performance considerations. **Text book 3: 4.1, 4.2.1, 4.2.2, 4.2.3, 4.4,4.5,4.6, 5.4, 5.5.1,5.6**	**10**
Module V	
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, Multiple bus organization, Hardwired Control, Microprogrammed Control. **Pipelining:** Basic concepts: Role of Cache memory , Pipeline Performance, Data hazards **Text book 3: 7.1, 7.2, 7.3, 7.4, 7.5 8.1,8.2**	**10**

Text Books:

1. Digital principles and applications, Donald P Leech,7th edition, Tata McGrawHill .
2. M. Morris Mano & Michael D. Ciletti, Digital Design With an Introduction to Verilog Design, 5e,Pearson Education. Carl Hamacher, ZvonkoVranesic, SafwatZaky, Computer Organization,5th
3. Edition, Tata McGrawHill

Reference Books:

1. Computer System Architecture-by M. Morris Mano

Question paper pattern:

- The question paper will have ten questions each question is set for 20 marks.
- There will be 2 full questions from each module each of the questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics under that module**.
- The students have to answer 5 full questions, selecting one full question from each module
- Marks scored by the student shall be proportionally scaled down to 50 Marks

E-books and Online course materials:

1. https://onlinecourses.nptel.ac.in/noc21_ee39/preview
2. https://archive.nptel.ac.in/courses/106/105/106105163

Course Outcomes (COs):

CO1	Design and Develop digital Logic circuits using Boolean algebra and logic gates.
CO2	Implement and test combinational and sequential logic circuits using HDLs like Verilog or VHDL.
CO3	Identify basic structure of computers and its performance measures.
CO4	Describe memory hierarchy and virtual memory management, interrupt handling and DMA.
CO5	Optimize and evaluate computer system performance using various benchmarks and metrics.

CO-PO-PSO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	-	-	-	-	-	-	-	-	-	2	3	-
CO2	3	2	3	-	-	-	-	-	-	-	-	-	2	3	-
CO3	3	3	3	-	-	-	-	-	-	-	-	-	2	3	-
CO4	3	2	3	-	-	-	-	-	-	-	-	-	2	3	-
CO5	3	3	3	-	-	-	-	-	-	-	-	-	2	3	-

DATA STRUCTURES AND APPLICATIONS
[As per Choice Based Credit System (CBCS)scheme] (Effective from the academic year 2023-2024)
SEMESTER – III

Course Code	**22CS33**	**CIE Marks**	**50**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**50**
Total Number of Lecture Hours	**40**	**Exam Hours**	**03**

CREDITS - 03

Course Objectives: This course will enable students to

- To impart the basic concepts of data structures.
- To understand concepts about searching and sorting techniques.
- To discuss the concepts of linear data structure.
- To understand the applications of non-linear data structure in problem solving.
- To study different sorting techniques.

Module I	**Hours**
Introduction: Data Structures, Classifications (Primitive & Non Primitive), Data structure operations, Representation of Linear Arrays in Memory, Dynamically allocated arrays .Structures, Self-Referential Structures, and Unions. Pointers and Dynamic Memory Allocation Functions. **Array Operations:** Traversing, inserting, deleting, Searching: Linear Search, Binary Search, and Sorting: Bubble Sort. Multidimensional Arrays, Polynomials: Polynomial Representation, Polynomial Addition, Sparse Matrices: Sparse Matrix Representation, Transposing Matrix. **Strings:** Basic Terminology, Operations and Pattern Matching algorithm: Naïve String Matching algorithm. Programming Examples.	**08**
Module II	
Stacks: Definition, Stack Operations, Array Representation of Stacks and Stack Applications: Infix to postfix conversion, evaluation of postfix expression.**Recursion**: Factorial, Fibonacci Sequence, Tower of Hanoi. **Queues:** Definition, Array Representation. Queue Operations, Circular Queues, Dequeue, Priority Queues.Programming Examples.	**08**
Module III	
Linked Lists: Definition, Representation of linked lists in Memory, Memory allocation and Linked list operations: Traversing, Searching, Insertion, and Deletion. Doubly Linked lists. Linked Stacks and Queues. Programming Examples.	**08**
Module IV	
Trees: Terminology, Binary Trees, Properties of Binary trees, Array and linked Representation of Binary Trees, Binary Tree Traversals - Inorder, postorder, preorder; Additional Binary tree operations-copying binary tree, testing equality. Threaded binary trees, Binary Search Trees – Definition, Insertion, Deletion (An empty left sub tree and nonempty right sub tree and vice-versa), Traversal, Searching, Application of Trees-Evaluation of Expression, Programming Examples.	**08**
Module V	

Graphs: Definitions, Terminologies, Matrix and Adjacency List Representation of Graphs, Elementary Graph operations, Traversal methods: Breadth First Search and Depth First Search. **Sorting Techniques:** Insertion Sort, Radix sort, selection sort.**Hashing**: Collision concept, Linear Probing, quadratic probing, double hashing examples.	**08**

Text Books:

1 .EllisHorowitzandSartajSahni, FundamentalsofDataStructuresinC,2ndEd, Universities Press, 2014,ISBN
0-7167-8250-2.

2.Seymour Lipschutz, Data Structures Schaum's Outlines, Revised 1st Ed, McGraw Hill, 2014,ISBN 978- 1259029967.

Reference Books:

1. Gilberg&Forouzan, Data Structures: A Pseudo-code approach with C, 2nd Ed, Cengage Learning,2014,ISBN,978-8131503140.
2. Reema Thareja, Data Structures using C, 3rd Ed, Oxford press, 2012,ISBN-13: 978-0-19-809930-7
3. Jean-Paul Tremblay & Paul G. Sorenson, An Introduction to Data Structures with Applications, 2 nd Ed, McGraw Hill, 2013,ISBN978-0074624715.
4. A M Tenenbaum, Data Structures using C, PHI, 1989,ISBN978-0131997462.
5. Robert Kruse, Data Structures and Program Design in C, 2nd Ed, PHI, 1996,ISBN978-8177584233.

Question paper pattern:

- The question paper will have ten questions each question is set for 20 marks.
- There will be 2 full questions from each module each of the questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics under that module**.
- The students have to answer 5 full questions, selecting one full question from each module
- Marks scored by the student shall be proportionally scaled down to 50 Marks

E-books and Online course materials

1. https://caucse.club/wp-content/uploads/2022/05/Fundamentals-of-Data-Structures-in- C-Ellis-Horowitz-Sartaj-Sahni- etc.-.pdf
2. https://pdfcoffee.com/data-structures-with-c-by-schaum-lipschutz-pdf-free.html.

Online Courses and Video Lectures 1.https://nptel.ac.in/courses/106102064.

Course Outcomes (COs):

CO1	Acquire and implement the fundamental knowledge on various data structures operations.
CO2	Apply stack and queue data structures in problem solving.
CO3	Analyze linked list for different applications.

CO4	Develop solutions using trees to model the real-world problem.
CO5	Analyse graph structures and hashing techniques to map the data.

CO-PO-PSO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	-	-	-	-	-	-	-	-	2	2	3	-
CO2	3	3	3	-	-	-	-	-	-	-	-	2	2	3	-
CO3	3	3	3	-	-	-	-	-	-	-	-	2	2	3	-
CO4	3	3	3	-	-	-	-	-	-	-	-	2	2	3	-
CO5	3	3	3	-	-	-	-	-	-	-	-	2	2	3	-

OPERATING SYSTEM
[As per Choice Based Credit System (CBCS)scheme]
(Effective from the academic year 2023-2024)
SEMESTER – III

Course Code	**22CS34**	**CIE Marks**	**50**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**50**
Total Number of Lecture Hours	**40**	**Exam Hours**	**03**

CREDITS – 03

Course Objectives: This course will enable students to

- To Study the concepts and terminology used in OS
- To Discuss suitable techniques for management of different resource‟s.
- To Illustrate process synchronization and concept of Deadlock
- To understand Memory management.
- To study the concepts of file

Module I	**Hours**
Introduction to operating systems: 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, and Computing environments? **System structures:** 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 generation, System boot.	**08**
Module II	
Process Management: Process concept, Process scheduling, Operations on processes, Inter process communication. **-threaded Programming:** Overview, Multithreading models, Thread Libraries, Threading issues .**Process Scheduling**: Basic concepts, Scheduling Criteria, Scheduling Algorithms, Thread scheduling, Multiple-processor scheduling	**08**
Module III	
Process 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, Recovery from deadlock	**08**
Module IV	
Memory Management: 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.	**08**
Module V	
File System: File concept, Access methods, Directory structure, File system mounting, File sharing. **Implementing File system:** File system structure, File system implementation, Directory implementation, Allocation methods. **Secondary Storage Structures:** Overview of Mass storage structures, Disk structure, Disk attachment, Disk scheduling-FCFS Scheduling, SSTF Scheduling SCANN Scheduling, LOOK Scheduling.	**08**

Question paper pattern:

- The question paper will have ten questions each question is set for 20 marks.
- There will be 2 full questions from each module each of the questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics under that module**.
- The students have to answer 5 full questions, selecting one full question from each module.

Marks scored by the student shall be proportionally scaled down to 50 Marks.

Text Books:

1.Operating System Concepts, by Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, 9th Edition, Wiley India, 2012.

Reference Books:

1. Operating Systems, A Concept-Based Approach, by DM Dhamdhere, 3rd Edition, Tata Mcgraw-Hill, 2012.
2. Modern Operating Systems, by Andrew S. Tanenbaum and Herbert Bos, 4th Edition, Pearson, 2014.
3. Ann McHoes Ida M Fylnn, Understanding Operating System, Cengage Learning, 6th Editi
4. D.M Dhamdhere, Operating Systems: A Concept Based Approach 3rd Ed, McGraw- Hill, 2013.
5. P.C.P. Bhatt, An Introduction to Operating Systems: Concepts and Practice 4th Edition, PHI(EEE), 2014.
6. William Stallings Operating Systems: Internals and Design Principles, 6th Edition,
- Pearson.

E-books and Online course materials

1. https://deepakdvallur.weebly.com/uploads/8/9/7/5/89758787/18cs43-os-module1.pdf https://de https://deepakdvallur.weebly.com/uploads/8/9/7/5/89758787/18cs43-os-module1.pdfepakdvallur.weebly.com/uploads/8/9/7/5/89758787/module_2.pdf

Course Outcomes (COs):

CO1	Investigate and evaluate the fundamental concepts and functions of operating systems, including their structure, operations, and various computing environments.
CO2	Analyze process management and multi-threaded programming and evaluate different process scheduling algorithms.
CO3	Experiment with process synchronization techniques and develop methods to handle deadlocks in an operating system.
CO4	Research memory management concepts including paging, segmentation, and virtual memory management.
CO5	Design file system structures and implement secondary storage structures and protection mechanisms.

CO-PO-PSO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	-	-	-	-	-	-	-	-	2	2	3	-
CO2	3	3	3	-	-	-	-	-	-	-	-	2	2	3	-

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

Object Oriented Programming with JAVA
As per Choice Based Credit System (CBCS)scheme] (Effective from the academic year 2023-2024)
SEMESTER – III

Course Code	**22CS35**	**CIE Marks**	**50**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**50**
Total Number of Lecture Hours	**40**	**Exam Hours**	**03**

CREDITS –03

Course Objectives: This course will enable students to

1. To Learn the principles of object-oriented programming.
2. To Understand programming features of Java.
3. To gain knowledge on: Inheritance, exception handling, Packages& interface
4. To Understand multithreading concept and event handling in java.
5. To understand event driven Graphical User Interface (GUI) programming using applets.

Module I	**Hours**
Introduction to Object Oriented Concepts: Procedure–Oriented and Object Oriented Programming System, Principles of Object Oriented Programming, Differences between C , C++ and Java, Console I/O, variables and reference variables, Function Prototyping, Function Overloading. **Class and Objects**: Introduction, member functions and data, objects and functions.	**08**
Module II	
Introduction to Java: Bytecode, Features of Java, Java Applications, Building and Running Java Program, Java Tokens, Data Types, Variables, Operators, Type Conversion and Casting, Arrays, Access Specifiers, Control Statements. **Classes**: Classes fundamentals, Declaring objects, Constructors, this keyword, garbage collection.	**08**
Module III	
Inheritance & Exception Handling: Inheritance: inheritance basics, using super, creating multi level hierarchy, method overriding. Exception Handling: Exception handling in Java. **Packages & Interfaces**: Defining Package, Access Protection, and Importing Packages; Interfaces: Defining and Implementing Interfaces, Nested Interfaces.	**08**
Module-IV	
Multi Threaded Programming: Multi Threaded Programming: What are threads? How to make the classes threadable ; Extending threads; Implementing runnable; Synchronization; Changing state of the thread; Bounded buffer problems, producer consumer problems. **Event Handling**: Two event handling mechanisms; The delegation event model; Event classes; Sources of events; Event listener interfaces; Using the delegation event model;	**08**
Module-V	

Applets: Applet basics, Applet Skeleton, Simple Applet Display Methods, Repaint method, Simple Banner Applet, HTML Applet Tag, Passing Parameters to Applet, getDocumentBase and getCodeBasemethods,AppletContext Interface. **Java Input/Output:** Stream classes, Byte Streams: InputStream, OutputStream, FileInputStream, FileOutputStream, PrintStream, DataInputStream, DataOutputStream;	**08**

Question paper pattern:

- The question paper will have ten questions each question is set for 20 marks.
- There will be 2 full questions from each module each of the questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics under that module**.
- The students have to answer 5 full questions, selecting one full question from each module.

Marks scored by the student shall be proportionally scaled down to 50 Marks.

Text Books:

1. Sourav Sahay, Object Oriented Programming with C++ , 2nd Ed, Oxford University Press, New Delhi, 2012.
2. Herbert Schildt, Java the Complete Reference, 7th Edition, Tata McGraw Hill, 2007.

Reference Books:

1. Mahesh Bhave and Sunil Patekar, "Programming with Java", First Edition, Pearson Education,2008, ISBN:9788131720806.
2. Rajkumar Buyya,SThamarasiselvi, xingchen chu, Object oriented Programming with java, Tata McGraw Hill education private limited.
3. E Balagurusamy, Programming with Java A primer, Tata McGraw Hill companies.
4. Anita Seth and B L Juneja, JAVA One step Ahead, Oxford University Press, 2017.

E-books and Online course materials/videos:

- https://www.geeksforgeeks.org/object-oriented-programming-oops-concept-in-java/.
- https://freecomputerbooks.com/OOP-Learn-Object-Oriented-Thinking-and- Programming.html
- https://freecomputerbooks.com/javaBasicBooks.html

https://archive.nptel.ac.in/courses/106/105/106105191/

Course Outcomes (COs):

CO1	Build a simple code which shows the implementation fundamentals in object-oriented programming.
CO2	Demonstrate the ability to develop Java applications for a variety of use cases.
CO3	Apply the concepts of inheritance and exceptions for solving in real world problems
CO4	Illustrates the concepts of Multi-Threaded Programming and event handling
CO5	Use the concepts of Applet to create Simple web applications.

CO-PO-PSO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	-	-	2	-	-	-	-	-	2	2	3	-
CO2	2	2	3	-	-	2	-	-	-	-	-	2	2	3	-
CO3	2	2	3	-	-	2	-	-	-	-	-	2	2	3	-
CO4	2	2	3	-	-	2	-	-	-	-	-	2	2	3	-
CO5	2	2	3	-	-	2	-	-	-	-	-	2	2	3	-

DATA STRUCTURES AND APLICATIONS LAB
[As per Choice Based Credit System (CBCS)scheme]
(Effective from the academic year 2023-2024)
SEMESTER – III

Course Code	**22CSL36**	**CIE Marks**	**50**
Number of Contact Hours/Week	**02**	**SEE Marks**	**50**
Total Number of Lab Contact Hours	**30**	**Exam Hours**	**03**

Credits – 01

Course Objectives:

1. To demonstrate Dynamic memory management.
2. To design and implement various linear data structures.
3. To solve various real-world problems using Non-Linear data structures.
4. To apply hashing technique for given problem.

Descriptions :

- Implement all the programs in "C " Programming Language and Linux OS.

Programs List:

1. Develop a Program in C for the following:
   a) Declare a calendar as an array of 7 elements (A dynamically Created array) to represent 7 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 Program in C for the following operationson Singly Circular Linked List (SCLL) with header nodes a. Represent and Evaluate a Polynomial $P(x,y,z) = 6x^2y^2z-4yz^5+3x^3yz+2xy^5z-2xyz^3$ b. Find the sum of two polynomials POLY1(x,y,z) and POLY2(x,y,z) and store the result in POLYSUM(x,y,z) Support the program with appropriate functions for each of the above operations
10.	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
11.	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

12	Given a File of N employee records with a set K of Keys (4-digit) which uniquely determine the records in file F. Assume that file F is maintained in memory by a Hash Table (HT) of m memory locations with L as the set of memory addresses (2-digit) of locations in HT. Let the keys in K and addresses in L are Integers. Develop a Program in C that uses Hash function H: K →L as H(K)=K mod m (remainder method), and implement hashing technique to map a given key K to the address space L. Resolve the collision (if any) using linear probing

Conduct of Practical Examination:

• Experiment distribution

a) For laboratories having only one part: Students are allowed to pick one experiment from the lot with equal opportunity.

b) 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

SEE are mentioned here, writeup-15%, Conduction procedure and result in -70%, Viva-voce 15% of maximum marks. SEE for practical shall be evaluated for 50 marks

Course Outcomes (COs):

CO1	Demonstrate theoretical concepts of Arrays, Queues, stack, Linked list, graphs & trees data structures through series of experiments.
CO2	Implement various data structures using C/C++
CO3	Debug syntactical errors, and troubleshoot the problems issues effectively
CO4	Analyze the data and interpret the results.
CO5	Prepare a well-organized Data Structures laboratory report.

CO-PO-PSO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	-	2	-	-	-	-	-	-	-	2	-	3
CO2	3	2	3	-	2	-	-	-	-	-	-	-	2	-	3
CO3	3	2	3	-	2	-	-	-	-	-	-	-	2	-	3
CO4	3	2	3	-	2	-	-	-	-	-	-	-	2	-	3
CO5	3	2	3	-	2	-	-	-	-	-	-	-	2	-	3

OPERATING SYSTEM LAB
[As per Choice Based Credit System (CBCS)scheme]
(Effective from the academic year 2023 -2024)
SEMESTER – III

Course Code	**22CSL37**	**CIE Marks**	**50**
Number of Lecture Hours/Week	**02**	**SEE Marks**	**50**
Total Number of Lecture Hours	**30**	**Exam Hours**	**03**

CREDITS-01

Course Objectives:

1. To Understand the need of system calls and CPU Scheduling in OS
2. To Identify the suitable techniques for process synchronization problem.
3. To Understand the various techniques for deadlock handling.
4. To demonstrate the need of Page Replacement and disc scheduling algorithms.

Programs List

PART-A

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 Dining Philosophers problem using semaphores.
4.	Develop a C program which demonstrates inter process 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) Worst fit b) Best fit c) 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 disk scheduling algorithm

Conduct of Practical Examination:

5. 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.

6. Change of experiment is allowed only once and marks allotted for procedure to be made zero of the changed part only.
7. Marks Distribution

SEE are mentioned here, writeup-15%, Conduction procedure and result in -70%, Viva-voce 15% of maximum marks. SEE for practical shall be evaluated for 50 marks

Course Outcomes (COs):

CO1	Demonstrate theoretical concepts of design and implementation of operating system through a series of experiments
CO2	Develop a program for Scheduling, Page replacement & system calls
CO3	Debug and troubleshoot software issues effectively
CO4	Analyze the data and interpret the results
CO5	Prepare a well organized laboratory report

CO-PO-PSO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	-	-	-	-	-	-	-	-	-	2	-	3
CO2	3	2	3	-	-	-	-	-	-	-	-	-	2	-	3
CO3	3	2	3	-	-	-	-	-	-	-	-	-	2	-	3
CO4	3	2	3	-	-	-	-	-	-	-	-	-	2	-	3
CO5	3	2	3	-	-	-	-	-	-	-	-	-	2	-	3

Object Oriented Programming with Java Lab
[As per Choice Based Credit System (CBCS)scheme]
(Effective from the academic year 2023 -2024)
SEMESTER–III

Course Code	**22CSL38**	**CIE Marks**	**50**
Number of Lecture Hours /Week	**02**	**SEE Marks**	**50**
Total Number of Lecture Hours	**30**	**Exam Hours**	**03**

CREDITS-01

Course Objectives: This course will enable students to:

1. Learn basics of JAVA programs and its execution.
2. Understand the principles of Object oriented programming.
3. Understand the concept of exception handling mechanism.
4. Grasp the fundamentals of multithreading and concurrency in Java, which allows for the execution of multiple tasks simultaneously.
5. Understand life cycle of the applets and its functionality.

Implement the following problem statements using Java in Windows/Linux operating system.

Programs list

1. (a) Write a Java program to implement class mechanism and create object to access the members of class.
   (b) Write a Java program to implement shift operators.
2. (a) Write a Java program to illustrate Type Casting of the data type and type conversion.
   (b) Write a Java program to iterate over Arrays using for Each loop to compute average of n natural numbers using Scanner class.
3. (a) Write a program in Java to demonstrate method overloading using iterative statements.
   (b) Write a program in Java to demonstrate constructor overloading using this keyword.
4. (a) Write a program in Java that implements multi-level inheritance.
   (b) Write a Java program to implement method overriding that shows use of super keyword.
5. (a) Write a Java program to illustrate Dynamic Method Dispatch using hierarchical inheritance.
   (b) Write a Java program for abstract class to find areas of different shapes.
6. Write a Java program that implements interface using extends keyword.
7. (a) Write a Java program that illustrates Exception handling mechanisms.
   (b) Write a Java program to illustrates break and continue statements.
8. Write a Java program that creates threads by extending Thread class.
   (a) First thread display "Good Morning "every 1 sec,
   (b) Second thread displays "Hello "every 2 seconds
   (c) Third display "Welcome" every 3 seconds.
9. Write a Java program for Producer and Consumer Problem using Threads.
10. (a) Develop an applet that displays a simple message.
    (b) Write a Java program to create a Banner using Applet.

Conduct of Practical Examination:

• Experiment distribution

a) For laboratories having only one part: Students are allowed to pick one experiment from the lot with equal opportunity.

b) 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

SEE are mentioned here, writeup-15%, Conduction procedure and result in -70%, Viva-voce 15% of maximum marks. SEE for practical shall be evaluated for 50 marks

Course Outcomes (COs):

CO1	Demonstrate theoretical concepts of constructor, inheritance, threads, Exception Handling and Applets through series of experiments.
CO2	Develop a program using basic programming constructs and standard libraries.
CO3	Apply advanced debugging techniques and utilize integrated development environment (IDEs) to efficiently identify, diagnose, and resolve software issues in java applications.
CO4	Employ advanced data analysis technique and utilize java libraries to process, analyze and interpret data effectively.
CO5	Develop comprehensive and well-structured laboratory reports.

CO-PO-PSO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	-	2	-	-	-	-	-	-	-	2	-	3
CO2	3	2	3	-	2	-	-	-	-	-	-	-	2	-	3
CO3	3	2	3	-	2	-	-	-	-	-	-	-	2	-	3
CO4	3	2	3	-	2	-	-	-	-	-	-	-	2	-	3
CO5	3	2	3	-	2	-	-	-	-	-	-	-	2	-	3

PROJECT-III
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2023-2024)
SEMESTER – III

Course Code	**22PRJ39**	**CIE Marks**	**50**
Number of Lecture Hours/Week	**02**	**SEE Marks**	**50**
Total Number of Lecture Hours	**30**	**Exam Hours**	**03**

CREDITS – 01

Course Objectives: This course will enable students

- Identify real-world problems across programming, domains and understand their business and technical implications.
- Undetrstand systematic methodologies to design, implement, and optimize solutions.
- Resolve technical challenges through debugging, research, and collaboration.
- Take responsibility for specific roles in a team and collaborate effectively to achieve project goals.
- Present project progress and findings clearly and confidently to both technical and non-technical audiences.
- Document the entire project in a structured, professional laboratory report.

Project Guidelines:

- Project work shall preferably be batch wise.
- Evaluation is based on concept clarity, system design, implementation, testing, presentation, and documentation quality, with a focus on proper coding standards, teamwork, and effective communication.
- Viva-voce examination in project work shall be conducted batch-wise.
- Minimum requirement of CIE marks for Project work shall be 50% of the maximum marks.
- Students failing to secure a minimum of 50% of the CIE marks in Project work shall not be eligible for the SEE Project examination.
- For a pass in a Project/Viva-voce examination, a student shall secure a minimum of 40% of the maximum marks prescribed.

Course Outcomes (COs):

CO1	Identify the topic from various domains (example programming databases, networking) to real world problems.
CO2	Develop methodology for the problem.
CO3	Resolve issues that arise during the project.
CO4	Learn to assign and accept roles and responsibilities within a team and write a good technical report.
CO5	Exhibit skills in presenting their project findings & progress orally

CO-PO-PSO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	-	2	2	-	-	2	2	2	-	-	-	3
CO2	3	3	3	-	2	2	-	-	2	2	2	-	-	-	3
CO3	3	3	3	-	2	2	-	-	2	2	2	-	-	-	3
CO4	3	3	3	-	2	2	-	-	2	2	2	-	-	-	3
CO5	3	3	3	-	2	2	-	-	2	2	2	-	-	-	3

SOFT SKILLS AND PERSONALITY DEVELOPMENT
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2023- 2024)
SEMESTER III

Course Code	**22HSM310A**	**CIEMarks**	**50**
Number ofLecture Hours/Week	**01**	**SEEMarks**	**50**
TotalNumberof LectureHours	**20**	**ExamHours**	**03**

CREDITS – 01

Course Objectives:

1. Enhance learners‟ soft skills by giving adequate exposure in the related subskills.
2. To acquaint the learners with moral values and its necessity.
3. Preparing the qualities that are important in the competitive era.

Module I	**Hours**
Introduction to Soft Skills and Hard Skills Personality Development: Knowing Yourself, Positive Thinking, Johari‟s Window, Communication Skills, Non-verbal Communication, Physical Fitness **Emotional Intelligence**: Meaning and Definition, Need for Emotional Intelligence, Intelligence Quotient versus Emotional Intelligence Quotient, Components of Emotional Intelligence, Competencies of Emotional Intelligence, Skills to Develop Emotional Intelligence	**04**
Module II	
Academic Skills Employment Communication: Introduction, Resume, Curriculum Vitae, Scannable Resume, Developing an Impressive Resume, Formats of Resume, Job Application or Cover Letter Professional Presentation: Nature of Oral Presentation, Planning a Presentation, Preparing the Presentation, Delivering the Presentation Job Interviews: Introduction, Importance of Resume, Definition of Interview, Background Information, Types of Interviews, Preparatory Steps for Job Interviews, InterviewSkillTips,ChangesintheInterviewProcess,FAQDuringInterviews Group Discussion: Introduction, Ambience/Seating Arrangement for Group Discussion, Importance of Group Discussions, Difference between Group Discussion, Panel Discussion and Debate, Types of Group Discussions, topic based and Case based Group Discussion, Individual Traits.	**04**

Module III	
Communication Skills: Art of Listening-Art of Speaking-Art of Reading-Art of Writing-Art of Writing E-mails: Email etiquette **Professional Skills Creativity at Workplace**: Introduction, Current Workplaces, Creativity, Motivation, Nurturing Hobbies at Work, The Six Thinking Hat Method Ethical Values: Ethics and Society, Theories of Ethics, Correlation between Values and Behavior, Nurturing Ethics, Importance of Work Ethics, Problems in the Absence of Work Ethics.	**04**
Module IV	
Capacity Building: Learn, Unlearn and Relearn: Capacity Building, Elements of Capacity Building, Zones of Learning, Ideas for Learning, Strategies for Capacity Building. **Corporate Skills**: Working with others- Developing a proper body language-behavioral etiquettes and mannerism- Time Management –Stress Management.	**04**
Module V	
Leadership and Team Building: Leader and Leadership, Leadership Traits, Culture and Leadership, Leadership Styles and Trends ,Team Building, Types of Teams, Decision Making and Negotiation: Introduction to Decision Making, Steps for Decision Making, Decision Making Techniques, Negotiation Fundamentals, Negotiation Styles, Major Negotiation Concepts **Job-hunting skills**: Writing Resume/CV- Interview skills -Group discussion -Mock interview Mock GD-Goal Setting-Career Planning.	**04**

Question paper pattern:

- The question paper will have ten questions each question is set for 20 marks.
- There will be 2 full questions from each module each of the questions under a module (with a maximum of 3 sub- questions), **should have a mix of topics under that module**.

The students have to answer 5 full questions, selecting one full question from each module. Marks scored by the student shall be proportionally scaled down to 50 Marks.

TextBooks:

1.Soft Skills: an Integrated Approach to Maximize Personality, Gajendra S. Chauhan, Sangeeta Sharma, Wiley India.

ReferenceBooks:

1. Personality Development and Soft Skills, Barun K. Mitra, Oxford Press
2. *Business Communication, Shalini Kalia,Shailja Agrawal, Wiley India*
3. Soft Skills- Enhancing Employability, M. S. Rao, I. K. International

Cornerstone: Developing Soft Skills, Sherfield, Pearson India

Online Courses and Video Lectures

1.Development by Vikas Divyakirti" || Drishti IAS || - YouTube

2.https://onlinecourses.nptel.ac.in/noc19_hs32/previe w (5967) How to Set Your Goal | Goal Setting in Your Life | Life Motivational Tips | Sonu Sharma - YouTube

Course Outcomes (COs):

CO1	Analyze and develop self-awareness and emotional intelligence skills.
CO2	Create and present impressive resumes, cover letters, and effectively prepare for job interviews and group discussions.
CO3	Implement effective communication skills, creativity, and ethical values in professional settings.
CO4	Design strategies for capacity building, time management, and stress management in corporate environments.
CO5	Optimize leadership and team-building skills and refine job-hunting techniques including resume writing and interview skills.

CO-PO-PSO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	2	2	3	3	2	-	2	3	-
CO2	3	-	-	-	-	-	2	2	3	3	2	-	2	3	-
CO3	3	-	-	-	-	-	2	2	3	3	2	-	2	3	-
CO4	3	-	-	-	-	-	2	2	3	3	2	-	2	3	-
CO5	3	-	-	-	-	-	2	2	3	3	2	-	2	3	-

Unix and Shell programming
[As per Choice Based Credit System(CBCS)scheme]
(Effective from the academic year 2023-2024) SEMESTER – III

Course Code	**22AEC311A**	**CIE Marks**	**50**
Teaching Hours/Week	**02**	**SEE Marks**	**50**
Total no .of lecture hours	**30**	**Exam Hours**	**03**

CREDITS -01

Course Objectives:

1. To mention the features of Unix
2. To understand the basic concepts of UNIX Architecture and basic Commands
3. To understand different types of Files, File system and basic file system commands.
4. To understand the concepts related to basic scripting language

Explore Unix

Introduction: operating System, objective, History, Features of UNIX, Kernel and Shell.

Unix File System: File and Common Commands, Shell, more about files, Directories, UNIX system, Basics of file directories.

Unix commands with syntax: Syntax and Unix commands ,

Unix shells: History of Unix shells, Shell Command files, Shell programming on files .

Programs List

1	**Basic Commands** a. Use the **ls** command to list files in your home directory. b. Use the **pwd** command to print the current working directory. c. Use the **cd** command to navigate to different directories. d. Use the **mkdir** command to create a new directory. e. Use the **touch** command to create an empty file.
2	**File Manipulation** a. Create a file named "mytext.txt" and add some text to it using a text editor. b. Use the **cp** command to make a copy of "mytext.txt" with a different name. c. Use the **mv** command to rename the copied file. d. Use the **rm** command to delete a file. e. Use the **cat** command to display the contents of a file.
3	**Text Processing** a. Use the **echo** command to print a message to the terminal. b. Use the **grep** command to search for a specific word in a file. c. Use the **wc** command to count the number of lines, words, and characters in a file. d. Use the **sort** command to sort the lines of a file. e. Use the **head and tail** commands to display the first and last few lines of a file.

4	**Permissions** a. Use the **ls -l** command to view the permissions of files in a directory. b. Use the **chmod** command to change the permissions of a file. Use the **chown** command to change the owner of a file.
5	**Variables** a. Assign a value to a variable and use echo to display its content. b. Combine variables and text in a echo statement. c. Experiment with different types of quotes (single, double) and understand their effects on variable interpolation.
6	**Scripting Basics** a. Write a simple script that prints a greeting message. b. Declare variables in a script and display their values. c. Use user input in a script to personalize the output.
7	**Control Structures** a. Write a script that uses an if statement to check if a number is positive or negative. b. Use a for loop to print numbers from 1 to 5. c. Implement a while loop that counts down from 3 to 1
8	**Command Substitution** **a.** Use command substitution to capture the output of a command and assign it to a variable. b. Incorporate command substitution into a script to dynamically obtain information.
9	**Job Control** a. Use the **ps** command to list running processes. b. Use the **kill** command to terminate a specific process.
10	**Environment Variables** a. Display the values of environment variables such as HOME, PATH, and USER. b. Experiment with modifying the value of an environment variable.

Conduct of Practical Examination:

• Experiment distribution

a) For laboratories having only one part: Students are allowed to pick one experiment from the lot with equal opportunity.

b) 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

SEE are mentioned here, writeup-15%, Conduction procedure and result in -70%, Viva-voce 15% of maximum marks. SEE for practical shall be evaluated for 50 marks

Course Outcomes (COs):

CO1	Utilize Basic UNIX commands effectively.
CO2	Write effective scripts using software tools
CO3	Debug and troubleshoot software issues effectively
CO4	Analyze the data and interpret the results
CO5	Prepare a well-organized laboratory report

CO-PO-PSO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	-	-	-	-	-	-	2	-	-	2	-	3
CO2	2	2	3	-	-	-	-	-	-	2	-	-	2	-	3
CO3	2	2	3	-	-	-	-	-	-	2	-	-	2	-	3
CO4	2	2	3	-	-	-	-	-	-	2	-	-	2	-	3
CO5	2	2	3	-	-	-	-	-	-	2	-	-	2	-	3

Data Analytics with Excel
[As per Choice Based Credit System(CBCS)scheme]
(Effective from the academic year 2023-2024)
SEMESTER – III

Course Code	**22AEC311B**	**CIE Marks**	**50**
Teaching Hours/Week	**02**	**SEE Marks**	**50**
Total No of teaching hours	**30**	**Exam Hours**	**03**

CREDITS-01

Course Objectives:

1. To Apply analysis techniques to datasets in Excel
2. Learn how to use Pivot Tables and Pivot Charts to streamline your workflow in Excel
3. Understand and Identify the principles of data analysis
4. Become adept at using Excel functions and techniques for analysis
5. Build presentation ready dashboards in Excel

Programs List

1	**Getting Started with Excel**: Creation of spread sheets, Insertion of rows and columns, Drag& Fill,use of Aggregate functions.
2	**Working with Data**: Importing data, Data Entry & Manipulation, Sorting & Filtering.
3	**Working with Data:** Data Validation, Pivot Tables & Pivot Charts.
4	**Data Analysis Process**: Conditional Formatting, What-If Analysis, Data Tables, Charts & Graphs
5	**Cleaning Data with Text Functions**: use of UPPER and LOWER, TRIM function, Concatenate.
6	**Cleaning Data Containing Date and Time Values:** use of DATEVALUE function, DATEADD and DATEDIF, TIMEVALUE functions.
7	**Conditional Formatting**: formatting, parsing, and highlighting data in spreadsheets during data analysis.
8	**Working with Multiple Sheets**: work with multiple sheets within a workbook is crucial for organizing and managing data, perform complex calculations and create comprehensive reports.
9	**Create worksheet with following fields**: Empno, Ename, Basic Pay(BP), Travelling Allowance(TA), Dearness Allowance(DA), House Rent Allowance(HRA), Income Tax(IT), Provident Fund(PF), Net Pay(NP). Use appropriate formulas to calculate the above scenario. Analyse the data using appropriate chart and report the data.
10	**Create worksheet on Inventory Management:** Sheet should contain Product code, Productname, Product type, MRP, Cost after % of discount, Date of purchase. Use appropriate formulas to calculate the above scenario. Analyse the data using appropriate chart and report the data.

Conduct of Practical Examination:

• Experiment distribution

a) For laboratories having only one part: Students are allowed to pick one experiment from the lot with equal opportunity.

b) 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

SEE are mentioned here, writeup-15%, Conduction procedure and result in -70%, Viva-voce 15% of maximum marks. SEE for practical shall be evaluated for 5 0 marks

Course Outcomes (COs):

CO1	Learn basic Excel functions to create, manage, and organize data in spreadsheets.
CO2	Design and develop basic programs to solve problems using appropriate logic and tools.
CO3	Debug and troubleshoot software issues effectively
CO4	Analyze the data and interpret the results
CO5	Prepare a well-organized laboratory report

CO-PO-PSO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	-	-	-	-	-	-	2	-	-	-	-	3
CO2	2	2	3	-	-	-	-	-	-	2	-	-	-	-	3
CO3	2	2	3	-	-	-	-	-	-	2	-	-	-	-	3
CO4	2	2	3	-	-	-	-	-	-	2	-	-	-	-	3
CO5	2	2	3	-	-	-	-	-	-	2	-	-	-	-	3

MATHEMATICS FOR CSS-IV
[As per Choice Based Credit System(CBCS)scheme]
(Effective from the academic year 2023-2024)
SEMESTER – IV

Course Code	**22MATS41**	**CIE Marks**	**50**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**50**
Total Number of Lecture Hours	**40**	**Exam Hours**	**03**

CREDITS - 03

Course Objectives: This course will enable students to

- Understand the concept of Programming.
- Able to Binary tree concept in data structure.
- Understand the concept of joint probability distribution and stochastic processes rising in science in computer Engineering.
- Understand the concept of errors and Hypothesis.
- Develop the knowledge of complex variable and discuss various properties of it.

Module I	**Hours**
Introduction of modular arithmetic and its applications in Computer Science and Engineering: Introduction to Congruences, Linear Congruences, The Chinese Remainder theorem, Solving Polynomials, Linear Diophantine Equation, System of Linear Congruences, Euler's Theorem, Wilson Theorem and Fermat's little theorem. Applications of Congruences-RSA algorithm. **Self-Study:** Divisibility, GCD, Properties of Prime Numbers, Fundamental theorem of Arithmetic.	**08**
Module II	
Definitions, Properties of trees and Examples, Routed trees, Weighted Trees and Prefix Codes. **Self-Study:** Sorting technique	**08**
Module III	
Joint probability distribution: 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 of Joint probability distribution**	**08**
Module IV	
Sampling theory: Sampling, Sampling distributions, standard error, test of hypothesis for means and proportions, Type I and Type II errors, Level of significance, confidence limits for means, one tailed and two tailed tests, student's t-distribution, Chi - square distribution as a test of goodness of fit. **Tracing of curves:** Cartesian form - Strophoid, Leminscate, Parametric form - Cycloid, Astroid, Polarform- Cardioid, Leminscate. **Self-Study: Types of samplings, Cartesian equations and their geometrical representation** **Applications of Sampling theory and curve tracing**	**08**
Module V	

Complex line Integrals: Cauchy's Integration theorem, Cauchy integral formula, Laurent's Series, types of singularities. Residue, Poles, Cauchy's Residue theorem (without proof) and Problems. **Transformations:** Bilinear transformations and problems. **Self-Study: Initial value and boundary value problems**	**08**

Question paper pattern:

- The question paper will have ten questions each question is set for 20 marks.
- There will be 2 full questions from each module each of the questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics under that module**.
- The students have to answer 5 full questions, selecting one full question from each module.

Marks scored by the student shall be proportionally scaled down to 50 Marks.

Text Books:

1. **B. S. Grewal**: "Higher Engineering Mathematics", Khanna publishers, 44th Ed., 2021.
2. **E. Kreyszig**: "Advanced Engineering Mathematics", John Wiley & Sons, 10thEd.,2018.

Reference Books:

1. **V. Ramana:** "Higher Engineering Mathematics" Mc Graw-Hill Education,11th Ed.,2017
2. **Srimanta Pal & Subodh C. Bhunia**:"Engineering Mathematics" Oxford University Press, 3rd E d., 2016.
3. **N.P. Bali and Manish Goyal**:"A text book of Engineering Mathematics" Laxmi Publications, 10th Ed., 2022.
4. **C. Ray Wylie, Louis C. Barrett:** "Advanced Engineering Mathematics" Mc Graw–Hill Book Co., Newyork, 6th Ed., 2017.
5. **Gupta C. B, Sing S. R and Mukesh Kumar:** "Engineering Mathematic for Semester I and II" , Mc-Graw Hill Education (India) Pvt. Ltd 2015.
6. **H. K. Dass and Er. Rajnish Verma:** "Higher Engineering Mathematics" S. Chand Publication, 3rd Ed., 2014.
7. **James Stewart: "**Calculus" Cengage Publications, 7th Ed., 2019.
8. **David CLay:** "Linear Algebra and its Applications" , Pearson Publishers, 4th Ed., 2018.
9. **Gareth Williams:** "Linear Algebra with applications", Jones Bartlett Publishers Inc., 6th Ed., 2017.

Course Outcomes (COs):

CO1	Apply the knowledge of Modular Arithmetic to understand RSA Algorithm.
CO2	Understand the models using advanced concepts of graphs in the real world applications
CO3	Learn to solve the problems on Joint probability distribution and stochastic processes and studying the examples on Markov's chains in discrete time
CO4	Understanding the Sampling Distribution to find the standard error for testing of hypothesis and learn to trace the Curve.
CO5	Learn Cauchys Integration theorem Residue to solve problems in engineering field

ANALYSIS AND DESIGN OF ALGORITHMS
[As per Choice Based Credit System(CBCS)scheme]
(Effective from the academic year 2023-2024)
SEMESTER – IV

Course Code	**22CS42**	**CIE Marks**	**50**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**50**
Total Number of Lecture Hours	**40**	**Exam Hours**	**03**

CREDITS - 03

Course Objectives: This course will enable students to

- Explain various computational problem-solving techniques.
- Apply appropriate method to solve a given problem.
- Describe various methods of algorithm analysis.

Module I	**Hours**
Introduction: What is Algorithm? Notation of Algorithm, Asymptotic Notations: Big-Oh notation (O), Omega notation (Ω), Theta notation (Θ) with examples, Mathematical analysis of non- Recursive and recursive Algorithms with Examples. **Brute force design technique:** Selection Sort, Bubble Sort, Sequential Search and Brute Force String Matching. Advantages and Disadvantages of Brute force design.	**08**
Module II	
Divide and Conquer: General method, Recurrence equation for divide and conquer, solving it using Master‟s theorem, Merge sort, Quick sort, Binary search, Strassen‟s matrix multiplication, Advantages and Disadvantages of divide and conquer. **Decrease and Conquer Approach:** Introduction, Insertion Sort, Depth-First Search and Breadth-First Search, Topological Sorting.	**08**
Module III	
Space-Time Tradeoffs: Introduction, Sorting by Counting, Input Enhancement in String Matching Harspool‟s algorithm **Dynamic Programming: Transitive Closure:** Warshall‟s Algorithm**.** All Pairs ShortestPaths: Floyd's Algorithm, **Transform and Conquer Approach:** Introduction, Heaps and Heap Sort.	**08**
Module IV	
Greedy Method: Minimum cost spanning trees: Prim‟s Algorithm, Kruskal‟s Algorithmwith performance analysis. **Single source shortest paths:** Dijkstra's Algorithm. **Optimal Tree problem:** Huffman Trees and Codes. Backtracking**:** General method, N-Queens problem	**08**
Module V	
Backtracking: Sum of subsets problem, Hamiltonian cycles. **Branch and Bound:** Assignment Problem, Travelling Sales Person problem, 0/1 Knapsackproblem **NP-Complete and NP-Hard problems:** P, NP, NP-Complete and NP-Hard classes	**08**

Text Books:

1.Introduction to the Design and Analysis of Algorithms, Anany Levitin:, 2nd Edition, 2009.Pearson.

2.Computer Algorithms/C++, Ellis Horowitz, Satraj Sahni and Rajasekaran, 2nd Edition, 2014,Universities Press/

Reference Books:

1.Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, CliffordStein, 3rd Edition, PHI.

2. Design and Analysis of Algorithms, S. Sridhar, Oxford (Higher Education).

Question paper pattern:

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
- The question paper will have ten full questions carrying equal marks.
- Each full question carries 20 marks.
- There will be two full questions (with a maximum of three sub questions) from each module
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module

COURSE OUTCOMES

CO1	Identify various time and space complexities of various algorithms for well known problems like searching, sorting etc.
CO2	Estimate the computational complexity of different algorithms using divide and conquer, decrease and conquer design paradigm.
CO3	Design efficient algorithms for sorting, string matching, and graph problems using dynamic programming.
CO4	Apply greedy and backtracking techniques to solve various problems.
CO5	Implement the programs by using backtracking and branch and bound and analyze the complexities.

CO-PO-PSO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	-	-	-	-	-	-	-	-	2	2	3	-
CO2	3	3	2	-	-	-	-	-	-	-	-	2	2	3	-
CO3	3	3	3	-	-	-	-	-	-	-	-	2	2	3	-
CO4	3	2	3	-	-	-	-	-	-	-	-	2	2	3	-
CO5	3	2	3	-	-	-	-	-	-	-	-	2	2	3	-

DATABASE MANAGEMENT SYSTEM
[As per Choice Based Credit System(CBCS)scheme]
(Effective from the academic year 2023-2024)

SEMESTER – IV

Course Code	**22CS43**	**CIE Marks**	**50**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**50**
Total Number of Lecture Hours	**40**	**Exam Hours**	**03**

CREDITS – 03

Course Objectives: This course will enable students to:

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

Module I	**Hours**
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.**Data Modelling using Entities and Relationships:** Entity types, Entity sets, attributes, roles, and structural constraints, Weak entity types, ER diagrams, Examples.	**08**
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.	**08**
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 assertionsand action triggers, Views in SQL, Schema change statements in SQL.**Database Application Development:** Accessing databases from applications, An introduction to JDBC, JDBC classes and interfaces, SQLJ, Stored procedures, Case study: The internet Bookshop.	**08**
Module IV	
Normalization: Database Design Theory – Introduction to Normalization usingFunctional 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, JoinDependencies 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 ofMultivalueddependencies and 4NF, Other dependencies and Normal Forms	**08**
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 MultipleGranularity Locking.	**08**

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

Reference Books:

1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan‟s Database System Concepts 6th Edition Tata Mcgraw Hill Education Private Limited

Question paper pattern:

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
- The question paper will have ten full questions carrying equal marks.
- Each full question carries 20 marks.
- There will be two full questions (with a maximum of three sub questions) from each module
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module

Course Outcomes (COs):

CO1	Design conceptual entity relationship diagrams for the real world applications.
CO2	Apply knowledge of relational databases to solve practical problems,
CO3	Use Structured Query Language (SQL) for database manipulation and also demonstrate the basic of query evaluation.
CO4	Implement normalization algorithms using database design theory for different applications
CO5	Analyze and implement transaction processing, concurrency control and database recovery protocols in databases.

CO-PO-PSO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	-	-	-	2	-	-	-	-	2	2	3	-
CO2	3	2	3	-	-	-	2	-	-	-	-	2	2	3	-
CO3	3	2	3	-	-	-	2	-	-	-	-	2	2	3	-
CO4	3	2	3	-	-	-	2	-	-	-	-	2	2	3	-
CO5	3	2	3	-	-	-	2	-	-	-	-	2	2	3	-

PYTHON APPLICATION PROGRAMMING
[As per Choice Based Credit System(CBCS)scheme]
(Effective from the academic year 2023-2024)
SEMESTER – IV

Course Code	**22CS44**	**CIE Marks**	**50**
Number Lecture Hour/Week	**03**	**SEE Marks**	**50**
Number of Lecture Hours	**40**	**Exam Hours**	**03**
CREDITS-03			

Course Objectives:

- Learn the syntax and semantics of Python programming language.
- Illustrate the process of structuring the data using lists, tuples and dictionaries.
- Demonstrate the use of built-in functions to navigate the file system.
- Implement the Object-Oriented Programming concepts in Python.
- Discuss the concepts of NumPy, Pandas and Data Visualization.

Module I	**Hours**
Python Basics: Entering Expressions into the Interactive Shell, The Integer, Floating-Point, and String Data Types, String Concatenation and Replication, Storing Values in Variables, Your First Program, Dissecting Your Program. **Flow control:** Boolean Values, Comparison Operators, Boolean Operators, Mixing Boolean and Comparison Operators, Elements of Flow Control, Program Execution, Flow Control Statements, Importing Modules, Ending a Program Early with sys.exit(). **Functions:** def Statements with Parameters, Return Values and return Statements, The None Value, Keyword Arguments and print(), Local and Global Scope, The global Statement, Exception Handling, A Short Program: Guess the Number.	**08**
Module II	
Lists: The List Data Type, Working with Lists, Augmented Assignment Operators, Methods, Example Program: Magic 8 Ball with a List, List-like Types: Strings and Tuples, References. **Dictionaries and Structuring Data:** The Dictionary Data Type, Pretty Printing, Using Data Structures to Model Real-World Things.**Manipulating Strings:** Working with Strings, Useful String Methods, Project: Password Locker, Project: Adding Bullets to Wiki Markup	**08**
Module III	
Pattern Matching with Regular Expressions: Finding Patterns of Text Without Regular Expressions, Finding Patterns of Text with Regular Expressions, More Pattern Matching with Regular Expressions, Greedy and Non greedy Matching, The findall() Method, Character Classes, Making Your Own Character Classes, The Caret and Dollar Sign Characters, The Wildcard Character, Review of Regex Symbols, Case-Insensitive Matching, Substituting Stringswith the sub() Method, Managing Complex Regexes, Combining re .IGNORECASE, re .DOTALL, and re .VERBOSE, Project: Phone Number and Email Address Extractor. **Reading and Writing Files:** Files and File Paths, The os.path Module, The File Reading/Writing Process, Saving Variables with the shelve Module, Saving Variables with the pprint.pformat() Function, Project: Generating Random Quiz Files, Project: Multiclipboard. **Organizing Files:** The shutil Module, Walking a Directory Tree, Compressing Files with the zipfile Module, Project: Renaming Files with American-Style Dates to European-Style Dates, Project: Backing Up a Folder into a ZIP File.	**08**

Module IV	
Classes and objects: Programmer-defined types, Attributes, Rectangles, Instances as return values, Objects are mutable, Copying. **Classes and functions:** Time, Pure functions, Modifiers, Prototyping versus planning. **Classes and methods:** Object-oriented features, Printing objects, Another example, A more complicated example, The init method, The__str__method, Operator overloading, Type-based dispatch, Polymorphism, Interface and implementation. **Inheritance:** Card objects, Class attributes, Comparing cards, Decks, Printing the deck, Add, remove, shuffle and sort, Inheritance, Class diagrams, Data encapsulation.	08
Module V	
Introduction to NumPy: Introduction, Array, NumPy Array, Indexing and slicing, Operations on Arrays, Concatenating Arrays, Reshaping Arrays, Splitting Arrays, Statistical operations on Arrays, Loading Arrays from files, saving NumPy Arrays in files on disk. **Pandas and Data Visualization:** Introduction to Python Libraries, Series, Data Frame, Importing and exporting data between CSV Files and Data Frames, Panda‟s series Vs NumPy ndarray.	08

Text Books:

1. Al Sweigart, "Automate the Boring Stuff with Python",1st Edition, No Starch Press, 2015. (Available under CC-BY-NC-SA license at https://automatetheboringstuff.com/) (Chapters 1 to 18)
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist, 2ndEdition, Green Tea Press, 2015. (http://greenteapress.com/thinkpython2/thinkpython2.pdf) (Chapters 15, 16, 17) (Download pdf files from the above links).

Reference Books:

1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan‟s DataSystem Concepts 6th Edition Tata Mcgraw Hill Education Private Limited

Question paper pattern:

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
- The question paper will have ten full questions carrying equal marks.
- Each full question carries 20 marks.
- There will be two full questions (with a maximum of three sub questions) from each module
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module

Course Outcomes (COs):

CO1	Create basic programs using variables, conditionals, loops, and functions.
CO2	Use lists, tuples, and dictionaries in Python programs.
CO3	Use Python for regex pattern matching, file manipulation, efficient organization, and debugging to solve computational tasks.
CO4	Utilize the concepts of Object-Oriented Programming in Python.

CO5	Develop application python programs using Numpy and Pandas.

CO-PO-PSO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	-	-	-	-	-	-	-	-	2	2	3	-
CO2	3	2	3	-	-	-	-	-	-	-	-	2	2	3	-
CO3	3	2	3	-	-	-	-	-	-	-	-	2	2	3	-
CO4	3	2	3	-	-	-	-	-	-	-	-	2	2	3	-
CO5	3	2	3	-	-	-	-	-	-	-	-	2	2	3	-

AUTOMATA THEORY AND COMPUTABILITY
[As per Choice Based Credit System(CBCS)scheme]
(Effective from the academic year 2023-2024)
SEMESTER – IV

Course Code	**22CS45**	**CIE Marks**	**50**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**50**
Total Number of Lecture Hours	**40**	**Exam Hours**	**03**

CREDITS – 03

Course Objectives:

This course will enable students to:

- Introduce the fundamental concepts of Automata Theory, Formal Languages and compiler design
- Principles Demonstrate Application of Automata Theory and Formal Languages in the fieldof compiler design
- Develop understanding of computation through Push Down Automata and Turing Machines
- Introduce activities carried out in different phases of Phases compiler
- Identify the undecidability problems.

Module I	**Hours**
Why study the Theory of Computation, Languages and Strings: Strings, Languages. A Language Hierarchy, Computation, **Finite State Machines (FSM)**: Deterministic FSM, Regular languages, Designing FSM, Nondeterministic FSMs, From FSMs to Operational Systems, Simulators for FSMs, Minimizing FSMs.	**08**
Module II	
Regular Expressions (RE): what is a RE?, Kleene‟s theorem, Applications of REs, Manipulating and Simplifying REs. Regular Grammars: Definition, Regular Grammarsand Regular languages. Regular Languages (RL) and Non-regular Languages: How many RLs, To show that a language is regular, Closure properties of RLs, to show some languages are not RLs.	**08**
Module III	
Context-Free Grammars(CFG): Introduction to Rewrite Systems and Grammars, CFGs and languages, designing CFGs, simplifying CFGs, proving that a Grammar is correct, Derivation and Parse trees, Ambiguity, Normal Forms. Pushdown Automata (PDA): Definition of non-deterministic PDA, Deterministic and Non-deterministic PDAs, Nondeterminism and Halting, alternative equivalent definitions of a PDA, alternatives that are not equivalent to PDA.	**08**
Module IV	
Algorithms and Decision Procedures for CFLs: Simplification of CFG, Elimination ofε-production and Unit Symbol, CFLs are closed under Union, Concatenation and Star-closure. CFLs are not closed under Intersection and complementation. **Z**M, Techniques for TM construction. Extension to the basic Turing Machine	**08**
Module V	

Program techniques for Turing machine, The model of Linear Bounded automata, Multi-stack Machines, TM with semi-infinite tape. **Decidability:** Definition of an algorithm, decidability, decidable languages, Undecidable languages, halting problem of TM, Post correspondence problem. Complexity: Growth rateof functions, the classes of P and NP, Quantum Computation: quantum computers, Church-Turing thesis. **Applications:** G.1 Defining syntax of programming language, Appendix J: Security	**08**

Textbooks:

1. John E. Hopcroft, Rajeev Motwani & Jeffrey D Ullman "Introduction to Automata Theory, Languages and Computation" Second Edition.
2. Peter Linz "An Introduction to Formal Languages and Automata" Fifth Edition.
3. A. M. Padma Reddy "Finite Automata and Formal Languages" A Simple Approach.

Reference Books:

1. S. P. Eugene Xavier "Theory of automata, formal languages and computation".
2. Basavaraj S. Anami & Karibasappa K. G "Formal Languages and Automata Theory"

Question paper pattern:

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
- The question paper will have ten full questions carrying equal marks.
- Each full question carries 20 marks.
- There will be two full questions (with a maximum of three sub questions) from each module
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module

Course Outcomes (COs):

CO1	Design a computational model Finite state machine with conversion between different types of FA and minimize the given FA for any regular language
CO2	Develop regular expressions ,languages and apply it for designing compilers.
CO3	Develop context free grammar ,push down automata for the given language and conversion between PDA & CFG .
CO4	Simplify CFG & apply the concept of Turing machine for a given Language.
CO5	Analyze and understand decidability and undesirability of various problems with their complexity analysis.

CO-PO-PSO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	-	-	-	-	-	-	-	-	-	2	3	-
CO2	2	3	3	-	-	-	-	-	-	-	-	-	2	3	-
CO3	2	3	3	-	-	-	-	-	-	-	-	-	2	3	-
CO4	2	3	3	-	-	-	-	-	-	-	-	-	2	3	-
CO5	2	3	3	-	-	-	-	-	-	-	-	-	2	3	-

ALGORITHMS LAB
[As per Choice Based Credit System(CBCS)scheme]
(Effective from the academic year 2023-2024)
SEMESTER – IV

Course Code	**22CSL46**	**CIE Marks**	**50**
Number Lecture Hour/Week	**02**	**SEE Marks**	**50**
Number of Lecture Hours	**30**	**Exam Hours**	**03**

CREDITS-01

Course Objectives: This course will enable students

- Design and implement various algorithms in C
- Employ various design strategies for proble solving.
- Measure and compare the performance of different algorithms

Programs List

PART-A

1. Design a program to search a key element of n integers using binary search algorithm and computetime complexity
2. Design a program to Sort a given set of n integer elements using Quick Sort method and compute itstime complexity.
3. Design a program to sort set of n integer elements using Merge Sort method and compute its timecomplexity.
4. Implement the 0/1 Knapsack problem using Dynamic Programming method. Greedy method.
5. Design a program to print all the node reachable from a given starting node in a given digraph usingDFS method.

PART – B

6. Write a Program find shortest paths to other vertices using Dijkstra's algorithm.

7. (a) Write a program to find a Minimum Cost Spanning Tree of a given connected undirected graphusi udingg Kruskal's algorithm.

(b) Write a program to find Minimum Cost Spanning Tree of a given connected undirected graph using Prim‟s algorithm.

8. Write a program to
(a) Implement All-Pairs Shortest Paths problem using Floyd's

algorithm.(b) Implement transitive closure using warshall Algorithm.

9. Design and implement to find a subset of a given set.

10. Implement Travelling Salesman problem using Dynamic program

Conduct of Practical Examination:

• Experiment distribution

a) For laboratories having only one part: Students are allowed to pick one experiment from the lot with equal opportunity.

b) 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

SEE are mentioned here, writeup-15%, Conduction procedure and result in -70%, Viva-voce 15% of maximum marks. SEE for practical shall be evaluated for 5 0 marks

Course Outcomes (COs):

CO1	Understanding of algorithmic design paradigms and the techniques used for analyzing their efficiency
CO2	Implement programs using various design strategies
CO3	Debug and troubleshoot software issues effectively
CO4	Analyze the data and interpret the results
CO5	Prepare a well organized laboratory report

CO-PO-PSO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	-	2	-	-	-	-	-	-	-	2	-	3
CO2	3	2	3	-	2	-	-	-	-	-	-	-	2	-	3
CO3	3	2	3	-	2	-	-	-	-	-	-	-	2	-	3
CO4	3	2	3	-	2	-	-	-	-	-	-	-	2	-	3
CO5	3	2	3	-	2	-	-	-	-	-	-	-	2	-	3

DATABASE MANAGEMENT SYSTEM LAB
[As per Choice Based Credit System(CBCS)scheme]
(Effective from the academic year 2023-2024)

SEMESTER – IV

Course Code	**22CSL47**	**CIE Marks**	**50**
Number of Lecture Hours/Week	**02**	**SEE Marks**	**50**
Total Number of Lecture Hours	**30**	**Exam Hours**	**03**

CREDITS-01

Course Objectives: This course will enable students to:

- Provide a strong foundation in database concepts, technology, and practice
- Practice SQL programming through a variety of database problems.
- Provide skills in retrieving and manipulating data stored in databases using SQLqueries.
- Design and build database applications for real world problems
- Learn techniques for generating reports from databases, including the use of SQLqueriesand reporting tools.

No.	Title of the experiment
1	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, butfrom Jan 2017 to Jun 2017. 3. Delete a book in BOOK table. Update the contents of other tables to reflect thisdata manipulation operation. 4. Partition the BOOK table based on year of publication. Demonstrate its workingwith a simple query. 5. Create a view of all books and its number of copies that are currently available in the Library.

2.	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 intheircities (Use UNION operation.) 4. Create a view that finds the salesman who has the customer with the highestorderof a day. 5. Demonstrate the DELETE operation by removing salesman with id 1000. All hisordersmust also be deleted.
3.	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(useJOIN operation). 4. Find the title of movies and number of stars for each movie that has at least one ratingand 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.
4.	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, Final IA)WriteSQL 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 each section. 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 table for all students. 5. Categorize students based on the following criterion: If Final IA = 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

5.	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 whoselast 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.
6.	Develop PL/SQL program using PROCEDURE.
7.	Develop PL/SQL program using FUNCTIONS.
8.	Develop PL/SQL program using CURSOR.
9.	Develop PL/SQL Programs using TRIGGERS.
10.	Develop PL/SQL programs using PACKAGES.

Conduct of Practical Examination:

• Experiment distribution

a) For laboratories having only one part: Students are allowed to pick one experiment from the lot with equal opportunity.

b) 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

SEE are mentioned here, writeup-15%, Conduction procedure and result in -70%, Viva-voce 15% of maximum marks. SEE for practical shall be evaluated for 5 0 marks

Course Outcomes (COs):

CO1	Demonstrate database concepts through series of queries.

CO2	Develop a program using MySQL.
CO3	Effectively debug and troubleshoot issues in DBMS programs, ensuring stable and performant database operations.
CO4	Examine data and query outputs.
CO5	Prepare a well-organized laboratory report.

CO-PO-PSO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	-	-	-	-	-	-	-	-	-	2	-	3
CO2	3	2	3	-	-	-	-	-	-	-	-	-	2	-	3
CO3	3	2	3	-	-	-	-	-	-	-	-	-	2	-	3
CO4	3	2	3	-	-	-	-	-	-	-	-	-	2	-	3
CO5	3	2	3	-	-	-	-	-	-	-	-	-	2	-	3

PYTHON LAB
[As per Choice Based Credit System(CBCS)scheme]
(Effective from the academic year 2023-2024)
SEMESTER – IV

Course Code	**22CSL48**	**CIE Marks**	**50**
Number of Lecture Hours/Week	**02**	**SEE Marks**	**50**
Total Number of Lecture Hours	**30**	**Exam Hours**	**03**

Course Objectives:

- Develop program to solve real world problems using python programming.
- Develop the programs using the concepts of control statements, data structures & files.
- Apply features of object-oriented and NumPy, pandas package to develop computationally intensiveprogramming & interpret the data.

Part-A

No.	Title of the experiment
1.	a. Develop a program to read the student‟s details like Name, USN, and Marks in three subjects. Display the student‟s details, total marks, and percentage with suitable messages. b. Develop a program to read the name and year of birth of a person. Display whether the person is a senior citizen or not. c. Read N numbers from the console and create a list. Develop a program to print mean, variance, and standard deviation with suitable messages.
2.	a. Write a program to demonstrate different numbered datatypes in Python and perform a different arithmetic operation onnumbers in Python. b. Write a program to create, concatenate and print a string andaccess a sub-string from a given string. c. Write a Python script to print the current date in the followingformat “SunMay 29 02:26:23 IST 2017”. d. Read a multi-digit number (as char) from the console. Developa programto print the frequency of each digit with suitable messages.
3.	a. Develop a program to find the largest of three numbers b. Develop a program to generate a Fibonacci sequence of length(N). Read Nfrom the console. c. Write a program to calculate the factorial of a number. Develop a programto compute the binomial coefficient (Given N and R).
4.	a. Implementing programs using Functions (Largest number in a list, area ofshape) implementing a real-time/technical application using Exception handling(Divide by Zero error, Voter‟s age validity, student mark range validation)

5.	Using Regular expressions, develop a Python program to a.Identify a word with a sequence of one upper case letter followed by lower case letters. Find all the patterns of "1(0+)1" in a given string.
6.	**a.** SET1 and SET2 are two sets that contain unique integers. SET3 is to be created by taking the union or intersection of SET1 and SET2 using the user-defined function Operation (). Perform either union or intersection by reading the choice from the user. Do not use built-in function union () and intersection () and also the operators "|" and "&". b The Dictionary "DICT1" contains N Elements and each element in the dictionary has the operator as the KEY and operands as VALUES. Performthe operations on operands using operators stored as keys. Display the results of all operations.
7.	Implementing programs using Strings. (Reverse, palindrome, character count, replacing characters)
8.	A. Develop a program to print the 10 most frequently appearing words in a text file. [Hint: Use a dictionary with distinct words and their frequency of occurrences. Sort the dictionary in the reverse order of frequency and display dictionary slice of first 10 items] B.Develop a program to sort the contents of a text file and write the sorted contents into a separate text file. [Hint: String method strip(), list method sort(), append(), and file method open(), readlines(), and write()]. C. Develop a program to backing up a given Folder (Folder in a current working directory) into a ZIP File by using relevant modules and suitable methods.

9.	Develop a program that uses class Students which prompts the User to enter marks in three subjects and calculate total marks, Percentage and display the scorecard details. [Hint: Use a list to store the marks in three subjects and total marks. Use_init() method to initialize name, USN and the lists to store marks and total, Use getMarks() method to read marks into the list, and display() method to display the scorecard details.]
10.	Implementing program using modules and python Standard Libraries (pandas, Numpy, Matplotlib, Scipy)

Conduct of Practical Examination:

• Experiment distribution

a) For laboratories having only one part: Students are allowed to pick one experiment from the lot with equal opportunity.

b) 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

SEE are mentioned here, writeup-15%, Conduction procedure and result in -70%, Viva-voce 15% of maximum marks. SEE for practical shall be evaluated for 50 marks

Course Outcomes (COs):

CO1	Demonstrate theoretical concepts of Python strings, lists, tuples, functions and file manipulation through series of programs.
CO2	Design and develop solutions to given problems using Python.
CO3	Debug syntactical errors, and troubleshoot programming issues effectively.
CO4	Analyze the programs and interpret the results
CO5	Prepare a well-organized Python programming laboratory report

CO-PO-PSO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	-	2	-	-	-	-	-	-	-	2	-	3
CO2	3	2	3	-	2	-	-	-	-	-	-	-	2	-	3
CO3	3	2	3	-	2	-	-	-	-	-	-	-	2	-	3
CO4	3	2	3	-	2	-	-	-	-	-	-	-	2	-	3
CO5	3	2	3	-	2	-	-	-	-	-	-	-	2	-	3

UNIVERSAL HUMAN VALUES
[As per Choice Based Credit System(CBCS)scheme]
(Effective from the academic year 2023-2024)
SEMESTER-IV

Course Code	**22UHV410**	**CIE Marks**	**50**
Number Lecture Hour/Week	**03**	**SEE Marks**	**50**
Number of Lecture Hours	**40**	**Exam Hours**	**03**

CREDITS-03

Course Objectives: Students will be taught to:

1. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.

Module I	**Hours**
Introduction to Value Education: Lecture 1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role ofEducation) **Lecture 2:** Understanding Value Education **Tutorial 1**: **Practice Session PS1** Sharing about Oneself **Lecture 3:** Self-exploration as the Process for Value Education **Lecture 4:** Continuous Happiness and Prosperity – the Basic HumanAspirations **Tutorial 2: Practice Session PS2** Exploring Human Consciousness **Lecture 5:** Happiness and Prosperity – Current Scenario **Lecture 6:** Method to Fulfill the Basic Human Aspirations **Tutorial 3: Practice Session PS3** Exploring Natural Acceptance	**08**
Module II	
Module 2 – Harmony in the Human Being (6 lectures and 3 tutorials for practice session) **Lecture 7:** Understanding Human being as the Co-existence of the Self andthe Body **Lecture 8:** Distinguishing between the Needs of the Self and the Body **Tutorial 4:** Practice Session PS4 Exploring the difference of Needs of Self andBody **Lecture 9:** The Body as an Instrument of the Self **Lecture 10:** Understanding Harmony in the Self **Tutorial 5:** Practice Session PS5 Exploring Sources of Imagination in the **SelfLecture 11:** Harmony of the Self with the Body **Lecture 12:** Programme to ensure self-regulation and Health **Tutorial 6:** Practice Session PS6 Exploring Harmony of Self with the Body	**08**
Module III	

Harmony in the Family and Society (6 lectures and 3 tutorials for practicesession) **Lecture 13:** Harmony in the Family – the Basic Unit of Human Interaction **Lecture 14:** 'Trust' – the Foundational Value in Relationship **Tutorial 7:** Practice Session PS7 Exploring the Feeling of Trust **Lecture 15:** 'Respect' – as the Right Evaluation **Tutorial 8:** Practice Session PS8 Exploring the Feeling of Respect	**08**
Lecture 16: Other Feelings, Justice in Human-to-Human Relationship **Lecture 17:** Understanding Harmony in the Society **Lecture 18:** Vision for the Universal Human Order	
Module IV	
Harmony in the Nature/Existence (4 lectures and 2 tutorials for practicesession) Lecture 19: Understanding Harmony in the Nature **Lecture 20:** Interconnectedness, self-regulation and Mutual Fulfilment amongthe Four Orders of Nature **Tutorial 10: Practice Session PS10** Exploring the Four Orders of Nature **Lecture 21:** Realizing Existence as Co-existence at All Levels **Lecture 22:** The Holistic Perception of Harmony in Existence **Tutorial 11: Practice Session PS11** Exploring Co-existence in Existence	**08**
Module V	
Implications of the Holistic Understanding – a Look at Professional Ethics(6 lectures and 3 tutorials for practice session) **Lecture 23: Natural Acceptance of Human Values Lecture 24:** Definitiveness of (Ethical) Human Conduct **Tutorial 12: Practice Session PS12** Exploring Ethical Human Conduct **Lecture 25:** A Basis for Humanistic Education, Humanistic Constitution andUniversal Human Order **Lecture 26**: Competence in Professional Ethics **Tutorial 13: Practice Session PS13** Exploring Humanistic Models inEducation **Lecture 27:** Holistic Technologies, Production Systems and ManagementModels-Typical Case Studies **Lecture 28:** Strategies for Transition towards Value-based Life and Profession**Tutorial 14: Practice Session PS14** Exploring Steps of Transition towards Universal Human Order	**08**

Text Books:

1. The Textbook - A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. The Teacher's Manual- Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, RR Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53

Reference Books:

1. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj – Pandit Sunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi

11. India Wins Freedom - Maulana Abdul Kalam Azad 12. Vivekananda - Romain Rolland (English) Gandhi - Romain Rolland (English).

Course Outcomes (Cos) :

CO1	Present sustainable solutions to the problems in society and nature
CO2	See that these solutions are practicable and draw roadmaps to achieve them.
CO3	Grasp the right utilization of their knowledge in their streams of Technology/Engineering/Management/any other area of study to ensure mutual fulfilment. E.g. mutually enriching production system with rest of nature.
CO4	Sincerely evaluate the course and share with their friends. They are also able to suggest measures to make the course more effective and relevant.
CO5	Make use of their understanding in the course for the happy and prosperous family and society.

CO-PO-PSO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	2	-	-	2	2	2	-	2	3	-
CO2	3	2	2	-	-	2	-	-	2	2	2	-	2	3	-
CO3	3	2	2	-	-	2	-	-	2	2	2	-	2	3	-
CO4	3	2	2	-	-	2	-	-	2	2	2	-	2	3	-
CO5	3	2	2	-	-	2	-	-	2	2	2	-	2	3	-

RESPONSIVE WEB DESIGN WITH BOOTSTRAP 5.0
[As per Choice Based Credit System(CBCS)scheme]
(Effective from the academic year 2023-2024)
SEMESTER – IV

Course Code	**22ACS411A**	**CIE Marks**	**50**
Number of Lecture Hours/ Week	**02**	**SEE Marks**	**50**
Total Number of Lecture Hours	**30**	**Exam Hours**	**03**

Course O bjectives: This course will enable students to:

To understand the use of Bootstrap framework for designing responsive web pages.

To gain hands-on experience in creating layouts using Bootstrap components

To design modern web interfaces using Bootstrap utilities such as typography, tables, and menus.

To develop skills to build mobile-friendly, interactive, and accessible web applications.

No.	Title of the experiment
1.	Install bootstrap framework and understand various tags,attributes to buid resposive web page
2.	Design web page that shows department name,college name at center of web page by using bootstrap framework and without using bootstrap framework
3.	Display student information content on responsive web page by using container and container-fluid classes
4.	Use offset column,reorderinG column, and nesting column to create responsive web page for given format
5.	Create responsive web page of class time table by using bootstrap grid system
6.	Show atleast three to four co-curricular activities of student that includes responsive tables with style such as hover state when mouse over,different color of each row,table with striped row etc
7.	Use bootstrap typography to create resposive web page on given blog topic
8.	Design resposive web page for student registration form using bootstrap layout,form control and bootstrap buttons
9.	Create various types of menus using bootstrap menu componentssuch as right aligned dropdown menu,drop up menu,adding headers of each item etc.
10.	Design responsive web page that shows odd(sem1,sem3,sem5) and even consider as menu,courses of each semester as submenu using button groups and button toolbar component

Conduct of Practical Examination:

• Experiment distribution

a) For laboratories having only one part: Students are allowed to pick one experiment from the lot with equal opportunity.

b) 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

SEE are mentioned here, writeup-15%, Conduction procedure and result in -70%, Viva-voce 15% of maximum marks. SEE for practical shall be evaluated for 5 0 marks

Course Outcomes (COs):

CO1	Learn the fundamentals of the Bootstrap framework and its components for building responsive web pages.
CO2	Design and develop responsive web applications using Bootstrap classes, grid systems, and User Interface(UI) components.
CO3	Debug and troubleshoot software issues effectively
CO4	Analyze the data and interpret the results
CO5	Prepare a well-organized laboratory report

CO-PO-PSO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	-	-	-	-	-	-	2	-	-	2	-	3
CO2	2	2	3	-	-	-	-	-	-	2	-	-	2	-	3
CO3	2	2	3	-	-	-	-	-	-	2	-	-	2	-	3
CO4	2	2	3	-	-	-	-	-	-	2	-	-	2	-	3
CO5	2	2	3	-	-	-	-	-	-	2	-	-	2	-	3

SCRIPTING LANGUAGES
[As per Choice Based Credit System(CBCS)scheme]
(Effective from the academic year 2023-2024)
SEMESTER – IV

Course Code	**22ACS411B**	**CIE Marks**	**50**
Number of Lecture Hours/Week	**02**	**SEE Marks**	**50**
Total Number of Lecture Hours	**30**	**Exam Hours**	**03**

Course O bjectives: This course will enable students to:

- Use JavaScript for dynamic effects
- To prepare PHP scripts
- Use JavaScript & PHP to validate form input entry

Sl.No.	Title of the experiment
1.	Write a JavaScript to design a simple calculator to perform the following operations: sum, product, difference and quotient
2.	Write a JavaScript that calculates the squares and cubes of the numbers from 0 to 10and outputs HTML text that displays the resulting values in an HTML table format.
3.	Write JavaScript to validate the following fields of the Registration page. a. First Name (Name should contains alphabets and the length should not be less than 6 characters). b. Password (Password should not be less than 6 characters length). c. E-mail id (should not contain any invalid and must follow the standard pattern name@domain.com) d. Mobile Number (Phone number should contain 10 digits only).e.Last Name and Address (should not be Empty).
4.	Write an HTML page including any required JavaScript that takes a number from text field in the range of 0 to 999 and shows it in words. It should not accept four and above digits, alphabets and special characters
5.	Write a JavaScript code that displays text “TEXT-GROWING” with increasing fontsize in the interval of 100ms in RED COLOR, when the font size reaches 50pt it displays “TEXT-SHRINKING” in BLUE color. Then the font size decreases to 5pt.
6.	a. Install and configure PHP, web server, MYSQL b. Write a program to print “Welcome to PHP” c. Write a simple PHP program using expressions and operators.
7.	Develop and demonstrate PHP Script for the following problems: a) Write a PHP Script to find out the Sum of the Individual Digits. b) Write a PHP Script to check whether the given number is Palindrome or not
8.	Write a PHP program to keep track of the number of visitors visiting the web page andto display this count of visitors, with proper headings.
9.	Write a PHP Program to display current Date, Time and Day.

10.	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
11.	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 0of a list named statesList. b. Search for a word in states that begins with k and ends in s. Perform 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 inelement 2 of the list. d. Search for a word in states that ends in a. Store this word in element 3 of the list.
12.	Write a PHP program to sort the student records which are stored in the databaseusing selection sort.
13.	Write a PHP program for sending and receiving plain text message (email).

Conduct of Practical Examination:

• Experiment distribution

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• Change of experiment is allowed only once and marks allotted for procedure to be made zero of the changed part only.

• Marks Distribution

SEE are mentioned here, writeup-15%, Conduction procedure and result in -70%, Viva-voce 15% of maximum marks. SEE for practical shall be evaluated for 5 0 marks

Conduct of Practical Examination: • Experiment distribution

g) For laboratories having only one part: Students are allowed to pick one experimentfromthe lot with equal opportunity.

h) For laboratories having PART A and PART B: Students are allowed to pick oneexperiment 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 zerooftthe changed part only.

• Marks Distribution

i) For laboratories having only one part – Procedure + Execution + Viva-Voce: 15+70+15 = 100 Marks

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

Course Outcomes (COs):

CO1	Design and develop dynamic, interactive web applications using HTML, CSS, JavaScript, and form validation techniques.
CO2	Implement full-stack web applications by integrating client-side technologies with server-side logic using PHP.
CO3	Debug and troubleshoot software issues effectively
CO4	Analyze the data and interpret the results
CO5	Prepare a well-organized laboratory report

CO-PO-PSO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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CO3	2	2	3	-	-	-	-	-	-	2	-	-	-	-	3
CO4	2	2	3	-	-	-	-	-	-	2	-	-	-	-	3
CO5	2	2	3	-	-	-	-	-	-	2	-	-	-	-	3